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Wilderness and Natural Areas in Eastern North America

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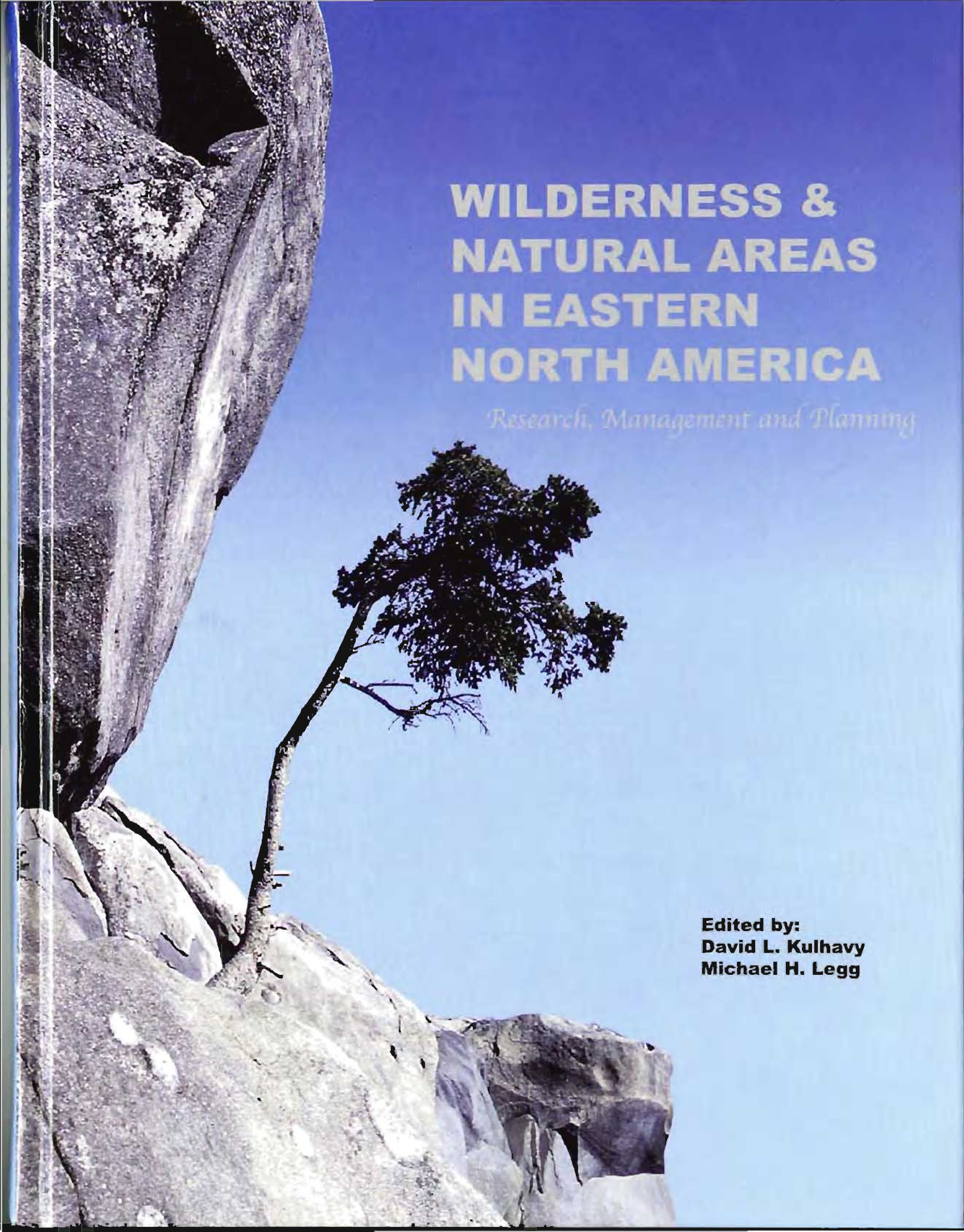

WILDERNESS & NATURAL AREAS IN EASTERN NORTH AMERICA

Research, Management and Planning

Edited by:
David L. Kulhavy
Michael H. Legg

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Research

Management

and

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Research, Management and Planning

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Foreword

Wilderness and Natural Areas in Eastern North America: Research, Management and Planning

R. Scott Beasley
Arthur Temple College of Forestry
Stephen F. Austin State University, Nacogdoches, Texas

A decade has passed since the conference *Wilderness and Natural Areas in the Eastern United States. A Management Challenge*, edited by David L. Kulhavy and Richard N. Conner (1986). That conference examined issues in wildlife, forest protection, management issues, visitor needs and impact, vegetation and grasslands and savannahs. This conference focuses on the critical needs of research, management and planning as we look forward to the 21st Century and management of these special areas. Congress has set aside wilderness areas in eastern North America under The Wilderness Act of 1964 (PL 88-577) and the amendments of 1975, known as the "Eastern Wilderness Act" (PL 93-622). We now have the perspective of time and improved visions of landscape measurement and preservation. Within the Arthur Temple College of Forestry, we are embarking on a five-year look into the future of natural area resources through our Forest Research Institute. We know that there are problems inherent in relation to small wilderness areas in eastern North America, but volumes such as this will lead the way by providing current and factual information for the natural resource manager of the next decade and beyond.

This conference was organized with impetus from the USDA Forest Service and special recognition is given to Larry Phillips, USDA National Forest Systems, Region 8. Within the USDI National Park Service, Karen Wade, Superintendent, Great Smoky Mountains National Park (GSMNP), provided early discussion and direction to the conference. Hubert Hinote and Phillip Gibson, SAMAB and John Romanowski, USDA Forest Service, Cherokee National Forest, provided input and guidance as the conference developed. Michael H. Legg and David L. Kulhavy, Arthur Temple College of Forestry; and John Burde, Southern Illinois University, provided organization and leadership for the conference. Rita Cantu provided inspiration through music and recitation.

Within the critical issues examined were overviews of natural resource management from Gray Reynolds of the USDA Forest Service, Karen Wade, GSMNP, and Hubert Hinote of SAMAB. Ed Zahniser, Harpers Ferry, provided a comprehensive retrospective examination of the roots of the wilderness movement in eastern North America. His remarks highlighted the role of "Zahnie," Ed's father during the development of the wilderness movement. Jon Rousch

Mike Link riveted the audience (and readers) with his philosophical and poignant tribute to his son, Matt, killed in a kayaking incident in New Zealand. Mike stressed "keep the wild in Wilderness." Paul Risk echoed that theme comparing the urban idealism with the wilderness reality stating "If wilderness is to remain, it is imperative that people stop trying to mold it to their ideas of 'fair' and 'appropriate' "

Jon Roush explored new politics and opportunities for eastern wilderness and natural areas stressing community-based conservation and concessions among stakeholders. Marlene Tull and Michael Legg echoed cooperation through transactive planning and the Limits of Acceptable Change (LAC) process. Chris Barns, USDI Bureau of Land Management, emphasized the Strategic Planning Process through presentation of Critical Strategies from the Sixth National Wilderness Conference. The primary critical issue identified and emphasized was education of the public.

Peter Landres and his coauthors examined benchmark use for evaluating change in wilderness, defining what is "natural" and how wilderness and natural areas should be protected and managed.

Education as a theme recurs throughout this volume. Tom Rillo presented ten propositions defining the role in wilderness education emphasizing environmental literacy as a requisite to wilderness and open space preservation. Gail Vander Stoep summarized visitor information, education and interpretation. In her paper, Gail promoted providing resource managers with training in interpretation and communication skills. Wadzinski presented an extensive public involvement with the Charles C. Deam Wilderness in Indiana, resulting in an amendment to the Forest Land and Resource Management Plan.

Zeller presented the American with Disabilities Act posing the question "how to balance the individual's rights with the appropriate use of the wilderness." Porter reviewed air pollutant monitoring and Mohr examined fire suppression strategies commensurate with wilderness management.

Wetland identification (Tracy et al.) and characterization of bottomland hardwoods (Walker et al.) for Harrison Bayou of Caddo Lake were examined as issues in wetlands management. Vegetation classification and forest composition in Sipsey Wilderness (Oswald and Green) and Alan Seeger Wilderness (Nowack and Abrams) were examined in the context of change and disturbance. Impacts of insects and diseases, including the southern pine beetle, *Dendroctonus frontalis*, were examined (Billings; Kulhavy and Ross; and Oak). Billings highlighted the impact of southern pine beetle on Texas wilderness and adjacent landowners.

Dan Pittillo presented an overview of the geologic and vegetation history of the Southern Appalachians. Kinard presented 15 natural areas maintained in South Carolina; Cook presented the concept of a psuedo-wilderness, an area that appears natural, is off-limits ot mechanized conveyances and is large enough to offer a semblance of remoteness. Public awareness and understanding include environmental education partnerships in wilderness management (Knapp and Marsen); integrating the wilderness land ethic into elementary and middle schools (Arnaudin); interpretive programs in the GSMNP (Voorhis) and Michigan (Nagel); examination of urban populations and wilderness issues (Parker and Koester, Russell et al.); and parks as classrooms (McCoy) and wilderness-based learning (McDonald and Cordell).

Management strategies are examined by Switzer, Mammoth Caves; Ocoee River as an Olympic site (Wright); selecting human experience indicators (Watson and Roggenbuck); and trails and trail impact (Silbergh, Burde et al., and Borrie and Roggenbuck).

Tom Kovalicky, in his summary address, gave a wake-up call for wilderness and natural areas managers and users. stressing that for the Interagency Wilderness Strategic Plan ever reach implementation, it is up to the audience. "This plan is the glue that holds the four National wilderness agencies together."

In summary, concepts and ideas found in Wilderness and Natural Areas: Research, Management and Planning coupled with the five themes of Preservation of Natural and Biological Values; Management of Social Values; Administration Policy and Agency Coordination; Training of Agency Personnel; and Public Awareness and Understanding, will lead us into the 21st century for planning and evaluation.

I wish to thank the USDA Forest Service, National Forest System, Region 8, especially Larry Phillips; John Romanowski, Cherokee National; Dr. Virginia Burkett, USDI National Biological Service; Karen Wade, Superintendent, Great Smoky Mountains National Park, USDI National Park Service; Hubert Hinote and Phillip Gibson, Southern Appalachian Man and the Biosphere (SAMAB) Program; and the American Wilderness Leadership School, for their contributions to the program. A special thank you to conference organizers Michael H. Legg and David L. Kulhavy, Arthur Temple College of Forestry; and John Burde, Southern Illinois University. Wilderness and natural area investigations into the 21st century need to be dynamic, insightful and based on practical guidance and resourcefulness.

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SECTION 3 Management of Social Values

SECTION 4 Public Awareness and Understanding

SECTION 5 Management, Policy, Training

[1]Primary theme for article: 1=Preservation of Natural and Biological Values; 2=Management of Social Values; 3=Administration Policy and Agency Coordination; 4=Training of Agency Personnel; 5=Public Awareness and Understanding

Wilderness in Eastern North America: Research, Management and Planning

David L. Kulhavy and Michael H. Legg, Arthur Temple College of Forestry, Stephen F. Austin State University, Nacogdoches, Texas
John H. Burde, Southern Illinois University, Carbondale, Illinois

The concept of wilderness and natural areas in eastern North America brings the challenges of research, management and planning that are unique to these areas. This conference examined these ideas in both a formal setting with papers and presentations and in an informal setting with conversation, recreation and musical interludes. The conference opened with Gray Reynolds of the United State Forest Service summarizing trends in wilderness management and visitor trends. Reynolds challenged the audience to seek out the non-traditional uses and expand the role of the wilderness users. Karen Wade, Superintendent, Great Smoky Mountains National Park, touched on the tangible concepts of the GSMNP, including the scenic grandeur, tourism, and the potential of the park for a wilderness experience. Ed Zahniser took us back to where eastern wilderness began. His constant reminder of the impact of "Zahnie," Howard Zahniser, Ed Zahniser's father. Howard Zahniser (19061964) was the primary architect of the 1964 Wilderness Act. In 1946, in the eastern U.S. wilderness of New York State's Adirondack State Park, Zahniser recognized a legislative model for wilderness protection in perpetuity—the 1894 "forever wild" clause of the New York State Constitution.

WILDERNESS AND NATURAL AREAS IN EASTERN NORTH AMERICA
Research, Management and Planning

Since the passage twenty years ago of the "Eastern Wilderness Act," wilderness and other areas managed to preserve or enhance natural qualities have taken on increasing significance in the eastern portion of North America. Fragmentation of ecosystems, population pressures and past human influences combine to create a unique combination of research, planing and management issues in these areas.

The Wilderness and Natural Areas Conference examined five areas with in the context of management:

1) Preservation of Natural and Biological Values
2) Management of Social Values
3) Administration Policy and Agency Coordination
4) Training of Agency Personnel
5) Public Awareness and Understanding.

Plenary addresses included:

•Gray Reynolds, Deputy Chief of the USDA Forest Service, on the value of wilderness to society;

•Ed Zahniser examining where wilderness preservation began, "Ah, Wilderness! Wilderness Areas in the East..where wilderness preservation began" quoting his father, Howard Zahniser, primary architect of the 1964 Wilderness Act.

•Karen Wade, Superintendent, Great Smoky Mountains National Park, noted "Eastern wilderness...sounds like a contradiction in terms to many people....We value wilderness because it is in sharp contrast to our Man-built landscape:"

•Tom Rillo, American Wilderness Leadership School, examining the role of wilderness in environmental education, offered "the goal of all outdoor environmental education programs is the development of an environmentally literate citizenry that is aware, articulate and activated with regard to environmental problems;

•Hubert Hinote, Southern Appalachian Man and the Biosphere Program, highlighted the public/private partnership focusing on the vision of the program: "promote the achievement of a sustainable balance between the conservation of biological diversity, compatible economic uses and cultural values across the Southern Appalachians."

•Christopher V. Barns, U. S. Dept. Interior, Bureau of Land Management, examined critical strategies for the 6th National Wilderness Conference with Implications for eastern wilderness management. "The need to educate a diverse array of publics is seen as even more critical in the East, with somewhat less emphasis on some biophysical management issues."

•Jon Roush presented "New Politics and New Opportunities for Eastern Wilderness" indicating "Policy decisions about wilderness management must respond to institutional changes taking place in the U. S. The arenas of action are shifting from federal to local, from public to private, and from piecemeal conservation to focus on the whole system."

•J. Dan Pittillo, Western Carolina University, presented "Geological and Vegetational History of the Southern Appalachians" describing geological events and interacting vegetational changes.

•Mike Link, Executive Director, Audubon Center of the North Woods, presented poignant testimony, "Risk—An Essential Element," sharing "I love wilderness and because I lost my son in a kayak accident...Let me share with you ideas about wilderness, risk and management."

•Jerry Stokes, U. S. Dept. Agr, Forest Service, Director, Wilderness and Natural Areas Program, convened an interagency panel that examined values and issues in wilderness and natural areas management in the United States.

•Rita Cantu, U. S. Dept. Agr. Forest Service, interspersed musical interludes with provocative vignettes on the values and spiritual epitaphs gleaned from wilderness.

•Tom Kovalicky, U. S., Dept. Agr., Forest Service, retired, summarized the conference offering "the issues on their Eastern wildlands are complex and are kept that way by the deep seated cultural, traditional and spiritual values of a very large and growing population.

Within the five working sessions, panels, research presentations, interactive sessions and discussion groups tackled the issues surrounding wilderness and natural areas in eastern North America focusing on research, management and planning. The setting adjacent to the Great Smoky Mountains National Park, provided an ideal location to examine the significant issues in management of these sensitive areas. The conference proceedings will be available from the Arthur Temple College of Forestry, Stephen F. Austin State University, Nacogdoches, Texas 75962 in early 1998. Please address inquires for copies to the above address; phone 409 468-3301; FAX 409 468-2489; email mlegg@sfasu.edu or dkulhavy@sfasu.edu.

Trends in Wilderness Management and Visitor Characteristics

Gray F. Reynolds, National Forest Systems, Davidsonville, MD

INTRODUCTION

1994 saw the 30th anniversary of The Wilderness Act. After 30 years of battles over allocation, more than 115 laws for designation, and agency attempts to "manage" the National Wilderness Preservation System, what can we say about our management strategy, the character of the wilderness, and the people who use it? Do we view wilderness differently now?

TRENDS IN WILDERNESS MANAGEMENT

No we do not view wilderness differently, but there continues to be more demands on the wilderness resource which challenge the integrity and wisdom of our wilderness managers. At the First National Wilderness Management Workshop in 1983, at the University of Idaho, Chief Max Peterson made the following predictions and challenges when asked, "Where do we go from here?" He challenged the University of Idaho to take the lead in developing an interagency wilderness management plan. He felt that each agency should elevate wilderness management to doing the job on the ground rather than committing too much of our energies to the question of which areas should be designated as wilderness.

Chief Peterson suggested that we needed consistent principles in valuing wilderness, but these principles may not lead to identical practices. What we do in a high alpine area in Montana to deal with certain problems probably will not fit the Everglades in Florida. He felt a need to look at basic principles, though, so that any practice is designed to perpetuate the naturalness and the values of wilderness."

Chief Peterson went on to say that we needed to use our money more efficiently, finding better ways to do things and using educational information more effectively. We needed to look to the user to help pay some kind of fee for use of wilderness. We needed to go farther in using volunteers to helping us in the wilderness. We must deal with the issue of fire in wilderness and look at use of planned ignitions. We must find better ways to pull together the collective wisdom of those with field experience. As we reflect on Chief Peterson's charge, we are still committed to achieving those actions, and have accomplished many over the past 13 years.

As a consequence of the Chief's request, a national steering committee, composed of members from all the wilderness management agencies and user groups, was established and a 5 year wilderness management action plan was developed. The action plan had five priority guidelines: educate the public; educate and train managers; wilderness capacities and user concentrations; interagency coordination and consistency; and consistent wilderness management practices.

Since this first National wilderness conference in 1983, all wilderness conferences have built on these guidelines. As of this month all of the four wilderness management agencies have signed off on a strategic action plan that addresses critical wilderness management issues that were identified by the participants at the 6th National Wilderness Conference in Santa Fe, New Mexico, November 14-18, 1994. Chris Barns from the BLM will discuss the Strategic Plan Wednesday morning. In fact the concurrent sessions of this conference are built on the critical issues that the plan identified: preservation of natural and biological values; management of social values; administrative policy and agency coordination; training of agency personnel; and public awareness and understanding.

The regional wilderness program leaders of the Forest Service are developing an action plan that will define the purpose and focus of the wilderness program within the Forest Service. This plan will tie in with the National strategic

plan and will focus on a few actions that can best "Secure the Benefits of an Enduring Resource of Wilderness."

The signing of the interagency plan shows that our agencies have elevated wilderness management to a higher level, and that we are committed to managing the wilderness on public lands. We are leveraging our money more effectively through partners. The introduction of the wilderness education box into elementary schools is a very successful use of partners. We show the teachers how the educational materials can enhance their environmental programs and, in many schools, the teacher associations will purchase the boxes. Mary Arnaudin and Pat Lancaster will be discussing how to get teachers involved with the wilderness box on Tuesday.

The Leave No Trace program, teaching outdoor ethics, is also very successful, and has reduced the impacts on the wilderness resource. The Aldo Leopold Wilderness Research Institute, which was designated in August, 1993 has a mission to obtain and provide information necessary to sustain wilderness resources in an ecologically and socially sound manner for the present and future.

A few weeks ago Congress approved the Recreational Fee Demonstration Program to demonstrate the feasibility of a user-generated cost recovery for the operation and maintenance of recreation areas or sites and habitat enhancement projects on Federal lands. The Forest Service has selected three wildernesses to put in the program: The Mt. Whitney and Desolation Wildernesses in California and the Sylvania Wilderness in Michigan. We are going to evaluate how this will be accepted by the visitors. Our research indicates that people are willing to pay for a quality experience when they know their fees will be returned to the site. There are other wildernesses where visitors are paying $3.00 to park at trail heads.

Volunteers are a valuable asset to our wilderness management program. If it were not for volunteers, we would not have a quality visitor management program. However, recent reductions in our budget are making it difficult to furnish protective clothing and pay expenses for our volunteers. It is a time when we must be innovative in managing our wildernesses. Martha Moran on the Redfeather Ranger District, Arapaho and Roosevelt National Forest in Colorado has taken the wilderness volunteer program to a new level. With help from outside businessmen to recruit volunteers and to bring in donations for administrative costs, she has started an "Adopt a Wilderness Program," a nonprofit corporation of volunteers. The volunteers will be trained to be wilderness ranger educators and must be able to spend at least 6 days a season in the wilderness. Martha said their initial goal was to recruit 50 volunteers, but to their surprise they had to start a waiting list at 150. They have received $1000.00 in donations and have more funds promised as soon as they get their nonprofit status. The Sierra Club also sponsors work crews that spend a week in wildernesses doing trail maintenance in many areas of the country.

Fire is still an issue in wilderness, even though wilderness managers are allowed to ignite prescribed fire in wilderness to:

1. Reduce fuels for the protection of outside resources.

2. Permit lightning caused fires to play their natural role.

No fire may be allowed to burn without documented, pre-planned, specified conditions.

At issue now is that any wilderness under 100,000 acres is too small to successfully contain long duration, free burning, lightning fires and our policy does not allow management ignited fires to maintain or restore fire dependent vegetative types. So, roughly 80% of our wildernesses need management ignited fire to mimic lightning sets, but our policy does not allow it.

National support is needed for management ignited fire to maintain wilderness in such a manner that ecosystems, plants and animals develop and respond to natural forces. In order to gain support for management ignited fire, we have authorized the National Forests in Florida to implement a national pilot project. This project is based on the fact that the National Forests in Florida have a high level of technical expertise in prescribed fire; the project is consistent with the intent of the Wilderness Act, meets wilderness objectives by focusing on natural processes, and returns fire on a naturally occurring interval.

We have developed better ways to pull together the collective wisdom of those with wilderness field experience. This is being done by the Arthur Carhart National Wilderness Training Center, dedicated the same time as the Research Institute, August, 1993. This is an interagency facility that is staffed and financed

by all four wilderness management agencies: Forest Service, Park Service, Bureau of Land Management and the Fish & Wildlife Service. The Center sponsors a national wilderness management workshop along with training in wilderness planning, primitive tool maintenance, etc. The center has published a set of nine wilderness training handbooks for wilderness rangers, primitive tools, wilderness awareness, fire planning, wilderness contacts, etc. You will hear more about the training center during the presentation by Liz Close, Acting Director of the training center.

IMPLICATIONS

Wilderness managers will need to development more expertise in the legal aspects of wilderness. Such expertise will not only help in avoiding appeals and lawsuits, but a sound knowledge of pertinent wilderness legislation will ensure that managers have firm grounds for decisions. As watchdog groups become more common, wilderness managers will need to work with them, enlisting their aid in developing management standards and wilderness regulations.

Agencies will need to allocate more dollars for baseline research and monitoring. A stronger emphasis on research in wilderness, looking at ecosystem functions as well as user impacts, will help managers make better decisions.

Management must place a greater emphasis on restoring natural processes in wilderness, specifically by the use of prescribed fire. Managers will need to develop expertise in the use of prescribed fire, both naturally-ignited and management-ignited.

Multi-unit or multi-agency wildernesses must be managed in cooperation. Similarly, there must be more consistency in management across the National Wilderness Preservation System.

Trends in Wilderness Users

Fortunately, research has begun documenting trends in wilderness recreation use and user characteristics. Since the mid-1980's, however, trends studies have been looking specifically at changes in wilderness use and users. I would like to mention some of the strongly consistent trends to see what the implications are for management.

Given the difficulty of generating trends across all wildernesses, there are a few clear, consistent changes. Visitor characteristics appear to have changed most; that is, the kinds of people visiting wilderness changed more than the things they were doing there or the experiences they were looking for.

People Changes

Primarily, the age of wilderness visitors appears to be increasing significantly, and a higher percentage of women, and more groups of women are taking trips. Outfitters are seeing an increase in the "non-traditional" users of wilderness—more women, more persons with disabilities, and more minorities, specifically Hispanics and Asians. The outfitters felt that these changes in visitor characteristics were related to increases in income and opportunity rather than cultural values regarding wilderness. Other consistent changes noted included an increased education level of visitors, a better rating for evaluation of litter conditions (although users still rated litter as the top resource condition problem), and more visitors who have been to other wildernesses. Today's wilderness visitor is older, more educated, and has more wilderness experience. I think it is significant that visitors support the return of fire to natural ecosystems, and this is a result of the change in user trends.

IMPLICATIONS

With today's wilderness visitors being older, managers can use wilderness management and education techniques suited to adult learning methods. Since more wilderness visitors have previously visited other wildernesses, they are aware of the basics of wilderness. They also have a high education level. Managers could attempt more complex messages, perhaps focusing on values and ecosystem concepts, instead of history and legislation of wilderness.

As the number of non-traditional users increase, managers must be sure that information is accessible to all users. Signs and brochures should be bilingual or multilingual in some areas of the country. Entry/access points should be well-located or improved.

WILDERNESS USE AND VALUES

We have seen that wilderness users are older, more educated, more wilderness experienced, and more often female or persons of color. While the outfitted public is seeking solitude, renewal and a wilderness experience, they are exhibiting a trend toward the higher end of the market—preferring better food, lightweight canoes, goretex jackets, etc.

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The increased use by non-traditional visitors is significant. It is clear that persons with disabilities want the same thing as other wilderness visitors. They want wilderness on its own terms, not modified or changed. Wilderness managers would do well to note that persons with disabilities understand the risk and challenges that come with wilderness, and want them.

Changing Views

A noticeable change in recent years, especially among wilderness managers, is the attention given in recent years to other values of wilderness besides recreation. Dan Williams, Professor of Forestry at the University of Illinois, prefers to look at the trends in the way we value wilderness. Wilderness managers and the public alike are exploring values beyond the purely recreational use of wilderness. One of Williams' key points is that what we value about wilderness, and what we do in wilderness, dictates how we manage it and what we study about it. To this point, we have extensively studied the recreational value of wilderness. Williams now sees a move into the area of human nature relationships, and suggests this will be a focus of future studies.

Perhaps it is time for a broader wilderness ethic. Julia Parker, with the Wildland Recreation and Urban Cultural Research Project, contributes the notion that different kinds of people with different kinds of values will view wilderness differently. Do our present concepts of wilderness reflect the diversity of values of the American population? Perhaps they did at one time, but in the last 30 years the racial make-up of the American population has changed. Parker asks whether it's time for a greater democratization of wilderness concepts; otherwise, we run the risk of income and opportunity being determining factors in who uses wilderness, and wilderness will drift into an elitist experience.

IMPLICATIONS

If we are not sensitive to changing kinds of visitors and their values, we may have more appeals and prescriptive legislation telling managers how to manage wilderness. There is also interest in congress in declassifying wilderness, a move that would be a precedent.

We need to provide opportunities outside of wilderness for the non-traditional user. Research has shown that maybe 50% of wilderness users would be satisfied with experiences outside of wilderness if they were available.

In summary, I challenge you to be innovative and open in developing management scenarios for the future. Nurture partnerships to help deliver outdoor ethics, volunteer programs and restoration work. Enhance the wilderness resource on public land by completing the LAC process and fire management plans. And engage your customers in the management of wilderness so we align with emerging user needs and trends. These areas represent the jewels in the "public lands crown".

WELCOME

Karen Wade, Superintendent, Great Smoky Mountains National Park, Gatlinburg, TN

On behalf of all of the employees of Great Smoky Mountains National Park, I want to join the organizers in welcoming you to this conference on Wilderness and Natural Areas in Eastern North America.

Eastern wilderness . . . sounds like a contradiction in terms to many people. We all know that there aren't many wild lands in the eastern United States. Great Smoky Mountains National Park, with 94% of its 810 square miles managed as a natural zone, is one of the largest and certainly one of the most threatened. In fact, the Smokies is probably the crystal ball composite of the values of all the large natural areas and wilderness in the United States and the very real threats, presently and in the future, that face all of them.

Let me briefly touch on some of the tangible benefits of the wilderness represented by Great Smoky Mountains National Park and the challenges to those values:

We value wilderness because it is in sharp contrast to our Man-built landscape . . . . a primitive place that inspires us, generating respect, awe, and emotional attachment. At the Smokies this landscape and its constituent elements attract over nine million visits per year, 3 1/2 million cars, more than any other National Park in the system. For the first time, this year the city of Gatlinburg will experiment with public transportation into the Park. . . . a way to get people to park their cars and leave the driving to the trolley driver.

Wilderness means a reasonable chance to enjoy natural quiet. Recently, helicopter tours over the Smokies have curtailed that reasonable expectation. A Tennessee state law restricting landings of helicopters within nine miles of the Park has been challenged and is now before the Tennessee Supreme Court. Meanwhile, federal agencies study impacts and possible remedies on a national scale. The real and obvious solution rests with consumers. If they chose not to patronize renegade operators then there would be no need for either state or federal regulation.

Tourism is a tremendous boost to communities and regions that surround wilder attractions. The Smokies generate over $700 million per year for surrounding communities, a whopping gold mine that has meant unparalleled prosperity and growth. It has also meant rapid development of most private lands, drastically reducing the roadless areas along our boundary which serve as corridors for movement of wildlife populations. Never has there been a greater need for land use planning on private lands which protect wilderness values. Such planning is currently going on by local governments at Townsend and Pittman Center, and on Chilhowee Mountain through the efforts of the Foothills Land Conservancy.

Another "direct tangible" value of a mountainous area is the steady supply of clean water provided. The Smokies, with its 40 some watersheds, is a source of municipal water for several adjacent towns. . . including the water you are drinking while here in Gatlinburg. Lately though, the public has come to recognize that the Park's more valuable function is in acting as a wetland. . . treating and purifying the precipitation we receive. Did you know that some of the highest nitrate deposition rates in Eastern North America occur here at the crests of these peaks? Not only do we receive heavy loads of nitrates and sulfates in the Park, but ozone occurs in greater average daily dosing along Park ridgetops than in Knoxville or Asheville. The current state administration, after a misstep earlier this year, has promised to sign a new agreement very soon that would affirm the state's commitment to partnership with the Department of Interior in assuring cleaner air in the Smokies and the region. While Tennessee's action alone will not solve the problem, it gives us hope. We have been heartened by the very vocal groundswell of public support which has accompanied this recent issue . . . perhaps a recognition of these values of which we will speak this week.

Recently in the United States, our fine systems of parks, forests and refuges have been under fire and criticized by those who use highly charged rhetoric and words like "lock up" and "elitism". Environmental activist groups are responding with the question, 'If our National Wilderness Preservation System is so great- why are we having a biodiversity crisis in this country?' It's a fair question: our native large predators and herbivores, some of them critical "keystone" species, are virtually gone, migratory bird populations are declining, some amphibian species appear to be checking out, old growth (so called "virgin forests" reduced to miniscule, highly fragmented tracts and wetlands reduced by half since the founding of the republic. I hope as you are here this week you will take the opportunity to learn more about our partnership with the US Fish and Wildlife Service to restore the red wolf to its range; and more about our very successful program to restore the river otter.

Many wilderness and national parks were set aside primarily for scenic grandeur and because they occupied otherwise unuseful lands. One group (The Wildlands Project) believes that biodiversity is not best served by the current set aside of acreage and distribution of these and related lands. Their alternative is to research where the most biodiverse lands are, to establish core areas, buffer area, corridors, sustainable agriculture and industries in the region, restore areas that are degraded and get everyone—public land managers, corporations, the public—to start thinking about the whole of it. We applaud this approach. In fact, federal agencies, state agencies, and non-governmental organizations and others have been doing that in the Southern Appalachians since 1988, under the aegis of the Southern Appalachian Man and the Biosphere Cooperative (SAMAB). . .but more on that tomorrow. The Wildlands Project and SAMAB are right, we need to do more and do it collectively. Just protecting more of the lands that are under-represented would be very helpful. Our experience , however, is that protected land status alone is not sufficient.

As it so happens, Great Smoky Mountains National Park is the nation's most biologically rich area—as many tree species as Europe, but only 1/5,000 its size. More vascular plan species live here than any other unit in the National Park System. This place is the regional or national center of diversity for such groups as salamanders, lichens, spiders, mosses, millipedes, and hymenopterans (parasitic wasps, especially.)

In other words, this landscape isn't just a pretty face. We have strictly protected it for 60 years, yet still it has suffered devastating losses: our most common tree - the American Chestnut - is completely gone; we have lost 95% of the dominant evergreen (Fraser Fir) on the highest peaks, and have documented precipitous declines in several other trees. All of this devastation in several other trees. All of this devastation due to non-native (exotic)forest insects and diseases from Asia and Europe. These aliens are joined by 25 species of invasive foreign plants, and European trout and hogs. And we are not even close to completing comprehensive inventories of our native species—mostly insects and other invertebrates—to know for sure what we are losing!

Perhaps most telling on the political scene, is that 60 years after the establishment of this significant National Park, this place still has no Congressionally designated wilderness. It's Wilderness values remain unrecognized for their National preeminence. And although the Tennessee delegation has spoken strongly through the years on behalf of such designation, North Carolina legislators through the years have hung steadfastly in their opposition.

Clearly solutions to many problems in eastern wilderness and national parks have to come from three things: an educated and activist public, an intelligent and diligent press, and strong leadership. . .all, sustained over time on behalf of those values held in the common interest. Without this, Advocacy for private interest will always prevail and great places like Great Smoky Mountains National Park will be lost forever. I think that is what this week is all about—maintaining values in the common interest for future generations.

I wish you well in your deliberations and thank you to the organizers for asking me to welcome you.

Where Wilderness Preservation Began

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Abstract: Howard Zahniser (19061964) was the primary architect of the 1964 Wilderness Act. In 1946, in the eastern U.S. wilderness of New York State's Adirondack State Park, Zahniser recognized a legislative model for wilderness protection in perpetuity—the 1894 "forever wild" clause of the New York State Constitution. As a wilderness advocate, Zahniser was profoundly informed by the work, writings, and public examples of natural resource scientists Robert Marshall, Aldo Leopold, and Rachel Carson. Neither Zahniser nor these field research-based activists were any more famous in mid-career than most of the people attending this conference. They simply did their work with commitment and passion. Their legacy invites you to broadcast the benefits of wilderness, recruit other wilderness workers, and be the glue today's wilderness movement needs.
Keywords: National Wilderness Preservation System, wilderness movement; eastern wilderness; wilderness and culture, Wilderness Act (1964); Wilderness Society; 'Forever Wild' Clause; Adirondack State Park; Adirondack State Forest Preserve

Ah, Wilderness! Ah, Wilderness in the East. Yes. In the East—where wilderness preservation began. Did Mike Legg or Larry Phillips have to twist my arm to get me to talk about wilderness in the East? Not on your life. As a toddler my nephew would climb into your lap, stare you in the eyes, and implore, "Let's talk about my birfday!" He pronounced it with an F: "birfday!" That's me now: Let's talk about wilderness in the East!

But first, let's pay homage to the first people here in the Smokies, the Cherokee people. Wasn't this touristic wilderness of Pigeon Forge/Gatlinburg once also the landscape of Cherokee cultural connectedness? When we try to understand this Great Smoky Mountains National Park, these great Cherokee and Nantahala national forests and this great, great Southern Appalachian Biosphere Reserve, aren't we really trying to recapture the sense and experience of these first peoples here, the Cherokee? And don't we need to relearn what John Elder calls "a larger grammar in which the words *culture* and *wilderness* may both be spoken?" I want to pay homage to the Cherokee.

Wilderness in the East: Not far from here, in 1935, Robert Marshall, Benton MacKaye, Harvey Broome, and others stopped alongside the road after a field trip and founded The Wilderness Society. It was to that Wilderness Society that my father, Howard Zahniser, went to work in late 1945, as the sole full-time employee, as its executive secretary and editor of the Society's magazine.

Wilderness in the East: Was there such a thing in the 1940s? My father, known to friends and associates as "Zahnie," had been at his Wilderness Society job only a few weeks when the late New York State conservationist Paul Schaefer, a home builder in Schenectady, New York, called on Zahnie and the Society to help fight a series of dams proposed to flood the wilderness lowlands of New York's Adirondack State Park.

Wilderness in the East: My father was incredulous when Paul Schaefer told him the Adirondack State Park boundary encompassed three times the area of Yellowstone National Park. Bounded there were a million-plus acres of Forest Preserve protected by the New York State Constitution "forever as wild forest lands. . ." Later in 1946, my father and our family went to taste this Adirondack wilderness in the East. We never ceased going back.

Paul Schaefer recruited Zahnie to give two major wilderness speeches on Adirondack wilderness, in 1953 and 1957. "In the Adirondacks and Catskills, it seems to me,"

Zahnie told a New York State joint legislative committee in 1953, "the people of New York State have already accomplished the firm dedication of certain great wilderness areas and have devised an excellent and unique land use classification for protecting these dedications."

Wilderness in the East. In his youthful Adirondack wilderness summers Bob Marshall lamented being born too late to explore vast wildlands as Lewis and Clark did. But Bob Marshall cut his wildlands eye teeth on wilderness in the East.

When next Zahnie spoke on Adirondack wilderness, in 1957, to the New York State Conservation Council, the first wilderness bill had been introduced in Congress. "I am always so happy to come to the Adirondacks and the Catskills and Albany. . . for I feel this is where wilderness preservation began, in a very real sense." The "forever wild" clause has graced New York State's Constitution since 1894. Bob Marshall's father, Louis Marshall, the great lawyer and champion of civil liberties, voted for "forever wild" at the 1894 constitutional convention and defended it at the 1915 constitutional convention. Wilderness in the East: Bob Marshall was a second-generation wilderness advocate!

Ah, Wilderness! Wilderness in the East... where wilderness preservation began. You are in the right place this week. And I hope you make this walloping wilderness and natural areas conference week the right time. Soak up all the wilderness savvy here. Commit yourself to broadcast the benefits of wilderness. Commit yourself to recruit, recruit, recruit other wilderness workers. And commit yourself to be the glue this wilderness movement needs right now. Broadcast the benefits. Recruit, recruit, recruit. And be the glue this movement needs now.

The Wilderness Act can be seen as a part of the Great Society thrust of the early 1960s. Most of the Great Society legislative program was initiated by Congressman and later Senator and Vice President Hubert Horatio Humphrey throughout the 1950s. Hubert Humphrey introduced the first Wilderness Bill, in 1955. The Wilderness Act was birthed in the Great Society, and this is important to us this morning and in this conference week. The Wilderness System was, and is still becoming, a Great System. The National Wilderness Preservation System grew from 9 million acres in 1964 to more than 100 million acres by 1994. It grew almost exclusively by citizen initiative working its will through the democratic legislative process in the Congress. And that is great! Our wilderness political process is part of the greatness of America.

To see the Wilderness Act as part of the Great Society, affirms that the Wilderness Act was birthed as a concept intimately positioned within society. Wilderness, the Wilderness Act, and the Wilderness System do not, in legislative intent or in fact, exist at the periphery of society. Wilderness is part and parcel of a holistic notion of a Great Society, which ours still is, despite daily pronouncements to the contrary by politicians who profess to want to lead us!

We need to revive our view of ourselves, not jingoistically or uncritically, but humanely and altruistically, as a Great Society. I submit to you that studying wilderness, protecting wilderness, managing wilderness, advertising the benefits of wilderness, recruiting for wilderness, and committing to be the glue for the wilderness movement—these acts show faith with the greatness of society. When you work for wilderness, you assert our national and social self-esteem. This room is full of people the nation owes a profound debt to for this important social work that is wilderness work. And I share with you my confidence that this room also is full of people the nation will owe an even greater debt to for wilderness work yet to come.

Wilderness must be at the core of our revived greatness as a society because we are dependent on the land, the Earth and its many expressions, both animate and so-called inanimate. I affirm this because I believe that, whether you be an evolutionist, creationist, or Big Bang-theory accidentalist, the whole of life is the source of life. The whole of life is the source of life. And what concept of life is more organically whole, is more communitarian, and more spiritually grounded than the fact of wilderness?

Just how old is the Wilderness Act this morning? Is it 31 years old, 32 years old, or nearly 40 years old? Listen to my father's unpublished journal recounting what he was up to at our home in Hyattsville, Maryland and then at his Wilderness Society office and around Washington, D.C., on June 11, 1956. Just how old is the Wilderness Act? Listen to his diary and decide for yourself:

"Awakened early, as Alice [his wife, my mother] was wondering whether the clock was right. So I soon got up, shaved, etc., got the [news]paper and read it and then wrote [...] until a bit after 8 when I got up and dressed. "The first thing at the office, I saw Spencer Smith to check with him as Sig Olson suggested regarding House introduction of the Wilderness Bill vis-a-vis the Superior Acquisition Bill. To my surprise [Spencer] said he saw no reason for holding off—nor had he, since the Superior Bill had passed the Senate! Sig had been urging delay and quoting Spencer! So I asked Spencer if he wouldn't check with Sig as I wanted to be sure it was not going to distress him. Later Spencer called and said he had called Sig and the Superior Bill had *passed* Friday. I called [Congressman] John Saylor's office to let him know the Wilderness Bill could be introduced. He introduced it, HR 11703, and decided to make the speech or statement later. I worked on preparing the statement. I drafted a letter for John Saylor to send to Edward Preble noting that the Wilderness Bill had been introduced on the 85th anniversary of Edward's birth."

Implicit in that letter are many of the wilderness values that helped, from 1955 to 1964, secure passage of the Wilderness Act. The wilderness values I want to celebrate with you today—and within you today—are patience, persistence, zeal, bridge building, a sense of humor, sharing the credit, procedural and institutional naiveté, a firm sense of community, and general good will. Nothing fancy on that list: but these character traits remain fundamental wilderness values. They are fundamental to winning the preservation and sound, science-based management of wilderness.

Howard Zahniser was born in the Allegheny Mountains area of western Pennsylvania in 1906, to an essentially unsalaried evangelical Christian minister and his wife. For much of his childhood his parents did not live on the money economy. An elementary school teacher interested him in the Junior Audubon Society and prompted his lifelong delight in birds. Zahnie would brag that he graduated in the top ten of his high school class—and quickly add that there were only ten students *in* the class.

As a teenager, Zahnie developed an inflammatory bone disease, osteomyelitis, then considered a 50 percent fatal disease. So he arrived at a small midwestern church college on crutches, also using a wheel chair, to play basketball. Because of this disease he did not know whether he would live to graduate. So Zahnie took only the courses that most interested him. At the end of four years he was still alive but lacked the required courses. He spent a fifth year as an upperclass freshman. He often boasted that he had crammed four years of college into five! Zahnie possessed a disarming sense of humor that he used to defuse conflict or break deadlocks.

Receiving an honorary doctor of letters degree for his conservation work from his small, church college alma mater in the late 1950s, Zahnie told the convocation he was so far behind in his correspondence the degree should be called a "doctor of postcards."

My father's father was an evangelical minister, and a theological footnote sheds light on Zahnie's approach to lobbying. My grandfather's journal for the year of his death shows that, in the first quarter of that year, my grandfather made more than 200 pastoral calls. In orthodox Christian theology, we are all sinners. Churches are not museums for saints but hospitals for sinners. A pastoral call never takes no for an answer. It may table the motion but not take no for an answer. And because we are all in the same theological canoe, we should not personalize whatever disagreement separates us from the Other. We can only all be redeemed together—much as in the Bodhisattva vow of Buddhism—even if this takes an eternity. And so we live in hope.

Although not an orthodox Christian, Zahnie brought traits of his upbringing to his work for wilderness. He became a lobbyist more allied in technique to a pastoral counselor than to a technocrat. He projected an end-times hope that we would all one day take this wonderful step—this creation of a National Wilderness Preservation System—together. He did not attack the opponent as a person. His archest Wilderness Bill opponent was Colorado Congressman and House Interior Committee Chairman, Wayne M. Aspinall, but Zahnie and Aspinall became genuine friends. They were friends despite the fact that Aspinall repeatedly violated House rules to block the Wilderness Bill, and despite the fact that Zahnie raised a lot of Cain in Aspinall's Congressional district.

Stewart Udall once said Aspinall had all the characteristics—both good and bad—of a hedgehog and that Aspinall was the last of the Congressional committee chairmen to run his committee as though only his vote counted. Still, these adversaries respected each other. Zahnie's college chum and lifelong associate Paul Oehser wrote in *Buckpacker* magazine:

"Even [Zahnie's] adversaries in the wilderness cause (I don't think he had any enemies) grew to respect and love him. He was persuasive but never caustic or vindictive. . . . And this was the backbone of his integrity and effectiveness."

The many references in Zahnie's wilderness writings to *enduring*, to *perpetuity*, and to the *eternity* of the future testify to this hope that we are all part of, but that is larger than each of us. That many of your job descriptions include the word *wilderness* testifies to that hope. My father would be overcome at the simple fact of this conference. To him this would look like a wilderness Woodstock!

It was as a journalist and writer that Howard Zahniser went to Washington, D.C. in 1930 at the urging of Paul Oehser to take a job as an editor with the Department of Commerce. Zahnie worked for the U.S. Biological Survey there, until recently our Fish and Wildlife Service, but now a National Biological Survey, excuse me, *Service*, again! Zahnie made inspection trips to wildlife refuges. His interests in literature and nature entwined. He became books editor of *Nature Magazine*. He became chief of information and publications for the Bureau of Plant Industry of the Department of Agriculture.

His mentor was the naturalist Edward Preble, mentioned in the diary excerpt I read from and for whom I am named. Zahnie was drawn into the small circle of wilderness activists who had formed the Wilderness Society in 1935 and had decided to take it public just before its driving force, Robert Marshall, died at age 38 in 1939. The founders were foresters, foresters and research scientists: Robert Marshall, Aldo Leopold, Bernard Frank, and Benton MacKaye; landscape architect Ernest Oberholzer; accountant Harold Anderson; Tennessee lawyer Harvey Broome; and publicist Robert Sterling Yard.

Next to them, Zahnie felt very ordinary as a government writer and editor, although none of these persons were then famous. Not even Bob Marshall, masters degree forester and PhD. plant physiologist, dead then six years, whose Alaska book *Arctic Village* had been a Literary Guild selection. True, Benton MacKaye, forestry planner, Harvard, Class of 1899, was the founder of the Appalachian Trail, but World War II had brought the Trail project to a dead halt. It was a quarter century later that some of these people would become famous through an Earth Day that they—and arguably the Wilderness Act—helped bring on.

Zahnie came to the Wilderness Society in 1945 after the death of Robert Sterling Yard, who had been the Society's entire staff. Yard's job would be expanded and split between the bedroll biologist Olaus Murie, who became director, working half-time out of Moose, Wyo., and Zahnie, who became executive secretary and magazine editor, working in a Washington apartment building with half-time clerical help. That was the awesomely powerful environmental group, the Wilderness Society, in 1945. Those of us registered for this conference no doubt outnumber the total membership of The Wilderness Society then.

There were few members, but a new realization. The Wilderness Society must build bridges with other public lands advocates to broaden support for wilderness protection. Today we call the bridges partnerships. The bridge-building paid off in the coalition that blossomed into the Dinosaur National Monument victory, defeating the Echo Park dam proposal. That coalition formed the core that began the push for a wilderness bill in 1955.

The job of building bridges of cooperation for wilderness will never be done. Aldo Leopold might have couched this outreach effort in ecological terms as widening the boundaries of the community. As you continue this great tradition in your wilderness work, you are surrounded by this great cloud of witnesses. And although still in the minority, you are therefore never alone. Commit yourself to broadcast the benefits of wilderness. Commit yourself to recruit, recruit, recruit other wilderness workers. And commit yourself to be the glue this wilderness movement needs right now. Broadcast the benefits. Recruit, recruit, recruit. And be the glue this movement needs now.

Should you feel naive at times, you also have Howard Zahniser, at least, as your witness. Less than a month after the wilderness bill was introduced in June 1956, our family embarked on an extended series of wilderness trips. Gone all of July and August, we were so late back for school in September that my principal let me choose my sixth grade teacher. In all that time of wilderness family camping I slept in a *bed* bed only five times. My mother cooked so many open campfire meals she should be canonized as a patron saint of wilderness cooks.

Evidently my father thought the wilderness

legislation would zip through Congress, and he would sit back on his laurels and write a best-seller on family camping in the American wilderness. We visited the Adirondacks, Boundary Waters Canoe Area, Cloud Peak Primitive Area, Grand Teton National Park's Alaska Basin, Montana's Bob Marshall Wilderness, and today's Glacier Peak Wilderness in Washington's North Cascades. We wilderness-traveled by foot, horsepacking, horseback, and canoe. We car-camped in federal, state, provincial and other parks between the trips. We all kept diaries for our father's grand book project.

Naive? The first wilderness bill was politically green behind the ears. It took eight years of lobbying and compromise to forge socially viable legislation. But without the naiveté, would these rag-tag conservationists have mustered the nerve to take that first step? Zahnie died with the book contract in force. All he wrote on it was yearly letters to the publisher to keep the book contract alive. Just days before he died on May 5, 1964, Zahnie wrote to his friend, the Adirondack conservationist Paul Schaefer, that it did not look like there would be a post-Wilderness Bill period of writing. Indeed, there was not.

Howard Zahniser was a writer and reader who made more trips to secondhand bookstores in any year than to wilderness areas in his lifetime. He was such a book junkie that, as a kid, I got free books in several secondhand bookstores, whose owners bought my silence so Zahnie could shop longer. A secondhand book shop opened near our house when I was a teenager. My father and I went there every Wednesday night. He called it "prayer meeting."

Conservation was driven by writers early in this century. In a *Wilderness* magazine article, Charles E. Little champions those writers following Henry David Thoreau's lead: Peattie, Krutch, Teale, Bromfield, Eiseley, Stegner, Dubos, Carson, Leopold, and Abbey.

> "Books by these authors...brought about a policy revolution a quarter century ago: the clean air and water acts, the Wilderness Act, the Endangered Species Act, the Coastal Zone Management Act, and the epochal Environmental Policy Act itself. This was the tangible result of a raised environmental consciousness engendered by books written with freedom and passion."

Zahnie was not only a writer but also a reader immersed in the literature of Dante, Blake, *The Book of Job*, and Thoreau. My father wore fabric file cabinets, large-pocketed suit coats suited to a lobbyist. The oversized inside pockets usually held a book by Thoreau and one by Dante or Blake along with other wilderness propaganda. Here is how Dante's masterwork *The Divine Comedy* opens:

> Midway in our life's journey, I went astray from the straight road and woke to find myself alone in a dark wood. How shall I say what wood that was! I never saw so drear, so rank, so arduous a wilderness!

I believe my father saw in those lines his own epic life challenge of the Wilderness Bill. Dante presents, as do Blake, the Job material, and Thoreau, a self immersed in a great life journey that reaches beyond the limited self. Dante, Blake, Job, and Thoreau enlarge, in Aldo Leopold's sense, the boundaries of the human community. As wilderness managers, wilderness stewards, wilderness scientists, and wilderness advocates, you share their task.

Zahnie's literary interests fed his delight in words that informed his choice of *untrammeled* to define wilderness. My sister Karen had a teddy bear that my father variously nicknamed "Wilderness Bill" or "Gladly, the Cross-eyed Bear." "Wilderness Bill" is an obvious nickname. The other moniker parodies a Christian gospel song, "Gladly, the Cross I'd Bear." Carefully mixing his metaphors, Zahnie once joked to a New York State conservation gathering that wilderness was "where the hand of man has never set foot."

Choosing a definition for wilderness was fraught with pitfalls. Zahnie took his clue from the word *wilderness*. In speeches and hearing testimony he reiterated that *wilderness* ends in *-ness* and connotes a quality. The Federal definition should not quantify it. A long search brought him to *untrammeled*. It is an unlikely, seemingly imprecise word to now define officially more than 100 million acres of federal land! Indeed, more than one writer on wilderness, even in scholarly settings, has misquoted it as "un*trampled*."

The genius of the word came clear in the 1970s battle for Eastern National Forest wilderness on lands recovered from being rooted, grazed, farmed, deforested, and eroded. Pristine? No. Old-growth? Hardly. Guided by the Wilderness Act definition, Congress placed them in the Wilderness System.

Zahnie fed himself with literature. He kept current with nature writing as books editor of *Nature Magazine*. He wrote the conservation

section for the *Encyclopedia Britannica Yearbook* series. It remains important to feed ourselves with works that reach beyond the limited self to enlarge the boundaries of the community.

In 1955, Zahnie wrote in a speech to a parks and open spaces conference: "It is characteristic of wilderness to impress its visitors with their relationship to other forms of life, and to afford those who linger an intimation of the interdependence of all life." In the wilderness," Zahnie said, "it is thus possible to sense most keenly our human membership in the whole community of life on the Earth. And in this possibility is perhaps one explanation for our modern deep-seated need for wilderness."

So what is this wilderness that we need? The naturalist John Hay implies that the "great message" of wilderness is inclusion and that wilderness makes a great statement of "the total involvement of life." Without wilderness, says Hay, we lose not only "incomparable species but the foundation of shared existence." The whole of life is the source of life. And what brings you more face to face with the total involvement of life, with the whole of life, than wilderness?

Ralph Waldo Emerson caught Henry Thoreau thinking such thoughts in Emerson's own woodlot in 1858. Emerson confided to his journal:

> "I found Henry yesterday in my woods. He thought nothing to be hoped from you, if this bit of mould under your feet was not sweeter to you to eat than any other in this world, or in any world. We talked of willows. He says 'tis impossible to tell when they push the bud (which so marks the arrival of spring) out of its dark scales. It is done and doing all winter. It is begun the previous autumn. It seems one steady push from autumn to spring."

What legislated vision of the Earth today so honors that "one steady push from autumn to spring" as the National Wilderness Preservation System? What a legacy for a wilderness researcher! What a legacy for a wilderness planner. What a legacy for a wilderness manager. And what if—let's hazard heresy a moment—what if *biodiversity* and *wilderness* are functional synonyms? More heresy—what if wilderness/biodiversity and cultural diversity are synonymous? This is not so far-fetched if, as Zahnie claimed, wilderness affords "an intimation of the interdependence of all life" and a keen sense "of our human membership in the whole community of life on the Earth." Aren't we are back in Cherokee country now?

John Hay suggests in his book *The Immortal Wilderness* that wilderness is not simply designated areas. Wilderness is the very texture of our true, natural lives, the whole, interpenetrating system of things. Hay calls wilderness "the earth's immortal genius." The poet Gary Snyder says as much in his book *The Practice of the Wild*. "A ghost wilderness hovers around the entire planet," Snyder says. "The world is watching: one cannot walk through a meadow or forest without a ripple of report spreading out from one's passage. . . Every creature knows when a hawk is cruising or a human strolling. The information passed through the system is intelligence." You get the idea that the system itself is wilderness, planetary intelligence. How elegant! Imagine: an ecosystem that features no outsiders. Imagine: an Earth community bounded only by gravity. Wilderness science is life science. But enough of heresy!

To construct a National Wilderness Preservation Ethic—and that is *our* generation's errand into the wilderness—we must draw out of our society's members this gut feeling that wilderness is both the DNA of human culture and the organizing intelligence of planetary life.

In some fancy restaurants wine stewards still wear a big key around their necks—at least in the movies! Wilderness stewardship demands your passion and commitment. Aldo Leopold's patient and astute ecological observations were driven by passion. Passion forged them into philosophy. But, just like you, he started out working in the field, an unknown researcher. Read or re-read his books. Robert Marshall studied tree rings in the Arctic and then rallied a spirited band of wilderness defenders. Just like you, he started out working in the field, an unknown researcher and planner. Rejoin those ranks.

Rachel Carson studied buckets of sea water and noted a fatal flaw in the unthinking effluence of industrial affluence. Just like you, she started out working in the field, an unknown government researcher. Her passion and patience in teaching herself to write resulted in the book, *Silent Spring*, that changed American life forever. Draw passionate people into your own circle. Drink their energy. Hire people who can catch passion. Be contagious yourself.

Aldo Leopold set our course when he wrote that "the problem we face is the extension of the

social conscience from people to land."

That is not heresy!

Passion? This is a huge social task. Listen to Leopold again: "No important change in ethics was ever accomplished without an internal change in our intellectual emphasis, loyalties, affections, and convictions." These are the core human values that wilderness planners researchers, managers, stewards, and advocates must first reach in people. And then *help* them nurture the wilderness within.

Passion? Ours remains an errand into the wilderness that none of us gathered here will see completed. Ally yourself with hope. The important thing is not so much to achieve, but to strive. Howard Zahniser did not live to see the Wilderness Act. In fact, he said once that creating a National Wilderness Preservation System was not even as important as the fact that so many of us would one day take that step together. How true. That step is now a 30-plus years' journey, and you are on that journey at this conference week!

This conference week can mark your personal trailhead for the coming National Wilderness Preservation Ethic. Expect switchbacks. Expect steep grades. But expect also success. You are equal to the challenge. Picture wilderness as the whole of life that is the source of life. Picture your own favorite wilderness spot. That is also what this week is all about. Wilderness research. Wilderness planning. Wilderness stewardship. Wilderness advocacy. These are not just jobs—or jobs and a half. Wilderness work is a mission. Wilderness work makes an ideal candidate for a life's work, for your life's work. I believe wilderness was so for Aldo Leopold, for Robert Marshall, and for Howard Zahniser. Their legacy is your open invitation today.

Commit yourself to broadcast the benefits of wilderness. Commit yourself to recruit, recruit, recruit other wilderness workers. And commit yourself to be the glue this wilderness movement needs right now. Broadcast the benefits. Recruit, recruit, recruit. And be the glue this movement needs.

New Politics and New Opportunities for Eastern Wilderness

Jon Roush, Wilderness and Natural Areas in Eastern North American: Research, Management and Planning, Gatlinburg Tennessee

Abstract: Policy decisions about wilderness management must respond to institutional changes taking place in the U.S. The arenas of action are shifting from federal to local, from public to private, and from piecemeal conservation to a focus on whole systems. These trends are changing the politics of conservation and producing a new model for policy making. The new model, community-based conservation, is based on consensus among diverse stakeholders. It changes and sometimes reduces the authority of land emanating agencies. Experience shows that community-based conservation works well as long as eight conditions exist. The most important prerequisite is the commitment of effective community leaders. Community-based conservation is not a panacea. It can be undermined by conventional interest politics, and often is. Still, it offers opportunities for building a constituency for wilderness. To enhance the possibilities of success, wilderness advocates and public officials need to concentrate on five priority areas of action.

Keywords: Eastern wilderness, policy, community-based conservation, advocacy

NEW POLITICS AND NEW OPPORTUNITIES FOR EASTERN WILDERNESS

For many people, the subject of this conference is inconceivable. Wilderness, they would say, is not in the East. Wilderness is the sweep of the Rocky Mountains, the solitude of southwestern deserts and canyon lands, the majesty of the Sierra Nevada, the vast reaches of Alaskan rivers, mountains, forests and tundra. Yet not only does eastern wilderness exist, it also is immensely important. Eastern wilderness includes some of our most scientifically significant and beautiful land. What is more, eastern wilderness is teaching us lessons we can learn nowhere else, lessons we sorely need to learn.

Eastern wilderness differs from western wilderness in some obvious ways. More people live in the East, and most wilderness ecosystems here include a large share of private land. The Southern Appalachian Mountain region includes the largest contiguous area of federally-managed lands east of the Mississippi River, comprising 3.8 million acres. It also happens to be within easy reach of two-thirds of the nation's population. Here on the edge of the Great Smokies National Park, we need no reminder of the demands population can put on eastern wild land. To compound the problems, even the Appalachians cannot be managed without the cooperation of private landowners, whose land penetrates and surrounds federal land in most watersheds. Elsewhere in the East, in new England for example, wilderness conservation must predominantly be a private enterprise.

Of course, most of the rest of the United States increasingly looks like the East. Since 1940, U.S. population has doubled, but visits to national parks have increased an incredible 16 times. Sometime in the next century, our national parks will endure more than one billion visits per year. Unfortunately, these visitors cause traffic jams, erode hiking trails, drop tons of litter, dispose of human waste in streams and near trails, and kill trees by unintentionally damaging roots while hiking. Meanwhile, crime is up in our national parks, and it is turning park rangers into police officers. Although I have been using parks as an example, other public lands suffer even greater pressures. Nearly three times as many Americans visit national forests as national parks each year.

Future wilderness managers will have more than visitors to worry about. Increased scarcity of resources will increase pressures for resource

extraction such as mining, grazing, and logging. On land not designated wilderness, wilderness values will be hard apprised to compete with economic demands. Natural areas and semi-natural areas that now buffer wilderness areas from overuse will themselves become degraded, complicating the work of wilderness managers.

Eastern wilderness managers are already familiar with those problems. The future will require a new relationship between wilderness and nearby human settlements, and in the East, the future has arrived.

A New Model for Decision Making

Meanwhile, other trends—less visible but no less significant—are changing the context in which we will address these problems. The United States is undergoing historic changes in the relationship between the federal government, local governments, and the private sector. Three changes in particular are important. They are the shifts from federal action to local, from public action to private, and from piecemeal conservation to a focus on whole systems.

These trends are changing the politics of conservation in ways hard to predict. Two of them (shifts toward localism and toward privatism) seem at odds with the third (more holistic, systems thinking). Wilderness management above all else requires long-term, coordinated stewardship of whole systems. Will that be possible in the new reality, with its passionate advocates for political devolution?

I think it could be. The new trends are producing a new model for policy-making-brief case study will illustrate this emerging model. In 1990, the U.S. Fish and Wildlife Service received a petition to list the Louisiana black bear as a threatened species. With its range in Louisiana, Mississippi, and east Texas, the bear was in trouble, partly because its habitat was disintegrating. Ninety percent of the Louisiana black bear's habitat is on private land, mostly commercial timber land. Many communities in the region depend on that timber for income. People in the region and in the timber industry feared that listing the Louisiana black bear would hurt their economy. On the other hand, the bear is an indicator species for hardwood bottom land ecosystems. Its conservation would also help many other species. Environmentalists set out to protect the bear. Landowners rallied in defense of property rights.

The situation had the makings of a classic environmental showdown. It pitted preservation versus multiple use, local interests versus federal policy, and economic development versus environmental protection. One could predict the usual avalanche of litigation, press releases, and pressure politics.

What actually happened did not follow the script. A group of eighteen people—representing industry, federal and state agencies, landowners, and conservation groups—started meeting, calling themselves the Black Bear Conservation Committee (the "BBBC"). They set some important ground rules. They agreed to respect each other, to set aside as much as possible their personal agendas, and whenever possible, to let scientific data and theories be the primary criteria for decisions. Meanwhile, biologists from the Fish and Wildlife Service determined that the bears' habitat needs could be compatible with normal forest practices in the region.

The BBCC agreed to some early steps to protect the bears. Those steps allowed the Fish and Wildlife Service to delay listing the species, to give the BBCC time to reach agreement. Eventually, the Service listed the Louisiana black bear as threatened, but with a provision exempting any unintentional killing during normal logging activities. The Endangered Species Act allows such unintentional killing as so-called "incidental taking."

Since then, the BBCC has enlarged its membership and continued to work for the bear in issues involving habitat, management, education, research and funding. Its members have produced a management handbook for landowners. They have launched a public education campaign to persuade people in the region, especially landowners, that the black bear is an asset. The Endangered Species Act requires that the Fish and Wildlife Service draft a recovery plan for the bear. At this time, the BBCC is completing a restoration plan that will be the core of that draft recovery plan.

We have two models for resolving issues of natural resource management. In the conventional model, combatants take positions and slug it out—in legislatures and executive offices, in courts, in corporate board rooms, and in the press. Finally, someone with enough public authority makes a decision. The deed is done, case closed, with clear winners and losers. In the BBCC model, the stakeholders don't just influence the process. They *are* the process, and they are committed to inclusiveness. They look for a solution in which

everyone wins. Their goal is to protect the environment and jobs, to address both national and local concerns. Agreeing that the best available science will guide them, they can rise above personal agendas.

The BBCC was an early example of what have become hundreds, perhaps thousands, of significant efforts for community-based conservation. Consider a few examples, chosen not because they are necessarily the best examples but because they are a good cross section of large and small projects.

In Miami, the Miami River Neighborhood Restoration Association and other citizens and agencies are working to restore the Miami River where it flows through the city's Little Havana neighborhood. In Portland, Oregon, many groups are cooperating to create parks in the Willamette and Columbia river watersheds. The Trust for Public Land, the Urban League, and the local parks department are converting vacant industrial land beside the Willamette River into a park.

In Oregon's Siskiyou Mountains, the Applegate River is a laboratory for ancient forest conservation. Industrial forest companies own 10% of the watershed. Other private landowners control 20%. The Forest Service and BLM control the remaining 70%. Twelve thousand people inhabit the region, although it contains no incorporated towns. Four years ago, some 60 residents got together to look for ways to save the Applegate's natural resources and economy. They included members of the Sierra Club, the Audubon Society, The Wilderness Society, community groups, the Farm Bureau, as well as loggers and officials of the Forest Service and BLM. Their objective is to restore the watershed through a cooperative community effort for ecosystem health and natural diversity, and they are making progress.

People are loving Marathon County, Wisconsin, to death. The county houses threatened songbirds, waterfowl, mammals, and insects. It also receives significant income from timber and tourism. Logging roads, recreational trails, and residential development—all threaten the area's diversity and natural qualities. A broad-based committee is working to resolve the conflicts.

These examples show a great diversity of strategies and goals, but they also show some underlying similarities. Community-based conservation is typically, but not always, a local phenomenon. Scale is crucial. People close to problems can often see appropriate solutions. Community-based conservation is inclusive. It asks that all stakeholders help define issues and solutions. It stresses accountability, because people make decisions in full public light. Government agencies, elected officials, business executives, and everyone else are accountable for those decisions. Most important, the emphasis is not on winning but on gaining a consensus. People are encouraged to ask not, "Does the decision give me everything I want?" but, "Can I live with it?" Technical expertise is important, but technical experts are no longer the final arbiters. Government is a participant, but only one of many.

The New Model's Strengths and Weaknesses

Is the new model better? It has much to recommend it. It encourages people to address a whole set of connected issues, rather than narrow project-by-project regulation. It generates buy-in from people who will help carry out the decisions, and as a result, it increases certainty. Tapping people's unpredictable creativity, the model encourages innovation. It benefits from the knowledge of people who are close to the problem and have relevant local experience. It also builds trust so that people are better prepared to work together again on other issues. Although the new model challenges conventional ways of thinking about conservation, it also offers new opportunities to build support for wilderness.

Does the new model yield good decisions? The answer to that question depends partly on the desired goals. If the goal is to help communities work well, the results are often positive. If the goal is to produce sustainable systems, the results can be more uncertain. Ecological systems have their own truth, a truth not created in meetings or elections. Ecological questions have right answers and wrong answers. Sometimes we get the answers before we think of the questions. A decision process could be perfectly democratic, participatory, and socially equitable—and yet still produce a decision that injures nature. Skeptics will remember the character in *Huckleberry Finn* (Twain, Mark The *Adventures of Huckleberry Finn* Ch. 26) who said, "Hain't we got all the fools in town on our side? And ain't that a big enough majority in any town?" To complicate the situation further, we can design decision processes to be participatory and equitable only

to have them undone by bad faith. The community model doesn't work when conventional power politics overpower it.

Communities of place are rarely homogenous. I once lived in a Montana community of fewer than 200 people. Norman Rockwell could have painted that town, and it had many qualities that I miss in Washington, D.C. If any of us were in serious trouble—say, burned out of our house—the entire community would rally to our help. Still, having a public cup of coffee with someone in that town could be a political act. Where everyone knows everyone, grudges can have a long life, even two or three generations. In such a community, the pressures for conformity are intense. If anyone disagreed publicly with my community's political orthodoxy--opining, say, that the Forest Service should reduce grazing permits on national forests—that person would learn the power of ostracism.

As if personal differences were not enough, people also can disagree about principles. Those differences drive them into groups held together by common values. We can call those groups communities of value. Communities of value may be structured, like a religious community, or informal, like fans of country music. Shared values are an essential ingredient for all healthy communities, but of course, differences in values can produce conflict. If you value someone's right to an abortion, and I value the sanctity of life at conception, then we may not agree about the local Planned Parenthood clinic. Analogous conflicts of value divide communities on environmental issues. Communities of place usually include conflicting communities of value. We can live in the same town but disagree violently about the value of old-growth forest.

When communities of value become politically organized, then we have communities of interest. A community of interest is a group of people knit together by the noble goal of defeating another group of people—for example, loggers and environmentalists. Therein is the problem. Communities of interest may choose not to participate. A single interest group, intent on winning, can shut the door to community-based conservation.

Prerequisites for Community-Based Conservations

Recently I have been seeking out people with experience with community-based conservation, to ask them what they think are the elements of success. From their responses and my experience, I have compiled a short list of necessary conditions for successful community-based conservation. I think there are eight.

The first prerequisite is an already existing spirit of community. Areas of the country that are experiencing rapid growth have difficulty with community-based conservation, because many newcomers have little or no psychological investment in the place.

The second necessary condition is a locally perceived need. A crisis in the local economy, a polluted river, even an inspiring vision for change—whatever the motivation, people see an urgent reason to set aside their differences and engage in the hard work of conservation. Often the perceived need is the need to respond to the threat of federal action. That is why so many of these community-based actions involve endangered species or wetlands.

Third, people need adequate technical support. They may need GIS capability or help with techniques of visualizing alternative futures. They may need professional facilitators, scientists, or technicians. Many communities do not have those capacities at hand, and they must turn to state or federal agencies. The technical support also can take the form of state or federal standards, which can provide essential guidance for the community.

Fourth, people need good information. Most of us do not understand the workings of our local economic systems or ecological systems. Community-based conservation is usually an educational process, but good information is helpful for another reason too. When everyone focuses on the same facts, agreement comes much easier. Communities often need exactly the kind of information that the National Biological Service and the Office Technology Assessment supplied until recently. They also need help analyzing their economic choices, such as the community development workshops sponsored by the Department of Commerce.

Fifth, communities need an institutional framework for action. They may need effective public agencies or private organizations, and appropriate laws and social customs. These institutions provide the legal and moral authority that will bring people together and enforce decisions. (The institutional framework is often weak when the action entails multiple communities within an ecosystem, like a watershed.)

Sixth, every community exists within larger communities—polities or jurisdictions, such as state and federal governments. Often those larger communities have their own environmental actions that influence the community's work. Community-based conservation requires that the influence of this superstructure be positive.

Seventh, community-based conservation needs money. The processes themselves often require paid facilitators, technology, and data gathering. The solutions often require capital investment in facilities or land acquisition. Federal grants may be the only feasible source of such money.

The final, most important prerequisite is leadership—specifically, leadership from the community. Someone in the community needs to have the idea, gather the people, and hold them together when the going gets rough. Most difficult of all, someone must assure that relevant stakeholders are at the table and that the table is a comfortable place for unpopular opinions.

Of course, more than one person can provide the leadership. The process is more secure if people share leadership. Nor do all the leaders need to be local. People resist community-based action for fear that their perspective will be under-represented or overwhelmed. Simply putting one environmentalist, one logger, and one public official on a committee will not assure a fair and thoughtful process. As a fractured and sometimes intolerant community, my Montana hometown was not unique. I have actively opposed models, like Secretary Babbitt's grazing advisory committees, that overlook those realities.

Although people outside the community can step in at crucial times, they cannot replace local leaders. Only local or regional leaders will have the credibility, influence and knowledge to pull a community together for conservation. A community can have all the necessary political, economic, and technological tools and still wear out its natural resources. In the new politics of conservation, success will depend on educating people in the skills and arts of citizenship.

Responding to the New Realities

Community-based conservation promises some powerful corrections to the shortcomings of the old politics of command and control. But it is not a complete substitute, and it will not always work. When it does work, success may be the result of a federal partnership. In our infatuation with localism we must think twice before weakening a federal agency. Doing so can be disastrous for community-based conservation.

Community-based conservation is a winning political strategy, but more than that, it is powerful strategy for conserving natural systems and honoring natural processes. When it works, it also is an engine of hope, reminding us of the strengths of democracy. Democracy's gift to us is that to let us disagree, to make disagreement not only safe but useful. What democracy requires in return is that we also find agreement, that we somehow make peace with each other. Recently Americans have come to understand that we also must make peace with the Earth.

The new trends present important new opportunities for building a constituency for wilderness. What is the largest obstacle to wilderness conservation? It is the perception that wilderness is irrelevant to people's everyday concerns. That perception is especially strong in cities. Furthermore, people who do care about wilderness have not felt that they have much influence in wilderness issues. In the East, many people who care about wilderness do not even think of wilderness as part of their environment. They think of wilderness as something that occurs in the public-land states of the West.

We can change the perception and the reality. If decision-making shifts toward ecosystems or watersheds, then wild land becomes part of the discussion. In the East, many wilderness areas are near large urban areas, and those urban areas are where the votes are that can support wilderness. By engaging those people in system-wide planning and management, we have an opportunity to educate them about the values of wilderness. Our challenge is to take advantage of that opportunity.

How can we do that? We need to work in five areas of action. First, every department of the federal government has programs and policies that affect local land use and consequently affect wild-land ecosystems. We all know that those programs and policies sometimes conflict with each other and sometimes inhibit wilderness management. We are driving with the brakes on. We need to begin rationalizing and coordinating those federal

actions.

The second area of action is to assure that people have the best available information and good scientific theory. Environmental advocates should work to increase funding for data gathering and ecosystem science. Meanwhile, public agencies need to examine their procedures to assure the greatest public access to the best available data.

The third area of action is to continue to experiment with institutional forms for managing landscape systems. Habitat conservation plans, safe harbors, watershed plans are all promising. Yet we still lack adequate ways to coordinate multiple jurisdictions, such as communities within a watershed. When I say we need to experiment, I use that term advisedly. Although we need to try out new institutional forms, we also need to analyze the results rigorously. Then we can build on the successes and learn from the mistakes.

The fourth area of action is community leadership. We think of wilderness issues in terms of big decisions: wilderness designation, or the loss of roadless areas. Yet in the future, and especially in the East, we will need to attend to the incremental effect of small decisions, like the siting of subdivisions. Each of us, no matter what our professional affiliation, can be a community leader. In the emerging reality, that will sometimes be our most important role.

Fifth and finally, we need to remember that the new model does not always work. In fact, often the new model works only because the old model lurks in the background. We still need strong support for our system of national lands and federal programs, as well as state and local public land. Our wilderness system, our refuge system, our national parks and forests—they all are part of a heritage such as no other nation in history has bequeathed to its citizens. Our overriding vision must be this: a national network of sustainable ecosystems. That network is impossible without a core of natural lands. We cannot supply that core without public lands. No matter what the decision model, the need to honor and protect federal land has never been greater.

Community-based conservation has huge promise, but we cannot treat it as some mechanical panacea. It is not just a matter of closing one door marked "command and control" and opening another marked "participatory democracy." Like most important work, this will take time and serious commitment. We will make mistakes. If we are smart, we will learn from the mistakes and build on the successes.

The Southern Appalachian Man and the Biosphere (SAMAB) Program

Hubert Hinote, Executive Director
SAMAB Cooperative

The SAMAB Program

What is the SAMAB Program?

It is a public/private partnership that focuses it's attention on the Southern Appalachian Biosphere Reserve. The vision of the program is to:

> promote the achievement of a sustainable balance between the conservation of biological diversity, compatible economic uses and cultural values across the Southern Appalachians. This balance will be achieved by collaborating with stakeholders through information gathering and sharing, integrated assessments, and demonstration projects directed toward the solution of critical regional issues.

The program encourages the utilization of ecosystem and adaptive management principles.

The Man and the Biosphere program (MAB) was established in 1971 by the United Nations Scientific, Educational, and Cultural Organization (UNESCO))on the premise that a balance can be sustained between conservation of biological diversity, economic development and cultural values. In 1976, UNESCO designated 59 biosphere reserves in eight countries; two of those were in Southern Appalachia—the Great Smoky Mountains National Park and Coweeta Hydrological Laboratory.

What is the Southern Appalachian Biosphere Reserve?

What area does it cover?

The "zone of cooperation" of the Southern Appalachian Biosphere Reserve covers the Appalachian parts of six states: Tennessee, North Carolina, South Carolina, Georgia, Alabama, and Virginia (see Fig. 1). It is loosely defined as the Southern Appalachian ecosystem. The Southern Appalachian Biosphere Reserve was designated by UNESCO in 1988 as a multi-unit regional biosphere reserve. UNESCO designated it based solely on its unique characteristics (geological, biological, and cultural) and plays no role in it's management. UNESCO has given special recognition (certificates) to five management units within the Southern Appalachian Biosphere Reserve.

1. Great Smoky Mountains National Park (managed by the National Park Service);
2. Coweeta Hydrological Laboratory (managed by the U.S. Forest Service);
3. Oak Ridge's National Environmental Research Park (managed by a private contractor for the U.S. Department of Energy):
4. Mount Mitchell State Park (managed by the State of North Carolina's Department of Health, Environment and Natural Resources); and
5. Grandfather Mountain (privately owned with protected easements provided to the Nature Conservancy).

Three other areas are in the process of acquiring this special recognition:

1. Tennessee River Gorge (near Chattanooga, TN and managed by a non-profit organization;
2. Roane Mountain area (mixed management but largely the U.S. Forest Service and a non-profit organization); and
3. Mount Rogers area in Southwestern Virginia (mixed management but largely the U.S. Forest Service).

How was the SAMAB program formed?

In 1986, the US Man and the Biosphere (MAB) National Committee endorsed the nomination of the Southern Appalachian

Biosphere Reserve and initiated planning of a model biosphere reserve regional project. Also in 1986, the National Park Service's Southeast Regional Director proposed pilot projects in Cooperative system planning be used in the Southern Appalachians. He described the critical problems facing this region as "...increasing urbanization, pollution, competition for consumptive resources, and the shrinking of personnel and fiscal resources." He stressed the need to begin a process of identifying regional issues and developing objectives and strategies to address them on a scale reaching beyond park boundaries, indicating that "...these efforts should draw their strength from interagency cooperation aimed at achieving common goals—an ecosystem approach which should be discussed with leaders of the area."

In 1988 Southern Appalachia was officially designated a multi-unit regional biosphere reserve. In the 1986 through 1988 period, some leaders in the region felt sure this designation would be forthcoming and they began work to put an organization into place to:

1. Encourage wise use of the area's natural resources and to foster environmental research, education, and training.
2. Promote knowledge and understanding of the natural and cultural resources of the region; and
3. Build a model of cooperative, integrated regional resource management.

In August 1988, six federal agencies signed an "Interagency and Cooperative Agreement for the Establishment and Operation of the Southern Appalachian Man and the Biosphere Cooperative." The signatories of this agreement were: U.S. Forest Service, National Park Service, U.S. Fish and Wildlife Service, Economic Development Administration, Department of Energy-Ecological Sciences Division (ORNL), and the Tennessee Valley Authority. Attachment 1 is the statement of work contained in that agreement. This statement of work empowered the SAMAB Cooperative Executive Committee to establish a Southern Appalachian Biosphere Reserve coordinating office.

It should be noted that signing the cooperative agreement did not commit an agency to any level of financial or in-kind support. This responsibility was delegated to the Executive Committee.

In mid 1989, a coordinating office was established at the Great Smoky Mountains National Park (GSMNP) and a part-time executive director (manager) for that office was named.

How is the SAMAB program organized?

Fig. 2 illustrates the organizational structure of the SAMAB program. It presently consists of two organizational entities:

- The SAMAB Cooperative (federal and state agencies join voluntarily); and
- The SAMAB Foundation.

The SAMAB Cooperative consists of Federal and State agencies who have signed the "Interagency and Cooperative Agreement": (as of July 1995, 11 federal and three state agencies have signed, attachment 2, with two other federal agencies giving it 'active' consideration). The Cooperative is managed by an executive committee (representing the signatories) who has overall responsibility. The coordinating office is charged with day-to-day operations and coordinating the overall activities of the program. Six Committees, made-up of representatives from both the public and private sectors, define issues, develop a plan of work, and implement the vision of the program. The six committees are:

1. Research and Monitoring;
2. Resources Management;
3. Sustainable Development;
4. Cultural and Historical Resources;
5. Environmental Education; and
6. Public Affairs.

In 1990, the non-profit SAMAB Foundation was formed the complement the Cooperative; to involve other interest groups such as private industry, other non-profit organizations, and special interest groups; and to help find means to support the program. The Foundation has established its own Board of Directors; members of the Board consists of (1) Private industry (e.g. Duke Power, Georgia Power, The Chevron Companies, WBIR-TV); (2) Non-governmental organizations (e.g. National Parks and Conservation Association, Environmental Defense Fund, Sierra Club); (3) Universities/Colleges (e.g. University of Tennessee-Knoxville, Carson-Newman College, Appalachian State University); and (4) Local Communities (e.g. Pittman Center, Tennessee). The Foundation is expected to become a significant fund-raiser.

The Foundation and the Cooperative work together to identify important natural resources

and economic development issues. Independently and together, they develop means for addressing these issues.

A third entity is presently being developed, the SAMAB Consortium. The Consortium will consist of colleges and universities that affiliate with the SAMAB program.

What are some of the issues that have been addressed?
What has SAMAB accomplished (done)?

It has undertaken cooperative projects/programs addressing some aspect as the following subject areas/issues:

Environmental Monitoring and Assessment

- •Forest Health Monitoring; Threats to forest health in the Southern Appalachians
- •Three workshops across region describing exotic insects and diseases affecting the forests
- •Approximately 100 plots already providing data. There are 100 additional plots expected in the next one to two years.
- •Landscape Ecology/ Landscape Monitoring
- •Held two workshops on Integrated/ Ecological Assessments
- •In cooperation with EPA's EMAP program, significant research is being funded on developing landscape scale modeling and analysis

Sustainable Development/Sustainable Technologies

- •Two regional workshops for better understanding and implementation strategies
- •Community strategic planning/tourism
- •Assistance in developing a strategic plan led to additional grants to the community for implementation
- •Outreach program to other communities underway.
- •Geographic Information Systems
- •Regional geographic information system underway.
- •Workshops on Forestry Best Management Practices.

Conservation Biology

- •Wetlands
- •Regional conference led to publication of Book entitled "Wetlands of the Southeastern United States."
- •Economic Use(s)/Protection of Native Plants
- •First Regional workshop clarified local interest; data needs; and opportunities for achieving sustainable economic development of biological resources.
- •Range of Native Brook Trout
- •Workshop led to additional funded research.
- •Neo-tropical Migratory Birds
- •Cooperative support led to additional monitoring and education programs.

Ecosystem Management

- •Testimony to the Senate subcommittee on Agricultural Research, Conservation, Forestry and General Legislation
- •Recognized by White House's Interagency Task Force on Ecosystem Management as a demonstration area for ecological assessment and ecosystem management.
- •Air Quality Management: Threats to Class I Airsheds
- •Brochure on "Understanding Air Pollution in the Southern Appalachians
- •Workshop led to the Creation of the Southern Appalachians Mountain Initiative (SAMI)—an eight state consortium of public and private groups to address air quality impacting Class I areas in the region;
- •Assisting in developing a framework for preparing air quality management plans on public lands in Southern Appalachian.
- •Partner with U.S. Forest Service on the Chattooga Ecosystem Demonstration Project
- •Regional Demonstration—Southern Appalachian Assessment

Environmental Education and Training

- •Directory of Environment Education and Training (member organization)*
- •Video, posters, and teacher guides on:*
- •Reintroduction of the Red Wolf into the Great Smoky Mountains National Park, in Cooperation WBIR-TV, Knoxville, (video won an Emmy Award and the educational poster was selected by Urban America as one of top 20 posters in America in 1992).
- •"Water: From the Mountains to the Coast", also in Cooperation with WBIR-TV, Knoxville.

•Dogwood Anthracnose, in cooperation with several non-government organizations.
*These were distributed to all schools and public libraries in the zone of cooperation.

Cultural and Historical Resources

•Workshop(s) led to ongoing development of a cooperative program to preserve and promote regional cultural resources;
•Developing databases on regional cultural resources.

Public Information and Education

•Newsletter
•Spring and Fall Conferences
•General Information about SAMAB and the Southern Appalachian Biosphere Reserve.
•SAMAB Home Page on the Internet

Attachment 3 contains some highlights of the 1994 and 1995 SAMAB program. Moreover, in April of 1994, SAMAB initiated work on one of the most significant projects to date, the Southern Appalachian Assessment (SAA). This integrated assessment will assemble existing data and evaluate past trends, current conditions, and future risks to the economic, ecological, and cultural resources of the region. The initial phase of the SAA will be completed in early 1996 with publication of resource-specific technical reports and a preliminary integrated report. Other products of the SAA include: 1) a comprehensive database made available to interested parties through a variety of media including a SAMAB Homepage on the Internet; and 2) identification of gaps in both available data and understanding of system function that will guide future research and monitoring activities. It is hoped that the results of the SAA will enable SAMAB partners to work together to protect the unique resources of Southern Appalachia while promoting economic development that is sustainable. The SAA has been recognized as one of three prototypes by the National Assessment Program under the Office of Environmental Policy and is expected to set the standards for anticipated integrated assessments conducted across the country.

How is SAMAB Funded?

Funding support for the SAMAB Cooperative may be categorized as follows:

•Direct support for the Coordinating Office (Salaries, benefits, travel and related costs directly associated with staffing the coordinating office)
•Pooling funds to implement specific programs/projects (e.g. Red Wolf Education program)
•In-kind services
•Staff serves on executive committee, Chair the various committees, and work on specific programs/projects;
•Administrative/clerical services, office, telephone, postage, printing services.

The SAMAB Cooperative Executive Committee is charged with generating funds and in-kind services to plan and implement the program. These funds and in-kind support generally come from the local managers and/or their regional offices. Since many of the Executive Committee members are local managers, they have willingly supported the program/projects because they have recognized the value of cooperation, coordination, and integration. It should be noted that no new or additional funds have been provided to the local managers because of their participation; rather they see the SAMAB program as an effective way to identify and address local and regional issues that reach beyond the mandate and scales of their respective agencies. SAMAB cooperation allows them to take an ecosystem approach to identifying and addressing problems facing the region.

Support, both financial and in-kind, has grown as the program has matured,; but local managers have limited ability to redirect funds and personnel. Gaining the support of regional and national agency administrators to commit time, attention, and money to support SAMAB efforts has limited its effectiveness in addressing a larger variety of regional issues. However, as the program has grown in stature and recognition, regional administrators and other agencies have increasingly provided support.

SAMAB still lacks a reliable financial base on long-term basis. This limits its ability to undertake activities that reach beyond the current budget cycle of local managers. Nevertheless, it has found ways to undertake a number of research and education projects that better inform the public and encourage better management practices.

The SAMAB Foundation will help raise funds, but to date it has not been successful in raising enough funds to significantly support regional projects, needed staff, and administrative expenses. The funds that the Foundation has raised have been used to support

programs/projects; but much more is needed. The Foundation is working to attract more private sector partners and to involve local people more directly is SAMAB activities.

What do some of the Stakeholders say about the SAMAB program?

•"...in the six state region of the Southern Appalachians, which includes my home state of Tennessee, we have a program called the Southern Appalachian Man and the Biosphere program SAMAB. This program is dedicated to finding ways for developing a sound economy while maintaining and enhancing a healthy environment. Through SAMAB, Federal, state and local, and public and private institutions have developed innovative cooperative approaches to ecosystems management and sustainable economic development. We still have a long way to go in these areas, but I believe SAMAB provides a useful model on a national and even international scale" statement by Senator Jim Sasser commenting on the Government Performance and Results Act of 1993.

•"Cooperation of all the government agencies was always very important to me. But I'm certain that without SAMAB, many of the positive things that have happened in out region would not have happened" Randall Pope, retired Superintendent, Great Smoky Mountain National Park.

•"In Southern Appalachia, we take cooperation for granted. The Parks people, the National forest people, TVA, the wildlife associations—they have built a tradition of working together. It's really mind-boggling. Forming SAMAB is another excellent example of building on this tradition:" Bill Landry, Host of the "Heartland" series, WBIR-TX, Knoxville.

•"TVA is to be further commended for its continued funding of and participation in the Southern Appalachian Man and the Biosphere Consortium" *Blueprint for TVA Environment Leadership*, submitted to TVA Board Chairman by a group of Environmental organizations. November 1993.

•"SAMAB really is a world class model" Dr. Frank McCormick, Director, Institute for International Training in Sustainable Development, University of Tennessee - Knoxville, in comparing his experiences in Brazil, China, and other countries.

• "The Southern Appalachian Biosphere Reserve exemplifies the U. S. modality of biosphere reserves. The modality is based on expanding regional partnerships to discover ways to harmonize biodiversity, cultural values, and socioeconomic development...The Southern Appalachian experience is particularly relevant in regions having complex land management systems, many protected area categories and ownerships, nature conservation and resource development. In such situations, the approach offers a useful model for building the knowledge, skills, and commitment needed for cooperative planning for ecosystem sustainability on a regional landscape basis" Dr. William Gregg, Director, International Affairs office, National Biological Service (in a presentation to the International Conference on Biosphere Reserves, Seville, Spain March 1995).

•"We in Pittman Center have been involved with the SAMAB program for almost five years. I want to make it clear that the SAMAB program does not infringe upon private property rights, try to depopulate an area, allow outsiders to direct future development, nor bring additional regulatory pressures. Our association with the program has resulted in many benefits to the community especially the recognition that economic development and natural resource protection are complementary goals not competing ones" James B. Coykendahl, III, Board of Alderman, Pittman Center, Tennessee. Comments to the US MAB program for publication in their "Biosphere Reserve Pamphlet" 1994.

•"A group of federal agencies will monitor forestlands in portions of six states that make up the Southern Appalachian Man and the Biosphere region...TVA's leadership in taking on this study is a continuation of that fine tradition of service to the region that has been part of the agency's mission since its founding...finding a significant need in the Valley while offering an example for the rest of the nation..." Editorial", the Knoxville News Sentinel, July 1, 1992.

•"The Tennessee Valley Authority (TVA) has scientists working on regional-scale environmental research and monitoring programs. Of particular relevance is their leadership in the Southern Appalachian Man and the Biosphere program, a forward thinking program that addresses environmental research, monitoring and management issues on an eco-regional scale. Furthermore, the emphasis of

their work has been on cross ecosystem issues, such as water quality and biological diversity..." Bruce Jones, Technical Director, of EPA's Environmental Monitoring and Assessments program (EMAP)—Landscapes Program.

•"We are honored to have the opportunity to introduce you to SAMAB, a program which is a recognized leader in achieving that cooperation and in implementing the concepts and practices of regional public/private partnerships...We strongly support SAMAB and encourage your support and help" Southeastern Natural Resource Leaders Group in an October 1994 letter to their respective headquarters' offices in Washington, DC.

•"With these agencies working together we have recognized a tremendous cost savings simply because multiple agencies are not collecting similar data individually, but instead are doing so jointly. This interagency approach also helps prevent duplication of efforts which leads to more efficiency and effective use of Assessment data." Statement of Dr. Jack Ward Thomas, Chief, U. S. Forest Service, before the Subcommittee on Forests and Public Land Management, Committee on Energy and Natural Resources, U. S. Senate, April 5, 1995.

•"Member agency personnel constitute a valuable pool of knowledge and experience: SAMAB uses these resources as a conduit for sharing, not only with other cooperative members, but also with public and private land managers throughout the region. Let us hope future managers will see the logic in working toward more cooperation, not less." *Park Science: Integrating Research and Resource Management.* National Park Service, Volume 15-Number 3; Summer 1995.

•"The Southern Appalachian Man and the Biosphere Cooperative, although containing Federal agency partners, has developed an identity separate from the agencies. This gives the Cooperative an unique ability to forge cooperation in all aspects of science and information dissemination. Many interviewees viewed the Cooperative as a resource and facilitator. Individual Management agencies might by contrast, be perceived as a threat. The Southern Appalachian Man and the Biosphere Cooperative has become accepted as a translator of technology. It facilitates science by increasing awareness among agencies of other agencies' missions and functions. It also helps eliminate duplication of effort in research activities and it encourages software compatibility for data sharing." *The Ecosystem Approach: Healthy Ecosystems and Sustainable Economies.* Report of the Office of Environmental Policy's Interagency Ecosystem Management Task Force, volume 1, June 1995, page 43-44.

What is SAMAB's future?

The future of SAMAB looks encouraging. Recognition and support for SAMAB has grown steadily. This is a reflection of the fact that the concept and principles on which it was established are sound and future oriented. It is also a strong reflection of individual leadership within each of the member organizations.

More specifically:

1. the concepts and principles on which SAMAB was established are more valid today than ever before; especially the need to identify and address issues that reach beyond the scale and mandate(s) of any single agency, and the need for developing coordinated and consistent data bases for multiple uses in both the public and private sectors.
2. The structure of the program places major emphasis on the development of strong public - private partnerships for both funding and decision-making (this is extremely important in Southern Appalachia where about one-third of the land base is publicly owned and managed).
3. The products and services of the program include environmental and economic problem solving options.
4. The federal government's emphasis on Performance Reviews, Ecosystem Management, Adaptive Management and other effectiveness and efficiency measures fits with the vision and action plan of SAMAB.
5. A wide range of stakeholders—local citizens, environmental groups, private industry, and government officials (local, state, national, and international)—have recognized the SAMAB program as a model for developing cooperative and coordinated research, resource management, and educational programs/ projects.

In 1994, SAMAB developed an Action Plan for the 1994-1996 period and is in the process of implementing that plan. SAMAB has done much with good faith and limited funds to fully achieve its goals. Participating agencies and the MAB National Committee should consider ways to support Biosphere Reserves through National Programs that provide adequate funding to enable regional MAB Cooperatives to contribute

effectively and efficiently to ecosystem management.

ATTACHMENT 1
INTERAGENCY AND COOPERATIVE AGREEMENT FOR THE ESTABLISHMENT AND OPERATION OF THE SOUTHERN APPALACHIAN MAN AND THE BIOSPHERE COOPERATIVE

ARTICLE II. STATEMENT OF WORK

1. Establish a Southern Appalachian Man and the Biosphere Cooperative (SAMAB). The cooperative shall be managed and directed through an executive committee comprised of one representative from each party to this agreement. The executive committee shall establish program policies consistent with the cooperative's objectives.
2. Cooperate with regional, state, and local governments, individuals, and other interested organizations to develop a land ethic that recognizes the importance of ecologically sound management of natural and cultural resources.
3. Identify principal environmental and developmental issues related to the objectives of the cooperative. This will be accomplished through a series of conferences and meetings with interested groups and individuals.
4. Undertake an ongoing and comprehensive effort to identify long-term, sustainable and ecologically sound economic development opportunities.
5. Undertake cooperative research and resource management initiatives which are regional in scope and disseminate resulting information from these activities.
6. Develop and implement a voluntary environmental education program with the public school systems of the region and with other interested organizations.
7. Establish cooperative relationships with state, local, and other federal entities within the region.
8. Procure and disseminate informational material appropriate to this project.
9. Empower the executive committee to establish a Southern Appalachian Biosphere Coordinating Office which and provide the expertise and labor to carry out the functions desired by the parties to this agreement.

ATTACHMENT 2
SAMAB COOPERATIVE MEMBERS

July 1995

Tennessee Valley Authority, Resources Group
USDA Forest Service, Southern Resource Station
USDI National Park Service, Southeast Region
USDI Fish and Wildlife Ser., Southeast Region
USDI Geological Survey, Water Resources Division, Southeast Region
USDI, National Biological Service
US Environmental Protection Agency, Reg. IV
Economic Development Administration, Atlanta Regional Office
US Department of Energy, through Environmental Sciences Division, ORNL
US Army Corps of Engineers, Ohio River Division, and South Atlantic Division
Appalachian Region Commission
State of Tennessee, Department of Conservation and Environment
State of Georgia, Dept. of Natural Resource
State of North Carolina, Department of Environment, Health, and Natural Resources

ATTACHMENT 3
HIGHLIGHTS OF SAMAB PROGRAM
Calendar Year 1994

- Integrated assessment workshop;
- SAMAB Business/Action plan and 'critical issues' identification developed;
- Sponsored the Sustainable Economic Development Conference for western North Carolina
- NBS, COE, ARC became the 9th, 10th, and 11th Federal agency signatory to SAMAB cooperative agreement;
- TN became the third state signatory to SAMAB;
- Discussions currently ongoing with NRCS, OSM;
- States of Virginia, South Carolina, and Alabama have been invited;
- Recommended that the Tennessee River Gorge became the 6th Biosphere Reserve unit in the SAMAB Region;
- Provided testimony to the Senate Sub-Committee on Agricultural Research, Conservation, Forestry, and General Legislation - April 14, 1994;
- Hosted visit by Federal Interagency Task Force on Ecosystem Management as a case study as part of NRP on July 11-15, 1994;
- Co-Sponsored with the Environmental Protection Agency an Ecological Assessment Workshop where SAMAB is being

considered as 1 of 3 protype areas to test National Assessment Program Protools for ecosystem assessment—April, 1994;
•SAMAB hosted meeting of Southeastern Natural Resources Leaders Group in Chattanooga, August 15-17, 1994;
•SAMAB participated with the U.S. Forest Service and others in a series of 3 meetings for public input on the SAA assessment; August 23, 25, and 27, 1994, in Asheville, Roanoke and Gainsville, GA;
•SAMAB hosted a visit from GAO September 11-15, 1994, representing the House of Representatives Committees on Agriculture, Natural Resources; Merchant Marine and Fisheries; and the Subcommittee on Specialty Crops and Natural Resources; and for the purpose of identifying ways for Congress to facilitate ecosystem management implementation and to gather information to testify before the House Budget Committee in the Spring of 1995;
•Developed joint Letter of Support (October 3, 1994) for SAMAB from Natural Resources Leaders Group to Washington level Bureau/Agency heads, —three responses;
•Annual Conference—November 14-17, 1994 in Hendersonville, North Carolina
•Hired NBS-sponsored data coordinator for SAMAB-Karl Hermann at Norris, TN
•SAMAB initiated the Southern Appalachian Assessment
•There was general financial support for executive director, FY 95 budget, need for continued support.

Calendar Year 1995

•Primary focus is the Interagency "Southern Appalachian Assessment." Databases finalized, put on the Internet, and preliminary reports completed by November 1995. Final Integrated Report will be issued in January 1996;
•SAMAB participated as 1 of 10 representatives in meeting on February 8, 1995 with the new Speaker of the House regarding natural resource issues:
•Presentation to Natural Resources Committee of the President's Council on Sustainable Development—Chattanooga, TN, January 1995;
•SAMAB Home Page established on the Internet;
•Executive Director participated in the International Conference on Biosphere Reserves. He and International Affairs Director Bill Gregg, NBS, co-authored a paper on SAMAB and presented it at the Conference, Seville Spain, March 1995.
•Presentation on SAMAB, as a model for ecosystem management, made to the National Hydropower Assn., Washington, DC, April;
•SAMAB Annual planning meeting, April 27-28, Asheville, NC
•Initiated Education program (brochures, \posters, etc.) to inform the public on the habits of Black Bears and the dangers of trying to feed them;
•Initiated programs to assist in the production of educational materials that describe the region's neo-tropical migratory birds and their values to society
•Team of six SAMAB representatives presented a five-day workshop in the Czech Republic. Developed a strategy for cooperation between SAMAB and Czech Biosphere Reserves and developed a Cooperative Program between SAMAB and the Kriboklatsko Biosphere Reserve, June;
•Hosted meeting of Southeastern Natural Res. Leaders Group in Charleston, SC. Sept.
•Team of four SAMAB representatives presented a three-day workshop and visited five protected areas (Biosphere Reserves) in the Slovak Republic. Memorandum of understanding on mutual cooperation was signed between SAMAB and the following groups: Slovak MAB National Committee, Slovak Environmental Agency, and the Director of the U.S. Peace Corps in Slovakia, October;
•SAMAB Annual Meeting November 14-16. Honorable Bruce Babbit, Secretary, Department of Interior is the Keynote Speaker. Initial findings of the Southern Appalachian Assessment will be shared at this meeting.
•Throughout the year, SAMAB leadership played a key role in developing and implementing the SAMI (Air quality) program.
•Hosted Biosphere Reserve Managers from

Poland, Germany, Czech Republic, Slovak Republic, Indonesia, and China.
•The SAMAB Foundation played a key role in supporting (handling the funding) for the USMAB Biosphere Reserve Directorate, participation of non-government representatives in the SAMI program, and the Southeastern Natural Resources Leaders group.

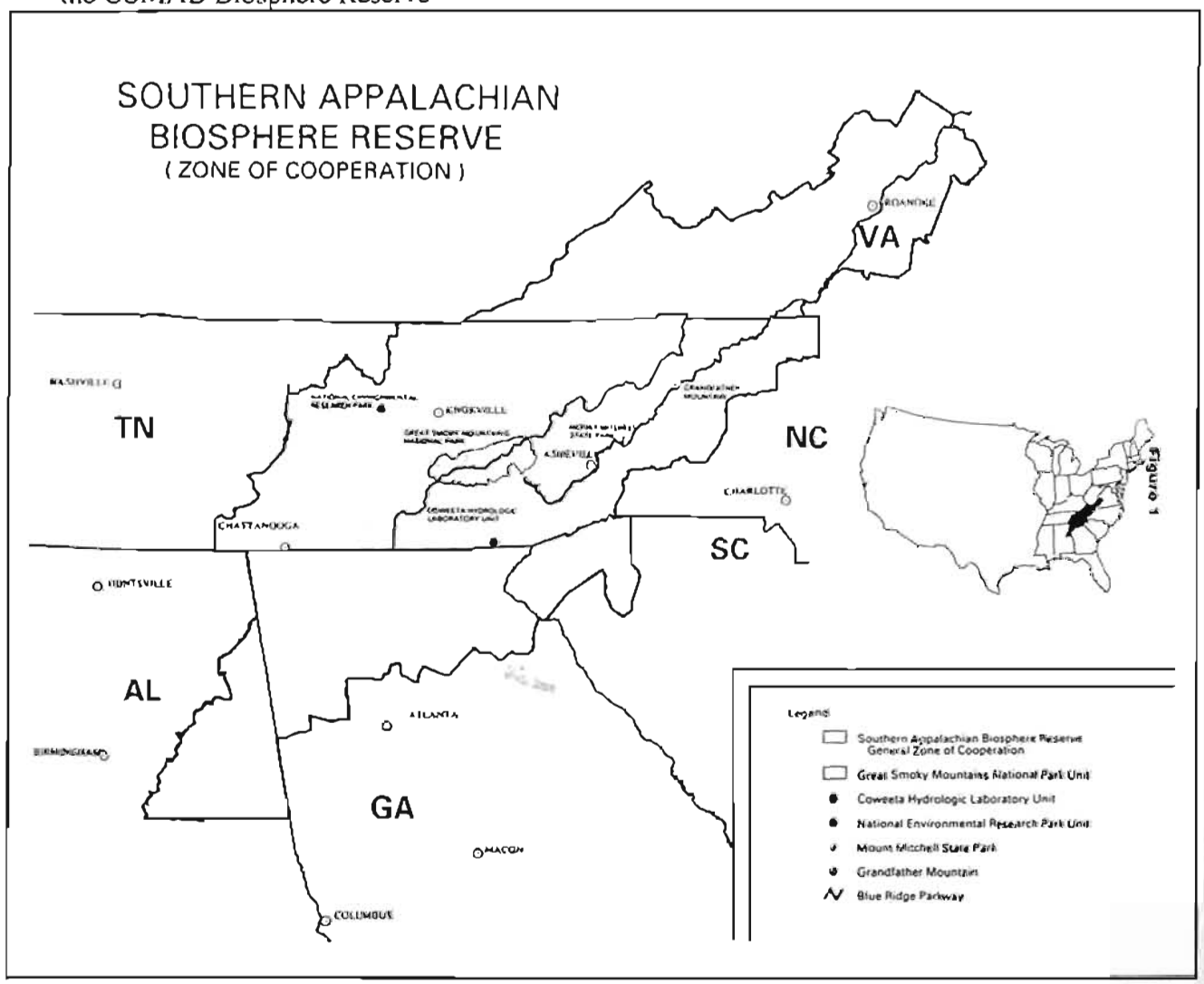

Fig. 1. Southern Appalachian Biosphere Reserve (Zone of Cooperation)

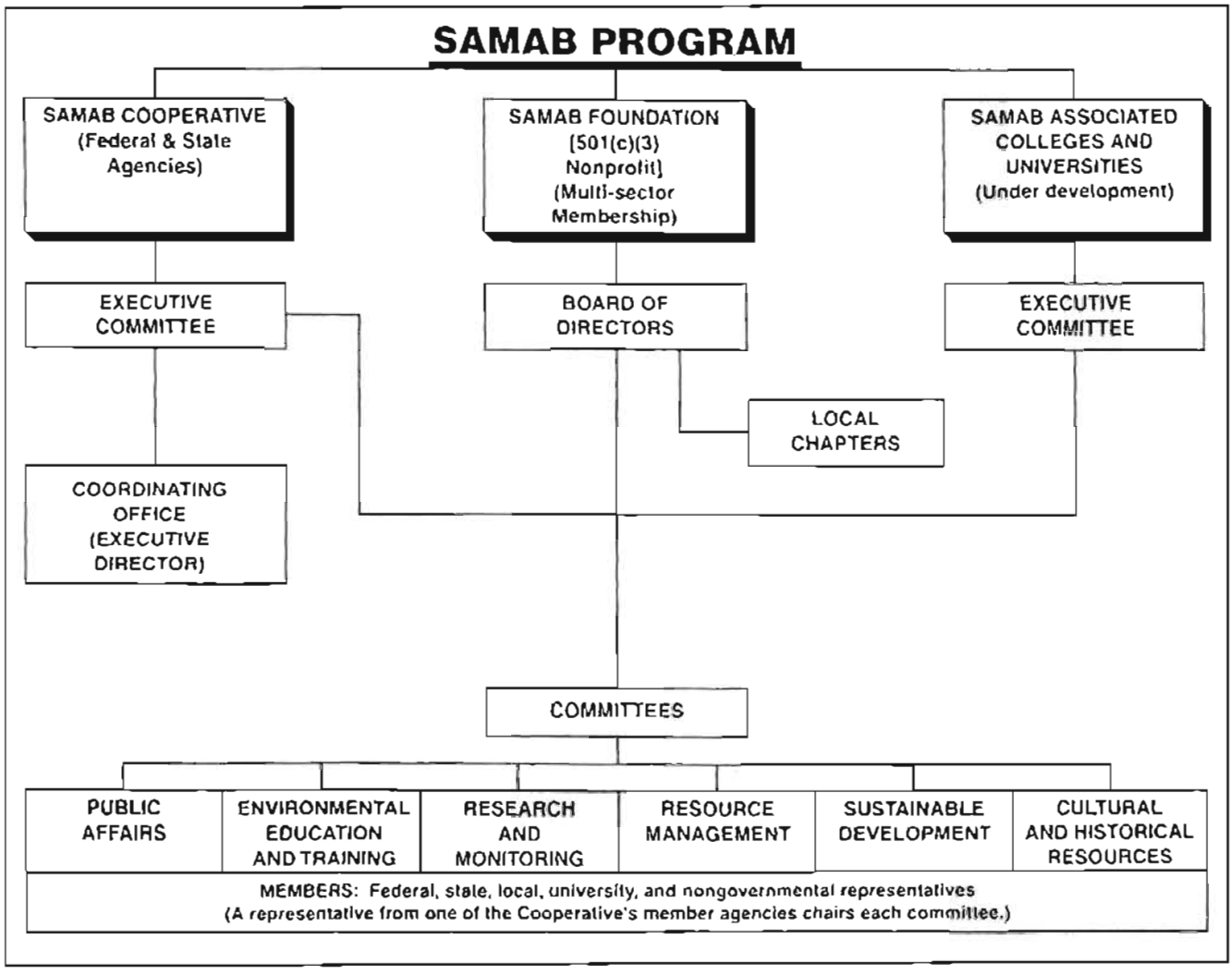

Fig. 2. Southern Appalachian Biosphere Reserve Program

Risk--An Essential Element Presented

Mike Link, Executive Director, Audubon Center of the North Woods

THE NEED FOR RISK

In today's litigious society we are willing to teach people knowledge and process, but there are few opportunities to face challenges. The wilderness is one of our prime resources, a tool for the individual, society, and the environment. However, for it to work it must be a product of natural forces, a combination of naturally occurring elements, and humans must face the same conditions as the other species and that includes the element of risk.

All people have the potential to grow intellectually, physically, and spiritually, but only a few realize that potential. Those who are successful know how to assess their abilities, seek knowledge and support, set appropriate goals, and take risks that are based on reason and confidence.

My Personal Commitment

I am here because I love wilderness and because I lost my son in a kayak accident. I am here to share because I believe there is a message that Matt and I still have to deliver together. Death is but a moment. Life precedes it, the spirit follows it, and we honor life by dwelling on the whole, not the moment.

Let me share with you some ideas about wilderness, risk, and management. Let me tell you a little about my son and I and then I will conclude with a restatement of what you already know is your challenge.

Ideas About Wilderness and Risk

Aldo Leopold "Of what avail are forty freedoms without a blank spot on the map."

Sigurd Olson- "I know now as men accept the time clock of the wilderness, their lives become entirely different. It is one of the great compensations of primitive experience, and when on finally reaches the point where days are governed by daylight and dark, rather than by schedules, where one eats if hungry and sleeps when tire, and becomes completely immersed in the ancient rhythms, then one begins to live."

John Muir "thousands of tired, nerve-shaken, over-civilized people are beginning to find out that going to the mountains is going home; that wildness is a necessity; and that mountain parks and reservations are useful not only as fountains of timber and irrigating rivers, but as fountains of life."

Rene Dubos "I know realize how much my life would have been enriched by longer and more intimate contacts with the wilderness. The experience of nature in a native prairie, a desert, a primeval forest, or high mountains not crowded with tourists is qualitatively different from what it is in a well-tended meadow, a wheat field, an olive grove, or even in the high Alps. Humanized environments give us confidence because nature has been reduced to the human scale, but the wilderness in whatever form almost compels us to measure ourselves against the cosmos.

Bob Marshall "Wilderness produces a soundness, stamina and élan unknown in amid normal surroundings. The wilds demand self, sufficiency, away from the coddling of civilization, where men [and women] depend on their own resources and this is of no small value in a country that covets individuality."

Theodore Roosevelt "Every child has inside him an aching void for excitement and if we don't fill it with something which is exciting and interesting and good, they will fill it with something which is exciting and interesting and not good."

T.S. Eliot "We shall not cease from exploration and the end of all our exploring will be to arrive where we started and know the place for the first time."

The Need for Wilderness

We live in a land of great abundance, but for the most part we are of relatively recent origin in

this country and we are still struggling to have a "sense of place" a sacred respect for the land such as the Indian religions express. The wilderness system is our best attempt. We are also in search of our heritage and the wilderness helps us fulfill that need.

I led a class called wilderness concepts. Five weeks in Montana, Wyoming, South Dakota, and Minnesota. We wanted to know what wilderness was from the stand points of both ecology and sociology. The results were:
1. areas large enough to sustain unmanaged; and
2. a place where you could feel separated from other humans and human resources. The last quality included the freedom to get lost, to test our skills, and to die. Wilderness is freedom and discovery, mystery and adventure, solitude and risk. It is beauty and diversity; it is satisfaction and values, where the rewards are earned and the consequences can be dramatic and permanent.

Risk is difficult to define. What one person rapidly accepts is often misunderstood or terrifying to another. A class 5 rapids looks like sure death to the uninitiated, but so does being a drug enforcement officer or a conservation officer approaching a poacher or a fireman battling a blaze or a New York taxi driver doing his daily work. For some life is a matter of routine, and risk is a departure from that routine. For me, risk is the acceptance and the realizations that I'm responsible for myself.
Karkov ". . . a whole person realizes that the real risk is living life without risk."

My Personal Reflection (Living, and Dying, with Risk)

We used to talk around the campfire, a father and a son. I remember well those conversations of grizzly bears, of sheer cliffs, of storms in the wilderness. My son Matthew and I talked of distant rivers, the beauty of the landscape, the exhilaration of the outdoors. It was a common love, something we could share. We also talked about risk.

"If a bear kills me, don't let anyone try to hunt it down." "If I get lost in the woods, don't send helicopters and search planes, let me find my own way out." "If I die on a river, don't let them dam it and steal its life on my account." Those are the things we would talk about around the campfire.

Then, on a quiet Saturday afternoon in December, the phone rang. "Mr. Link, this is the American Consul in New Zealand. Your son has been in a kayaking accident."

Risk is part of the wilderness experience, a part of the beauty of our relationship with the outdoors. Risk is inherent in our freedom; the freedom to test our own personal limits and to test our skills against the outdoors. Risk is a necessary part of growing up, of just growing. That's what Matthew and I talked about around the campfire. We talked of acceptance, the fact that it is the risk of death that makes life spicy and more worth living. But then, the phone rang.

"Mr. Link, your son is dead." In a single sentence, the voice on the phone made all the words real. Here was the summation of all we had talked about, risk taken to the final degree. The first thing I thought of was the campfire.

Matthew died when his kayak became pinned in the Taumarunui River of New Zealand. He and some friends had just completed the kind of trip they had always dreamed of. They were just 10 feet from the take-out when Matt became trapped underwater in his kayak, beyond the reach of help.

For [several[year[s] now I have carried Matt's memories inside of me when I hike or paddle, or sit along around the campfire. I relive the adventures we had, the sensations we shared as he grew up with a father who led outdoor trips for a living. Matt had grown up with the feel of a paddle in his hand, the heft of a backpack on his shoulders. The outdoors was a part of his natural heritage. It was his life, and his death. Like everyone who has faced loss, I search for meaning when there is none. The trails I still walk are no longer the same. The rivers I paddle have a sadder song. But they are no less beautiful, no less important.

And neither is the concept of risk. I would give anything to have my son back, but I would never willingly allow risk to be removed from our wilderness experiences. Handrails and steps, protective barriers, and concrete walls all serve to diminish the resource more than they protect the individual. Each barrier that keeps us from personal contact with the environment reduces the impact of the experience and lessens its value. I want to feel the cobwebs as I hike down a trail. I want to be allowed to enter places wild enough to get lost in. I want the river to flow free. Matt wanted that too.

What satisfaction is there in any pursuit if the outcome is preordained? Would we attend football games or a world series if we already knew the final score? Would any success be as

sweet without the possibility of failure? In nature we learn that life and death are part of the same endless cycle. The values that are a part of the natural environment include an acceptance of death. The predator and the prey are both to be honored.

These are not revelations to the backpacker, the paddler, or anyone who lives close to nature. Anyone who has truly looked at nature knows that ours is a world of living and dying; death surrounds life and is incorporated into the weave and weft of every existence. I can never reconcile my son's death and say it was good. It was, however, inevitable. Moreover, there are different kinds of death, and more terrible ways of dying than by doing something you love.

Those who bemoan wilderness because of the risk, those who see not threat in toxic rain, ozone depletion and rain forest destruction have suffered another form of death. They have removed themselves from the earth that we all depend on. Physical death is inevitable. Spiritual death is something different.

Matthew knew all of this. I know that from our campfire talks. He knew the risks inherent in the wilderness travel. He had honed his skills until he felt comfortable in Class V rapids. He never blatantly defied the odds. In each situation he assessed the risk and accepted it, or turned around. He chose to paddle the river that day.

Now he is gone, but the wilderness remains. And it should remain, as a place of beauty, wildness, and risk, a place where life—and death—still hold true to their meanings.

Matthew would have it no other way.

The Challenge

Ultimately it is for you the wilderness manager to place the opportunity for wilderness experience in context of ecosystem preservation. If it means new standards for wilderness users set them; if it means new education then teach; but whatever you do don't call a park wilderness unless it is. Don't offer wilderness without risk. Our world can not afford to be without this ultimate freedom.

> When you're on a journey and the end keeps getting further and further away, then you realize that the real end is the journey. (Philosophy of Karlfried Graf Durckheim)

Critical Strategies from the Sixth National Wilderness Conference: Implications for Eastern Wilderness Management

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Abstract: Strategic Planning Groups were an integral part of the Sixth National Wilderness Conference in Santa Fe, New Mexico during November 1994. The recommended actions that were a result of that process are compared with the responses of conference attendees who indicated they had extensive knowledge of eastern wildernesses. The need to educate a diverse array of publics is seen as even more critical in the East, with somewhat less emphasis on some biophysical management issues. In the East, as in the National Wilderness Preservation System as a whole, management of the recreational resources is seen to be important, but not as critical an issue.
Keywords: Strategic planning, National Wilderness Conference, education, recreation resources

In November 1994, over 700 people gathered in Santa Fe, New Mexico for the Sixth National Wilderness Conference. These attendees were a mixture of Federal agency specialists and managers, students and academicians, and other interested members of the public. In addition to celebrating the 30th Anniversary of the Wilderness Act, they participated in a strategic planning exercise designed to develop consensus on the actions needed to guide wilderness stewardship over the next decade.

The Strategic Planning Process

In preparation for the work at the conference, early registrants were asked to provide a prioritized list of the top ten wilderness issues that they believed should be addressed in the next ten years. A total of 128 issues were distilled from the responses of 217 registrants, and have been compared with the list of issues generated at the 1983 Wilderness Management Workshop in Moscow, Idaho (Barns and Krumpe 1995).

The idea behind the Strategic Groups at the Santa Fe Conference was not just to identify issues, but to suggest actions that might start to solve these problems. To do that, the issues were grouped into seven topics:

- Natural & Biological Policy
- Administrative Policy
- Interagency / Intergroup Cooperation
- Management of Non-Recreation Resources
- Recreation Management
- Education & Training of Agency Personnel
- Education of the Public.

Six hundred conference attendees were divided into 40 groups of 15 people each. Each of these small groups addressed the issues of only one of the seven topics. Attendees were assigned to groups dealing with a specific topic according to either their expressed interest in an issue or their job. An attempt was made to keep the individual small groups balanced both geographically and among agencies or professional affiliations.

The small groups spent one afternoon going through a nominal group technique (NGT) (Delbecq et al. 1975) similar to that used in Idaho in 1983 (Krumpe 1985). Facilitators were given "scripts" used to guide the groups through the following steps of this decision-making process:

1. Individuals silently generate a list of priority actions.
2. A composite list of actions is derived for the group by asking for one action from each individual in turn until all actions are listed.
3. Each action is briefly discussed to clarify meaning and intent.
4. Each individual then votes for his or her top priority actions of the group by distributing a fixed number of votes as they see fit. (In this case, each individual was given eight votes,

which could be distributed among that individual's top eight actions, all devoted to one action, or some combination thereof).

5. The group's priorities are then determined by simply summing the individual votes.

Each group selected a spokesperson. The next afternoon, all the groups that worked on the same topic were brought together. The NGT process was repeated, though step #1 was omitted and step #2 consisted of each spokesperson reporting his or her group's priorities from the previous day. All the members of each group that worked on that topic voted once again to establish the topic's priority. Topic spokespersons were selected.

The following day, the top priority actions for each of the seven topic areas were presented by the topic spokesperson to the assembled conferees. A list of these actions was then distributed in ballot form. On this ballot, attendees were not asked to decide which action was most important. Rather, they were asked to apportion time—what percentage of wilderness stewards' time should be spent on each of these topics; and within each topic, what percentage of time should be spent on each action. This was an attempt to reflect the reality of wilderness stewardship—forcing hard choices since time, as well as money, is finite. (One action may be just as important as another, but might take more time to accomplish; some important actions may be out of an individual's control.)

In addition, the ballot asked demographic questions: "Do you work for a Federal agency? If so, which one? If not, what is your primary involvement with wilderness?" etc. Respondents were also asked to identify the physiographic regions of the United States containing the wildernesses with which they were most familiar.

Results

424 people filled out usable ballots (Barns 1997). Of these, 41 professed expertise in Eastern Wilderness by claiming extensive knowledge of one or more wilderness areas located in a physiographic region that lies -- wholly or in part -- east of the Mississippi River in the continental United States, Puerto Rico, or the Virgin Islands.

To the nearest whole percent, voters apportioned time among the seven topics as follows. The percentage for the "Eastern knowledgeables" appears first, followed by the percentage voted by the conference as a whole in parentheses:

- •Natural & Biological Policy 15% (18%)
- •Administrative Policy 11% (11%)
- •Interagency / Intergroup Cooperation 10%
- •Management of Non-Recreation Resources 13% (14%)
- •Recreation Management 13% (13%)
- •Education & Training of Agency Personnel 14% (13%)
- •Education of the Public 24% (20%)

Below is a list of the actions for each topic as developed and worded by the conference attendees. Within each topic, the actions are listed in the priority given to them by those who worked on that particular topic. Following each action is the percent of each topic's time that the "eastern knowledgeables" voted to spend on that action, followed by how the conference attendees as a whole voted.

Natural and Biological Policy

A. Acquire legal authority and funding to aggressively purchase & retire non–conforming uses. 30% (26%)

B. Establish a natural interagency group to develop & implement a wilderness health monitoring system. 13% (16%)

C. Translate the definition of naturalness for each wilderness into management goals/desired future conditions statements. 14% (12%)

D. Restore the natural process of fire in ecosystems by creating prescribed fire plans both natural and management ignited. 19% (21%)

E. Establish exchange programs with our international counterparts at the technical, professional & management levels to spread the ideals of wilderness, & internationally to preserve biodiversity. 7% (7%)

F. Acquire areas and develop proposals for acquiring areas that contain unrepresented ecosystems to be included under the NWPS. 15% (16%)

Administrative Policy

A. Convene interagency panel to review existing wilderness management policy and guidelines and to recommend uniformity. 14% (17%)

B. Have NBS assist in developing standards for biological resources that all agencies can use for monitoring. From this, develop data analysis systems that are easy to implement and understand. 17% (17%)

C. Establish positions with "wilderness" in the title at all agency levels and develop career ladders for those positions. 19% (18%)

D. Restructure the budget process to emphasize wilderness management. 19% (20%)

E. Work to amend or revise the executive order regarding the Federal Advisory Committee Act. 12% (14%)

F. Mandatory wilderness management performance elements for managers. 18% (13%)

Interagency / Intergroup Cooperation

A. Establish and empower a formal National level interagency group. 17% (19%)

B. Establish federal interagency (including tribal) workgroups at the local level. 21% (20%)

C. Establish a federal interagency (including tribal) work group at the bio-regional level. 17% (18%)

D. Establish a uniform State of the Wilderness report for land management agencies to report to Congress and include agency wilderness needs. 23% (19%)

E. Standardize positions descriptions and evaluations for wilderness managers and create an Office of Personnel Management wilderness management series with accreditation requirements. 20% (23%)

Management of Non-Recreation Resources

A. Implement exotic plant management which includes prevention, detection, and quick control of spot infestations as well as public education. 17% (21%)

B. Develop public education programs (i.e. media campaigns) to stimulate acceptance of natural processes, the management ignition of prescribed fire, and to recognize and promote non-recreational values of wilderness. 20% (19%)

C. Develop a comprehensive monitoring program which utilizes measurable objectives to assess impacts within wilderness areas as well as outside threats. 17% (15%)

D. Educate wilderness managers, resource specialists, non-recreation users and any other affected/interested parties about wilderness management philosophy, policy, and objectives. 10% (12%)

E. Evaluate existing data, assess and identify needs, and establish methods and guidelines for inventory and monitoring of non-recreation wilderness values on an interagency basis for bio-geographical areas. 11% (10%)

F. Research, develop, and implement interagency GIS. 7% (7%)

G. Complete both prescribed natural fire and minimum impact fire suppression plans by the year 2000. 12% (10%)

H. Develop wilderness personnel exchange program between agencies. 5% (6%)

Recreation Management

A. Continue to fund field based work force. 35% (30%)

B. Establish national public electronic network to provide better pre-trip information both inside and outside of wilderness. 9% (11%)

C. Leave No Trace training for all commercial users and require teaching of wilderness ethics to their clients. 15% (16%)

D. Develop fee legislation where fees are returned to wilderness management programs. 11% (15%)

E. Establish a national interagency action plan for agency-outfitter relationship. 6% (6%)

F. Develop consistent strategies between agencies to address new user groups and technologies, and non-traditional users. 7% (9%)

G. Link interpretation of heritage/cultural resources to wilderness values. 8% (7%)

H. Develop, identify and distribute information on new recreation management tools and techniques (e.g., conflict resolution models, experience time slot systems). 5% (6%)

Education & Training of Agency Personnel

A. Have a liaison/point of contact and adequate representation from USFS, BLM, NPS, FWS at Carhart Training Center and Aldo Leopold Institute with direct link to other national training centers. 17% (16%)

B. Develop a formalized interagency training program and budget to implement for all levels of personnel including seasonals and volunteers. 14% (17%)

C. Identify specific wilderness training needs and awareness of what training is currently available between agencies. 9% (8%)

D. Incorporate wilderness training which includes wilderness values in existing training for ecosystem management and for functions such as fire, natural resources, cultural resources, orientations, etc. 13% (17%)

E. Expand line officer training to include mid-level staff, specialists, and others affected by and/or involved in decision-making that affects wilderness. 13% (13%)

F. Retain trained seasonals to educate

others and maintain continuity of expertise. 17% (15%)

G. Need to get different agencies (microregions) to focus on a vision and strategy to achieve the vision for education and training. 7% (6%)

H. Provide more accessible interagency information sources (for example: Internet, electronic publication of abstracts of current wilderness research, BBS). 7% (7%)

Education of the Public

A. Develop a coordinated national strategy to address nationwide wilderness education including interagency & external organizations, the public and media. 23% (22%)

B. Identify strategies appropriate to diverse audiences (e.g., cultural, rural, urban and non-traditional groups). 11% (15%)

C. Take front desk personnel to the wilderness. 7% (9%)

D. Establish and fill permanent interagency positions for wilderness information and education specialists by Jan. 1, 1997 for wilderness units. 11% (9%)

E. Develop consistent wilderness curriculum which includes the role of wilderness within the larger landscape and incorporate into the larger process of ecological education. 14% (15%)

F. Use a national clearinghouse organization to identify or recruit funding partnerships for ecological education from the private sector. 7% (7%)

G. Work with national environmental education organizations to add wilderness education to grades K through 12. 19% (17%)

H. Utilize private sector marketing expertise and techniques to identify and test message effectiveness. 5% (6%)

It should be remembered that these figures represent the average of respondents' priorities. Individually, there was great variation in assigning percentages of effort that should be spent on any given item. For the most part, this can be attributed to the differences in the problems facing the varied units in the National Wilderness Preservation System. In addition, a few individuals opted to emphasize only one action or heavily weighted what may be assumed to be their specialty. Rather than representing what they felt was a realistic or absolutely appropriate balance of our efforts, these respondents may have skewed their one ballot hoping to gain a little more weight for their under-appreciated speciality. It is likely these biases canceled each other out in the aggregate.

Eastern *vs.* System-wide Comparison of the Highest Priority Actions

It is possible, by multiplying the percentage voted to each topic by the percentage voted for each action within that topic, to produce a ranked list of all the top actions proposed. While this slightly undervalues the topics with more actions in them, the results are nonetheless telling. The top seven actions for the conference attendees as a whole are:

1. Acquire legal authority and funding to aggressively purchase and retire non-conforming uses.
2. Develop and commit to a coordinated national strategy to address nationwide wilderness education including interagency & external organizations, the public, and media.
3. Continue to fund field-based work force.
4. Restore the natural process of fire in ecosystems by creating prescribed fire plans, both natural and management-ignited.
5. Work with national environmental organizations to add wilderness education to grades K through 12.
6. Identify strategies appropriate to diverse audiences (such as cultural, rural, urban, and non-traditional groups).
7. Develop a consistent wilderness curriculum which includes the role of wilderness within the larger landscape and incorporate into the larger process of ecological education.

Of these top seven actions, numbers one and four directly address issues concerned with management of the natural and biophysical values of wilderness, rather than the recreational and social values of wilderness (which are not represented in the top seven actions). This reflects the trend of increasing concern over issues reported by Barns and Krumpe (1995).

In addition, actions two, five, six, and seven all concerned wilderness education. In the past, the main thrust of wilderness education has been toward Leave No Trace or other programs geared toward on-site recreationists. The top actions here indicate there is a growing awareness that wilderness education needs to be concerned with the values to society as a whole and be directed at a much more diverse audience.

The remaining of the top seven actions, "Continue to fund field-based work force," is one possible response to the number five issue

reported overall prior to the conference (Barns and Krumpe 1995): "Lack of understanding or commitment by agency hierarchy."

These top seven actions generated from the ballots of the conference attendees as a whole are also the top seven according to those professing extensive knowledge of Eastern wildernesses. However, the order is significantly different:

1. Develop and commit to a coordinated national strategy to address nationwide wilderness education including interagency & external organizations, the public, and media.
2. Work with national environmental organizations to add wilderness education to grades K through 12.
3. Continue to fund field-based work force.
4. Acquire legal authority and funding to aggressively purchase and retire non-conforming uses.
5. Develop a consistent wilderness curriculum which includes the role of wilderness within the larger landscape and incorporate into the larger process of ecological education.
6. Restore the natural process of fire in ecosystems by creating prescribed fire plans, both natural and management-ignited.
7. Identify strategies appropriate to diverse audiences (such as cultural, rural, urban, and non-traditional groups).

In addition to the changes evident by comparing the two lists of the top seven actions, the portion of time that should be devoted to "National strategy for wilderness education" increased by a quarter to well over 5% of the total time to be spent on improving wilderness stewardship. "K-12 education" had a similar increase in the percentage of time that should be devoted to it. And the 8th most important action to Eastern Wilderness experts was "Establish and fill permanent interagency wilderness information and education specialists." This action was rated 30th by the conference attendees.

Clearly, education of the public is seen as much more important to those familiar with Eastern Wilderness than the System as a whole. The percentage of effort devoted to Education of the Public increased to 24% from 20%. But time is finite. If more is spent on public education, on what will be spent less? For Eastern Wilderness experts in Santa Fe, it appeared to be the management of non-recreation resources.

The #1 action overall, "Retiring nonconforming uses," slipped to #4 in the East. "Restoring the natural process of fire dropped from 4th to 6th, and the portion of time that should be devoted to it decreased by 25%. The 9th overall action, "Establish an interagency natural group to develop and implement a wilderness health monitoring system" dropped to 24th in the East, and the portion of time that should be devoted to it decreased by one third.

Why these differences between Eastern Wilderness experts and those of the System as a whole? Perhaps education of the public is seen as more important because there are so many more people in the East. Perhaps the management of non-recreation resources is not so critically in need of help because, for instance, Eastern Wildernesses may have fewer grazing permits, mineral leases, or other nonconforming uses. Perhaps fire has not become so removed from the natural ecosystems of the East because fire suppression has been kept up by Mother Nature's rains rather than by short-sighted, though well-meaning humans.

A Wilderness Strategic Plan

As an out-growth of these planning groups in Santa Fe, the four wilderness-managing agencies resolved to develop a *Wilderness Strategic Plan* to focus wilderness stewardship for the next several years.

The *Wilderness Strategic Plan* contains 33 actions grouped into five broad topics. No priority is implied in the organization of the *Plan*'s list of actions. It is expected that some of these actions may be more important than others to a given agency. As has been demonstrated above, there are regional differences. Certainly there will be differences in needs between individual units in the National Wilderness Preservation System. Indeed, they may vary between neighboring wildernesses. The *Wilderness Strategic Plan* assumes that the managers closest to the ground will know best what is needed to improve the stewardship of their particular unit. At some level, and in some area, each of the actions will be important. And, as the introduction to the *Strategic Plan* states, "our commitment to progress in each of these areas is unequivocal. America's 'enduring resource of wilderness' is too important for anything less."

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Naturalness and Natural Variability: Definitions, Concepts, and Strategies for Wilderness Management

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Abstract: Wilderness managers are increasingly questioning what it is they are managing for and the benchmarks used for evaluating change in wilderness conditions. This debate is largely focused on defining what "natural" is and how it should be protected and managed. In this paper we describe the reasons for defining naturalness, briefly review current understanding about ecological integrity and variability, define naturalness and discuss the issues that must be addressed in developing such a definition, and finally we offer a strategy for setting management goals and evaluating outcomes of management actions related to naturalness. Our intent is to provide a structured framework for thinking about and making the hard decisions required to manage for naturalness: decisions on spatial and temporal scales, and on value judgments related to the issues of native people's influence and the criteria that trigger management actions in wilderness.
Keywords: Wilderness, natural areas, naturalness, ecological integrity, wilderness management, management goals, management strategy, wilderness philosophy

Over 104 million acres of land in the United States are designated as wilderness, managed for their natural character and the benefits to society that accrue from this character. When initially established, many wildernesses, especially in the eastern United States, were not pristine (Gomez-Pompa and Kaus 1992), and today all wildernesses are beset with direct and indirect threats occurring both inside and from outside the boundary of the area (Cole and Landres 1996). The need to protect wilderness conditions without fully knowing what these conditions are has led to considerable debate about the goals of wilderness management (Virden and Brooks 1991), largely centered over defining what "natural" means and how "naturalness" should be protected and managed (Maser 1990, Shrader-Frechette and McCoy 1995, Andrews 1996). This debate is increasingly leading wilderness managers to question what it is they are managing for and the benchmarks they use for evaluating change in wilderness conditions (White and Bratton 1980).

In this paper, we describe the issues that must be addressed in defining and managing for naturalness. Our goal is to provide a structured framework for the process of setting wilderness management goals from an ecological perspective. This perspective provides guidance to managers of natural areas by clarifying terms and definitions, and by providing the context to answer questions on the management of natural areas such as:

- What did this area look like before European settlement?
- What are desired future conditions for natural areas? Is it appropriate to even ask this question for natural areas, and what are the implications of asking it?
- Is there sufficient information to manage for naturalness? How can we protect natural areas if

we don't know what they are supposed to look and function like?

•How natural does an area need to be to qualify as a natural area?

We first discuss reasons for defining and managing naturalness in natural areas, then briefly review current ecological understanding about concepts of integrity and variability, offer definitions for "naturalness" and "natural variability" and discuss the requirements for these definitions, examine the barriers in defining and managing for naturalness, and close with a proposed strategy for managing for naturalness. This strategy focuses on developing goals, evaluating when ecological conditions are beyond acceptable limits, and determining when protection or restoration actions are warranted. No single strategy of managing for naturalness could cover all the issues in all locations; exceptions are the ecological rule. But if such a strategy covers many issues most of the time, then management of natural areas will improve.

REASONS FOR DEFINING AND MANAGING FOR NATURALNESS

There are at least four reasons why defining and managing for naturalness in landscapes that are under some form of protected status is either necessary or helpful.

First, wording from the Wilderness Act of 1964 (P.L. 88-577) and subsequent wilderness acts strongly implies that naturalness is the primary management goal for these areas. For example, Section 2 (c) of the Wilderness Act states that "wilderness...is hereby recognized as an area where the earth and its community of life are *untrammeled by man*...retaining its *primeval character and influence*...protected and managed so as to preserve its *natural conditions*...affected primarily by the *forces of nature*" (emphasis added).

Second, agency policies and guidelines require managers to protect and sustain natural conditions in wilderness and other natural areas. The USDA Forest Service Manual, for example, states that the agency will "[m]anage wilderness to ensure that human influence does not impede the free play of natural forces or interfere with natural successions in ecosystems..."(FSM 2320.1-2323.26b, page 6).

Third, society values natural areas for many reasons (Bengston and Xu 1996, Manning and Valliere 1996), including recreation, economics (e.g., the income earned from people who want to experience nature and from the extraction of natural resources), education and learning (e.g., to improve understanding and management of natural resources everywhere), and ethics and philosophical reasons that include stewardship responsibilities and intergenerational justice to protect and preserve what we have today for future generations.

Fourth, understanding the concept of naturalness allows managers to improve the protection of areas managed for their natural values in several ways. The concept of naturalness provides the basis for determining the goals or targets for protecting natural areas from internal and external, direct and indirect threats. Furthermore, the concept of natural variability provides improved understanding of ecosystem dynamics and change, as well as a benchmark to determine whether observed changes in conditions in an area are caused by human actions (Morgan et al. 1994). Essentially, naturalness provides a benchmark or standard for evaluating wilderness conditions and the outcomes of managing for those conditions.

While it may be desirable to define naturalness for the reasons given above, is it necessary or possible? An alternative would be not to define naturalness directly, instead defining naturalness indirectly as the inverse of known threats, i.e., the greater the number of threats in an area, which are relatively easy to quantify, the lower its naturalness. For example, an area affected by regional air pollution, grazing, and fire exclusion would be less natural than an area affected only by regional air pollution. This indirect definition is analogous to defining human "health" as the absence of disease, and suffers from the same basic problem: the lack of a target that serves as a forward-looking goal and as a benchmark for evaluating change. Referring again to the human analogy, without a benchmark "normal" temperature, it is impossible to diagnose a fever, especially in its early stages. In addition, it has been argued that since there are no pristine environments today, it is impossible to define naturalness or natural variability. These concepts, however, are not tied to or dependent on pristine environments because their primary utility is in understanding how ecological systems that are relatively unaffected by people change in response to the anthropogenic threats of today.

Directly defining naturalness is a proactive step that, in addition to the reactive step of

identifying and reducing threat impacts, will improve natural area management by providing a target and benchmark, and by improving understanding about the ecological system.

UNDERSTANDING ECOLOGICAL SYSTEMS

In the context of managing ecological systems, the integrity of an ecological system is composed of three vital attributes that strongly interact with one another to form the present and future system: composition, structure, function. Composition is simply the components or elements (who or what) that make up the ecosystem. For example, species, habitat types, or landscape features are all components. Structure is the spatial arrangement or pattern that the components are arrayed in. Individuals of a species, for example, may be aggregated (such as flocking birds) or widely dispersed (such as many medium-sized or large carnivores). Habitats may be spread relatively uniformly over a landscape, or may be tightly clustered around certain features of a landscape. And function refers to processes that result from the interaction of different components (such as predation, decomposition, or nutrient turnover in soil) or disturbances such as fire, insect outbreaks, windstorms, or floods.

Each of these three attributes of ecological systems exhibit spatial and temporal change, or variability (Sprugel 1991, Landres 1992). Virtually all ecological systems, no matter how large or small, exhibit spatial and temporal variability. Spatial and temporal variation is caused by differences in site conditions (e.g., geological substrate, elevation, slope, aspect, lee or windward exposure), disturbance events, and ecological processes such as succession and dispersal. Ecological variability is quantified with different types of descriptors, including central tendency (e.g., mean, median), dispersion (range, standard deviation, coefficient of variation, variance, kurtosis) "spikes" or relatively short-term, high-magnitude changes in ecological conditions, and "trends" or relatively long-term, low magnitude, directional changes in ecological conditions. Spikes and trends are described by the magnitude and timing of change (e.g., seasonality). Other descriptors for spikes include size class distribution (how big they are), frequency distribution (how often they occur), and persistence (how long they last).

All descriptors of ecological integrity and variability are scale dependent, that is, they yield different results depending on how big an area and how long a time is examined. For example, the number of species of any taxon varies with sampling area and time: a larger area sampled, or longer time frame sampled, will yield a greater number of species and greater variability. Given the complexity of ecological systems and scale dependence of descriptors, no single metric, such as range (the difference between maximum and minimum), will ever adequately describe ecological integrity and variability. In addition, understanding past conditions and their variability beyond photo or written records requires paleoreconstructions derived typically from tree-rings or pollen from lake or bog sediments. Inferring past conditions and predicting future ones, however, is problematic because the further away from the present the greater the variability and the lower the confidence or certainty of the estimates. Reasons for this greater variability include: (1) fewer data further back in time for deriving estimates, and no real data forward in time; (2) lower assessment accuracy further back in time, and no assessment accuracy forward in time; and (3) increasing probability of encountering rare or unknown events and circumstances with greater amounts of time, either in the past or in the future.

Management Implications

These ecological considerations lead directly to several management implications which are vital in defining and managing for naturalness.

- Managing entire ecological systems, by definition the goal for many protected areas, entails larger spatial and longer temporal scales. At these larger and longer scales, the system is more variable, complex, and dynamic, and our knowledge-base is less than for specific components of an ecological system.
- Change is constant, although it may be at larger spatial and longer temporal scales that humans cannot directly sense (Landres 1992). There is no "balance of nature" and managing ecological systems will always entail substantial uncertainty and surprise, which managers must learn to expect.
- No single point or period of time, such as pre-European settlement, is valid to use as the benchmark for management goals because it offers only a single image of conditions in a dynamic system.

- Management goals should be based on inferences derived from all historical information. For many areas this would likely encompass a period of about 200 years in which photos, written histories, and tree-ring reconstructions are available.

DEFINING NATURALNESS AND NATURAL VARIABILITY

Naturalness may be defined as the compositions, structures, and functions within an area that are unaffected by contemporary (roughly from the time of European settlement on) anthropogenic influences. The definition of naturalness requires explicit spatial bounds, temporal bounds, and value judgments. Spatial bounds define the size and location of the assessment area boundaries. Likewise, temporal bounds define how far back in time ecological understanding is sought, and how far forward in time this understanding will be extrapolated. Management goals initially drive decisions about which ecological attributes are of interest, and these attributes in turn drive decisions about the spatial and temporal scales used in the assessment. The relevant time period is also affected by how far back in time there is sufficient information for understanding the relatively unperturbed dynamics of the ecological system. Assessments need to go back in time only to the point at which most of the system dynamics are captured; too far back in time, relevance is lost because the set of conditions (e.g., weather, species composition, or disturbance regime) is too different from what occurs today.

Value judgments influence which components, structures, and functions are considered in defining naturalness, and these values differ depending on the knowledge, attitudes, and beliefs of the people making these judgments. In short, values occur within a cultural context and change over time. In addition, there will likely be insufficient information about some attributes that might need to be included in assessing naturalness, requiring judgments and opinions about these attributes.

Only by making value judgments explicit can their influence on definitions, assessments, and decision-making be recognized and debated (Bazerman 1986). In the definition of naturalness offered above, several value judgments were made. First, protecting naturalness is a worthy management goal. Second, disturbance by native peoples prior to European settlement is considered part of the natural milieu because: (a) in some cases the relative impact of native peoples was minimal because of low population density and patchy distribution, and they had relatively primitive technologies; and (b) in those cases where the impact of native peoples was great, such as from intensive agriculture or the use of fire, the environmental change wrought in the past strongly influenced the ecological systems we see today. The third value judgment is that all contemporary anthropogenic impacts, either direct or indirect, compromise naturalness. Past disturbances such as from logging, mining, or biological invasions cannot be undone; however, by restoring aspects of native compositions, structures, and functions, these areas can be restored to more natural conditions. And even though all contemporary anthropogenic impacts are deemed here to compromise naturalness, socio-political criteria may strongly influence the acceptability of some impacts, for example from grazing, subsistence living, or hunting.

There will never be an absolute definition of naturalness because the definition is context-, scale-, and value-dependent. For example, there is much debate and consternation about whether impacts from native peoples are natural (e.g., Hunter 1996). From a biological perspective, given occupancy times in North America of 11,000 years or more, native peoples have certainly affected the evolution of many taxa, especially from large-scale and intense impacts like fire. But native peoples did not occupy all areas nor impose intense impacts in all the areas they did occupy, so an important research need is documenting in what areas and in what ways native people exerted their influence, and the response of the ecological system to this influence. The crucial point here is that decision-makers not use a single, rigid definition of naturalness applied to all cases in all areas. Instead, decision-makers need to explicitly and openly discuss the spatial bounds, temporal bounds, and the value judgments used in deriving their definition of naturalness.

Natural variability may be defined as the natural change in the compositions, structures, and functions of an ecological system over time (temporal variability) and from one place to another (spatial variability), and the statistical description of these changes. Range of natural variability (RNV) is a phrase commonly used to

describe ecological variability, but it may be unclear if this phrase is being used to describe the statistical range or merely the general notion of variability. Morgan et al. (1994) offer several reasons why the phrase historical range of variability (HRV) is preferable to RNV. Whichever phrase is used, the time span (temporal scale) and geographic area (spatial scale) must be clearly defined. Potentially, either RNV or HRV can be misused because nearly any set of conditions may fall within the ecological variability of an area; clear-cutting, for example, has been justified on the grounds that natural disturbances (e.g., fire, volcanoes, or wind storms) have felled all the trees within an area. This view of the forest as merely its trees ignores the different ecological effects of different disturbances, and the spatial and temporal extent of those disturbances.

BARRIERS TO DEFINING AND MANAGING NATURALNESS

There are many barriers to defining and managing protected areas for naturalness. First, there is a lack of sufficient information and understanding about most natural systems, because most of the data and information are (a) qualitative (e.g., species composition or general trends) rather than quantitative; (b) from specific sites requiring extrapolation and inference to use these data for other areas; and (c) from recent times so there is little understanding of long-term ecological change.

Second, commonly used terms and concepts in policy and management, such as natural, ecological health, integrity, balance of nature, and biodiversity, are strongly influenced by cultural beliefs which may have little grounding in ecological reality, and are often vaguely defined by their users. For example, the notion of a "balance of nature" was influenced by the romantic landscape painters of the middle to late 18th Century who depicted natural areas as unchanging places of beauty, peace, and tranquility (Botkin 1990). Further, comic book characterizations of nature, the story of Bambi for example, have adversely affected most people's understanding of the role of fire in ecosystems.

Third, it may be difficult to justify the time and effort spent defining naturalness goals for an area given known threats and day-to-day emergencies that most managers encounter. In other words, developing a long-term vision is easily preempted by short-term needs. This is especially true because concepts of naturalness are still being developed; there are no off-the-shelf frameworks that can be readily adopted, requiring each area to develop their own conceptual frameworks and management applications which will be costly in resources and time. Further, there are no administrative incentives (e.g., an explicit element of a performance evaluation) for decision-makers and managers to protect and sustain naturalness. Without such incentives, natural area management will continue to focus on short-term crises. Goals related to managing for naturalness will also need to be incorporated into established agency planning frameworks.

Fourth, there has been little discussion and no resolution between two opposing philosophical views of wilderness (White and Bratton 1980, Cole 1996): is wilderness "unmanipulated" or "natural"? The management implications of these two views are very different. If wilderness must be, by definition, unmanipulated, then wilderness management is an oxymoron, manipulation is not justified and current conditions (e.g., higher densities of certain tree species caused by fire suppression or the presence of exotic plants) are accepted although not desired, and the potential adverse results of action are considered to be worse than the results of inaction. In contrast, if wilderness is natural, then wilderness management is not an oxymoron, manipulation (e.g., management-ignited fire or weed removal) is justified to correct the consequences of past and present impacts, and the potential adverse results of inaction are considered to be worse than the results of action even though our knowledge is limited.

Each of these barriers by itself is a formidable obstacle to managing protected areas for naturalness. Together, these barriers will be overcome only by first recognizing them, and then by concerted, thoughtful, and directed action.

A STRATEGY TO MANAGE FOR NATURALNESS

A logically structured strategy is proposed to manage protected areas for naturalness and natural variability (Fig. 1). The proposed strategy consists of five sequential steps: define terms and set operational bounds, determine goals and objectives, evaluate ecological conditions, determine what types and whether action will be taken, and evaluate management

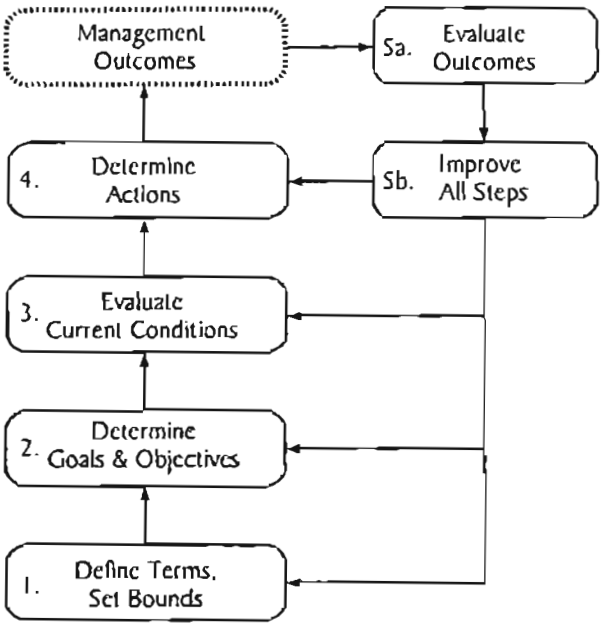

Fig. 1. A strategy to manage natural areas for naturalness. Each solid box is a distinct part of the strategy and is explained in the text.

outcomes. Each step is discussed in detail below. Two basic assumptions underlie this strategy. The first assumption is that management actions should not direct the course of natural change in wilderness ecosystems. Because the future of a natural area is not a straight-line projection of the past, a natural area manager must carefully watch the system and take only the minimal actions needed to ensure protection of these systems from anthropogenic threats. Spikes or anomalous values of various parameters define natural conditions and natural variability, and should not automatically be prevented from occurring. The second assumption is that if current conditions or disturbances are deemed unacceptable, then prudent and minimal management actions are warranted to protect or restore natural conditions.

DEFINE TERMS AND SET OPERATIONAL BOUNDS

Definitions, and their underlying assumptions, as well as value judgments need to be explicitly and clearly stated so their merits and faults can be openly discussed by stakeholders who may have different attitudes and beliefs. Further, the spatial and temporal bounds need to be set: spatial bounds for the geographic area, and temporal bounds for defining how far back in time, and how far forward in time, is appropriate for assessment purposes. The set of conditions that will be used as reference for pre-impact comparisons is derived from (a) the definitions and value judgements that establish what conditions are used; (b) the spatial bounds that establish the location and the size of the area; and (c) the temporal bounds that establish the reference time period.

DETERMINE GOALS AND OBJECTIVES

Clearly defined goals and objectives are of paramount importance. Vague goal statements such as "Our goal is to maintain and restore naturalness" or "Our goal is to manage this area for its natural values" are insufficient because it is impossible ever to know what, when, or where these goals have been accomplished or even what the trend is toward accomplishing them. To be useful in natural area management, goals and objectives must be stated in more precise and ecologically relevant terms. We suggest that three general goals may be broadly applicable to managing natural areas, and further that general types of objectives may be applied to each of these goals.

The three general goals stem from what may be considered basic tasks of protected area management (Cole and Landres 1996). The first goal is evaluation: assessing what is there and determining if there is a problem by comparing current conditions to a pre-defined reference. The second goal is protection: determining what is causing the problem and stopping it or mitigating its impacts on the valued natural attribute. Under this protection goal, action is taken on the *threat*, not on the valued attribute; for the threat of fire exclusion, for example, action is taken to stop suppressing fires. The third goal is restoration: restoring valued attributes of the system to pre-impact conditions. Under this restoration goal, action is taken on the valued ecological attribute; for the *effects* of fire suppression, for example, management-ignited prescribed fires may be used.

The objectives are based directly on protecting and sustaining the compositional, structural, and functional attributes within an area. These three attributes are combined into two general types of objectives: condition-based objectives that combine compositional and structural attributes, and process-based objectives based on functional attributes.

Because of the dependency among these attributes of ecological systems, managing for naturalness requires both types of objectives. Condition-based objectives, such as protecting native species and their distribution across the landscape, are necessary but not sufficient because they generally do not account for essential ecological processes that operate over longer temporal and larger spatial scales. Similarly, process-based objectives, such as maintaining fire regimes, are necessary but not sufficient because they generally do not account for essential ecological components and structures, nor rare elements that are mandated for protection.

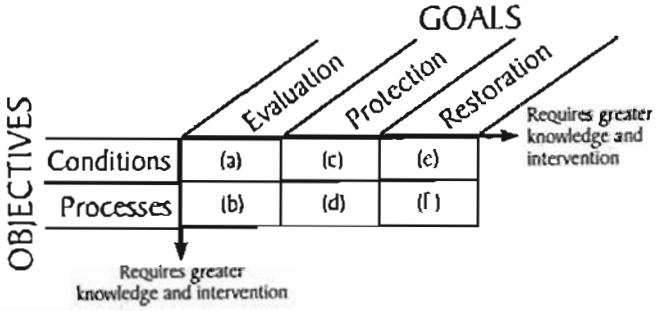

Fig. 2. A two-way matrix illustrating the interaction between goals and objectives (explained in the text) for managing natural areas. Each box of the matrix, labeled (a) through (f), is a potential set of distinct issues and questions for natural area management planning and action. The following examples illustrate the different types of issues and questions that are categorized within the matrix: (a) What is the distribution of endangered species "x" and does this distribution differ from what occurred naturally? (b) What is the current fire regime and does it differ from what occurred naturally? (c) What is causing the declines in endangered species "x" and how can these threats be reduced? (d) What is causing the changes in the fire regime and how can these threats be reduced? (e) Where and how can endangered species "x" populations be restored? (f) Where and how can the fire regime be restored?

Goals and objectives can be arrayed in a two-way matrix (Fig. 2) showing the range of issues or questions to be considered for natural area management planning and action. There will always be some issues where the difference between goals and objectives is unclear; imprecision at this stage, however, is of less concern than bringing to light all potential issues so priorities can be determined.

Moving from evaluation to restoration goals typically requires increasing levels of knowledge about an area, and increasing levels of management intervention and cost for implementing actions. Likewise, moving from condition- to process-based objectives typically will require larger areas, longer time frames, greater cost, and greater uncertainty. Thus, issues or questions in the lower right-hand portion of the matrix (restoring processes) will often be more difficult to assess, plan for, and take action on compared to issues in the upper left portion of the matrix (evaluating composition and structure).

Once the matrix is fully developed there will be too many issues to effectively deal with and priorities must be determined. Some priorities, however, will already be known, such as for threatened or endangered species. Many factors will influence these priorities, including ecological significance, management needs and constraints (e.g., available resources and policies), and concerns from politicians and special interest groups (Landres 1995).

EVALUATE ECOLOGICAL CONDITIONS

Current ecological conditions are evaluated to determine if they are within or beyond predetermined levels of acceptability. This evaluation requires defining both measurable assessment parameters and standards of acceptability. An assessment parameter is anything that is measurable and has a known relationship or linkage to an objective. For example, the amount of barren ground is a common assessment parameter of campsite condition. Likewise, species richness (the number of species in an area) is a common assessment parameter of animal communities; mean fire return interval (the average number of years between fires) is a common assessment parameter of fire regimes. The spatial and temporal bounds for each assessment parameter must be determined because different parameters operate at different scales and are accurately measured only at those scales. The degree of precision or certainty of the evaluation also needs to be defined because higher levels of precision or certainty may require different assessment parameters and will also require greater sampling effort. For example, evaluations of endangered species require very

specific assessment parameters and high levels of certainty, resulting in greater time, effort, and cost for the evaluation. Lastly, no single parameter will be sufficient to evaluate naturalness or natural variability; instead a suite of factors will be needed (Anderson 1991).

Standards of acceptability are threshold values for the assessment parameter that triggers recognition of a problem or action. In natural areas these standards must take into account the natural variability of the assessment parameter. For relatively well known parameters of condition-based objectives, these standards could be based on 80-95% confidence limits (depending on the degree of certainty required) for the mean or median attributes of the parameter (assuming a normal distribution for the parameter). Assessment parameters for most process-based objectives, however, are poorly understood. In this case, attributes of processes could be allowed to vary anywhere within the minimum and maximum values for the pre-defined time period. For example, a moving average fire return interval, or the amount of area burned, or the number of fires in an area may all be allowed to vary anywhere within the range of values known to occur for the chosen time period.

Insufficient information about ecological systems is a significant impediment to developing these standards for both condition- and process-based objectives. This lack of information requires that planners and decision-makers use all types of available information, from site-specific field data to simulations, expert opinion, and general theory, and carefully document which sources of information, along with all assumptions and value judgements, are used for what purposes.

DETERMINING THE TYPE OF ACTION

Once current conditions are compared to the standards of acceptability for the assessment parameter, decisions will be needed about the type of action that is appropriate. Because all management actions in wilderness should be taken only when necessary, a structured series of increasing levels of intervention action is proposed here. If results of the comparison are within acceptable standards, this indicates a "green light" that ecological conditions appear within predicted norms and the course of action is to continue with present monitoring. If results are close to the limits of acceptability for the assessment parameter, then the course of action would be to first review the appropriateness of the assessment parameter and standards of acceptability, second, increase the rigor of monitoring to increase precision and accuracy of the comparison, and third, develop a protection strategy to reduce the impact of the threat. This is analogous to a "yellow light" indicating that conditions appear to be close to the limits of predicted norms and that more and better scrutiny is warranted. And last, if the standards for the assessment parameter are not met, then the course of action would be first to review the appropriateness of the assessment process, second, to increase the rigor of monitoring, third, to develop a protection strategy, and fourth to develop a restoration strategy for the valued system attribute. This is analogous to a "red light" indicating that conditions are already beyond predicted norms.

If a "red light" occurs, extra caution is warranted because the observed conditions may simply be the expression of natural change (White and Bratton 1980, Swanson et al. 1994). Clearly defined goals and objectives, explicit social and ecological values, and an understanding of natural variability together influence the decision as to whether an observed change is acceptable or unacceptable. In wilderness, either of two situations suggest that observed changes are unacceptable. The first situation is when the change in conditions is human caused. There are many examples of this, such as air pollutants causing change in decomposition or production rates, or fire suppression causing change in composition and mosaic structure of forests, or recreation around a lake threatening the reproduction of an endangered species, or an introduced exotic plant threatening populations of native plants. The second situation is when the effects of natural change or disturbance threaten important social or ecological values of natural areas. Examples of this situation include natural fire threatening to burn every hectare of a small wilderness, or a small natural fire threatening the single remaining population of an endangered species, or natural succession threatening to change conditions needed by an endangered species.

DETERMINING WHEN ACTION IS APPROPRIATE—THE CENTRAL DILEMMA

If observed changes in ecological conditions

are deemed unacceptable, should action be taken? This might be called the central dilemma of wilderness management—under what set of conditions is action warranted? Potentially, the greater the difference between a goal-objective and current conditions, the greater the need and intensity of action. For example, a small reduction in vegetation within a campsite warrants the mild action of restricting access for one or two months, while a campsite completely barren of vegetation requires both protection and restoration actions that may last many years. Fire suppression-caused changes in forest composition and stand structure may warrant the intense action of management-ignited prescribed fire combined with other fuel reduction methods.

Deciding to take action, however, must be weighed against several legitimate arguments against taking action: there is only tenuous and insufficient information; there is a potential that the ecological system will develop a new, and natural, ecological trajectory; there are potential adverse impacts of any action; and last, the philosophical question of whether action is appropriate in wilderness is still unresolved. If action is taken, it should be minimal, prudent, and careful. Three steps can help ensure effective action: first take protective action against the threats; second, if necessary take minimum restoration actions on the valued natural attribute; and third, evaluate the effects or outcomes of the management action after a short period of time to make needed corrections.

EVALUATE MANAGEMENT OUTCOMES

Evaluating management outcomes is the first step of an overall improvement process for refining all parts of this strategy of managing for naturalness. An improvement or adaptive management process is especially important when attempting to manage for naturalness because our understanding about natural systems and the consequences of management actions is clearly insufficient (e.g., see Lancia et al. 1996). Even with current meager understanding, protection and restoration actions can still be taken now as long as improvement actions are structured into the management process at fairly short time intervals. Short time intervals allow correction and redirection before unforeseen adverse consequences develop or accumulate. As new experience, more and better ecological information, new legislative mandates, and new administrative policies and guidelines develop, the strategy used to manage for naturalness will also improve.

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Section 2: Preservation of Natural and Biological Values

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Wilderness and natural areas in eastern North America are subject to change in their structure and function depending on both the scale of the wilderness area and the influence of endogenous and exogenous forces. Forman and Godron (1986, p. 11) defines a landscape as a "heterogeneous land area composed of a cluster of interacting ecosystems that is repeated in form throughout." Within a landscape, there are measurable and recognizable spatially repetitive clusters of interacting ecosystems, geomorphology and disturbance regimes. The discipline of landscape ecology focuses on the three characteristics of a landscape (Forman and Godron 1986):

1. structure, the spatial relationships among the distinctive ecosystems or "elements" present—more specifically, the distribution of energy, materials, and species in relation to the sizes, shapes, numbers, kinds, and configurations of the ecosystems.
2. function, the interactions among the spatial elements, that is, the flows of energy, materials, and species among the component ecosystems.
3. Change, the alteration in the structure and function of the ecological mosaic over time.

Despite extreme differences, all landscapes share a common fundamental structure. They are composed entirely of patches, corridors, and a background matrix. Landscapes are influenced both by natural processes and human influences; these landscapes reflect four pervasive natural processes: geomorphology, interacting strongly with climate; plant and animal establishment and speciation; soil development and disturbance. Humans generally increase landscape heterogeneity by modifying the rhythms of natural disturbance, diversifying the tools of landscape modification through increasing human aggregation and built-up environments; the development of politics; and the input of fossil fuel energy. Human influence leads to distinctive patterns of changes in patches, corridors and matrix.

Landscapes may not be in a state of equilibria, depending largely on the amount of potential energy or biomass, the level of resistance to the disturbance, and the ability to recover from disturbance. Managers strive for and contribute to landscape heterogeneity, wanting an optimum balance for high resistance to disturbance, biotic diversity, low maintenance energy required, and high harvest yield.

Within the wilderness and natural areas examined in the context of these papers, we find that Pittillo sets the stage with the geologic and vegetational history of the southern Appalachians. Beginning with the geomorphology, he follows with vegetational change and interpretation of vegetational diversity. Geologically, the area is defined as the southern section of the Blue Ridge Province. The vegetational change patterns presented include patterns within a human lifetime back in time to the Tertiary and Triassic Periods.

Billings examines the impact of southern pine beetle outbreaks on Texas wilderness and adjacent private lands. Billings traces the establishment of five wilderness areas, totaling 37,000 acres, in the National Forests in Texas. By 1993, less than 10 years after wilderness status was designated, the southern pine beetle, *Dendroctonus frontalis* Zimmermann, had decimated nearly 40 percent of the mature pine overstory. Smith and Nettleton, hazard rating the area for the southern pine beetle at the time of wilderness designation, concluded "the areas chosen for wilderness attributes are also areas where the SPB can be expected to cause extensive losses. More importantly these areas will continue

to provide highly susceptible host type for the SPB during epidemic periods...managers will have to continue to weigh the importance of undisturbed wilderness against the economic losses that will be suffered by adjoining landowners during SPB outbreaks." This was born out in the paper by Billings. Coulson (1986) recommends "the application of carefully selected management practices may provide a way of dampening the effects of the disturbance regime and thereby allow certain desirable wilderness attributes of the landscape to exist. A prior analysis of the structure, function and potential change of the vegetation on a landscape level is essential in selection of a wilderness area if catastrophic changes to the biomass are to be avoided."

Kulhavy and Ross provide a case history of the southern pine beetle outbreak in the Kisatchie Hills Wilderness area followed by fire. This outbreak mirrors the outbreak in the Four Notch Further Planning area in eastern Texas (Billings and Varner 1986). Within this area, 3736 acres were infested by the southern pine beetle and efforts to control it. Eventually the area was excluded from wilderness consideration. A further review of bark beetles in wilderness is provided.

Oak presents case studies relevant to the Southern Appalachian Mountains and the Great Smoky Mountains National Park, including oak decline, European gypsy moth, southern pine beetle, and beech bark disease. Oak stresses the importance of understanding the role of past and present disturbances in shaping the composition and structure of today's forest. This promotes the need for understanding the landscape and the landscape processes promulgated by Forman and Godron (1986) and expanded on by Forman (1995).

Kinard promotes the ideas of set-aside areas in South Carolina as part of the Society of American Foresters role in natural resource conservation. These set-aside areas include examples of biodiversity and expound on the Biotic Diversity Principle of Forman and Godron (1986) where "Landscape heterogeneity decreases the abundance of rare interior species, increases the abundance of edge species,...and enhances the potential total species coexistence."

Cook promotes the concept of a pseudo-wilderness with expanded concepts for use and sustainability. These areas may be any size, but small areas may be easier to designate and maintain. Tracy, Key and Williams examine functional wetlands and provide guidelines for their use. Nowacki and Abrams examined forest stands along an edapho-vegetational gradient composed of *Tsuga-Betula* on wet stream bottoms of the Alan Seeger Natural Area. Oswald and Green classified landtype and vegetative classification of the Sipsey Wilderness, Alabama. Walker, Brantley and Burkett characterized old-growth bottomland hardwood wetland forests in the Harrison Bayou of northeastern Texas.

Forman states "It is unethical to consider an area in isolation from its surroundings or for its development over time. Landscape ecology can play a key catalytic role in decreasing the gulf between government and economic actions and the demands of the land ethic." This concept can be applied to the preservation of natural and biological values in the research, management and planning of wilderness and natural areas in Eastern North America.

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Geologic and Vegetational History of the Southern Appalachians

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Abstract: The southern Appalachian Mountains is here defined as the southern Blue Ridge Province. These mountains originated as a tropical ancestral mass, Laurentia, that subsequently collided with Africa and was shoved as a thin crust up over the North American continent over 300 million years before present. From this time the North American continent has moved northwesterly to its present position, developing considerable vegetational variation as a product of influx of both tropical and northern species. Short-term changes in vegetation can be observed in a human life-time but the past changes through the glacial periods and back to the tropical climates of the early vegetation origin present a much more varied concept. Interpretation of these vegetational pattern changes can best be obtained from sediment histories preserved in depressions such as the southern Appalachian bogs. Some of the early geologic events and interacting vegetational changes are described in this paper.
Keywords: geologic history, physiography, southern Blue Ridge Province, southern Appalachians, vegetational history, glacial periods, plate tectonics, continental drift, Flat Laurel Gap, Craggy Gardens, tropical relicts, glacial relicts

BRIEF GEOLOGIC HISTORY

INTRODUCTION

In this paper the southern Appalachians are narrowly defined as the southern Blue Ridge Province. This southern section of the Blue Ridge Province was initially defined by Fenneman (1938) with the Roanoke River dividing it from the northern section and this physiographic definition has generally been followed by other physiographers for the past several decades (Hunt 1974, pp. 253-263). The geologic formations that underlie the Blue Ridge Province are primarily metamorphic with some igneous intrusions while those to the west underlying the Ridge and Valley Province are sedimentary rocks. To the east, the Piedmont Province is underlain by metamorphic and igneous rocks very similar to those of the Blue Ridge.

The rocks of the Blue Ridge Province may be divided into two main groups, the sillimanites and kayanites. The sillimanites, with gneisses, schists, and granitic gneisses, are as much as 1-1.2 billion years old (Hadley and Nelson 1971, Stuckey and Conrad 1958). Scattered among these rocks are complex ultramafic lenses, usually dunite or amphibolite. The second group, kayanites, are found along the western edge of the province and are comprised of metasedimentary rocks of quite a different appearance than the older and more altered sillimanites.

Brief Early Geologic History

Geologists have long thought that uplift was responsible for the higher mountain terrain in the Blue Ridge Province (Hack 1982). The process by which this came about has been debated for some time with earlier geologists recognizing an older surface, called a peneplain, that was believed to be upthrusted more or less intact, but later theorists suggested there was a more complex series of events leading to the existing landforms. Hatcher and Goldberg (1991) and Horton and Zullo (1991) explained the complicated process starting with the ancestral continental mass, Laurentia, that eventually developed as North America. Rifting and spreading of the North American and African tectonic plates resulted in three oceanic basins separating the two continents with subsequent compression of the two plates producing a

second fusion of the two continents, forming the supercontinent Pangaea. A small continental unit Hatcher and Goldberg call the Piedmont Terrain, and an island arc, the Western Avalonian Arc, were subsequently shoved into the North American continent and thrust upon it during this compression. This was Hatcher and Zietz's (1978) thin-skinned model that resulted in considerable folding of the Ridge and Valley Province to the west, and distortion of the small continent and island arc rocks as the overthrust sheets which were shoved northwestward over the North American continent. Supporting this concept are seismic readings taken across the region that indicate a change in geologic structures from 5,000 to 10,000 feet beneath the Blue Ridge Province surface and representing sedimentary rocks similar to those of the Ridge and Valley of the North American continent.

Physiographers now describe the various ranges and cross ranges of the Blue Ridge Province according to the contiguous nature of the major mountain masses and the valleys that separate them. Hack (1982) noted that the valleys constitute trenches or basins separated by the major ridges. Fig. 1 represents a compilation of the various ridges that make up the southern section of the Blue Ridge Province with the eastern continuous range, the Blue Ridge, extending from northern Georgia where it wraps around the southern terminus of the province and continues northeastward into South Carolina, North Carolina and into Virginia where it ends just south of Pennsylvania as a narrow band of less than 20 miles, the Virginia portion making up the northern section of the Blue Ridge Province. Along the western margin of the province, the Unicoi, Great Smoky, Newfound, Bald, Unaka, Stone, and Virginia Balsams comprise the ranges opposite and parallel to the Blue Ridge. Cross ranges include the Nantahala, Cowee, Balsam, Craggy, Black and other minor ranges through the wider southern section of the province.

The origins of the Blue Ridge Province began south of the equator around a billion years ago. They were drifting northeastward until the collision with Africa and then were pushed northwesterly. Early South and North America were not connected but around 5 million years ago the Isthmus of Panama joined the North American and South American continents. This resulted in a major change of ocean currents with warm waters of the Gulf Current being forced northeastward toward northern Europe instead of the former movement into the Pacific Ocean. This caused a considerable modification of weather patterns and precipitated the ice ages that have alternated about every 100,000 years with warmer interglacial periods during the past 2.5 million years. The North American plate continues its northwestward movement today as the climatic pattern continues toward the end of the present interglacial cycle.

VEGETATIONAL CHANGE

Vegetational pattern changes are recognized within human lifetimes. Trees get larger and fallow fields become forests, but sometimes it is harder to realize the vegetation across the face of the earth is constantly changing. For example, National Park Service personnel are asked why the rhododendrons of Craggy Gardens seem less colorful in a given year than in years past, if forests were taking over the heath balds. If we examine the past century, some of this change will be more clearly understood.

Craggy Gardens

A photograph taken in 1915 (Fig. 2a) by photographer William A. Barnhill, is duplicated in 1977 (62 years later, Fig. 2b) as a matched pair. The common use of the high mountain meadows by a herdsman is illustrated by the grazing sheep. The trees in the foreground are buckeye (*Aesculus flava* Solander) and the rounded and scattered shrubs catawba rhododendron (*Rhododendron catawbiense* Michx.). Craggy Pinnacle also had a smoother texture, suggesting grasses and forbs, compared to the rougher textured recent photo with low bushes of blueberry (*Vaccinium corymbosum* L.) and other shrubs. Glacial relict plants that still occur on Craggy Pinnacle include spreading avens (*Geum radiatum* Michx.), deerhair bulrush (*Scirpus cespitosus* L.), Appalachian club moss (*Huperzia appalachiana* Beitel & Mikel), and single-flower rush (*Juncus trifidus* L.). In the 1977 photo (Fig. 2b at center) the visitor's center is seen in the gap and the tunnel that cuts through the ridge is the black circle above and to the left. Craggy Dome, the peak to the right, also supports a glacial relict population of the big tooth aspen (*Populus grandidentata* Michx., Fig. 3). In the matched photo pair of the heath on the shoulder of Craggy Pinnacle (Figures 4a and 4b), closure of the shrub canopy and exclusion of the smooth-textured

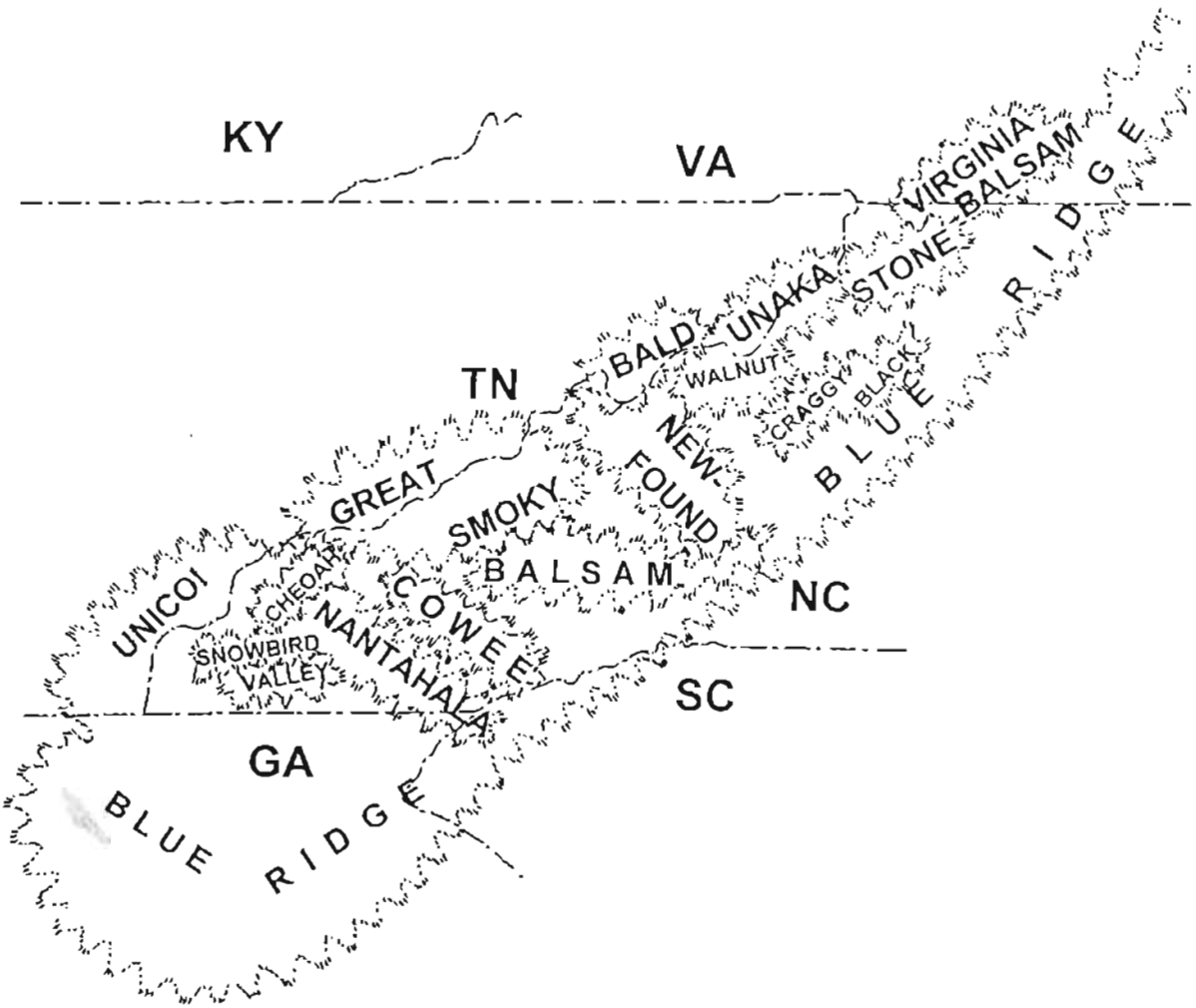

Fig. 1. Ranges of the Southern Blue Ridge Province. Range and minor range names are derived from 7.5 minute topographic maps of the area.

grassy glade is evident between 1965 (4a) and 1977 (4b). The relative expansion of both *Vaccinium corymbosum* (darker, lower shrubs in the upper portion of the left glade) and *Rhododendron catawbiense* is seen even though the focal length of the lens and the seasons of the two photos differ.

Flat Laurel Gap

At an elevation of 4,800 feet south of Mt. Pisgah (Fig. 5a) on the Blue Ridge Parkway, is a relatively level wetland site known as Flat Laurel Gap, named because of its extensive rhododendron and mountain laurel heath. It occupies the center of Pisgah Ridge, a northeast extension of the Great or Richland Balsam Mountains southwest of Asheville, North Carolina. In 1983 a team of paleoecologists, Drs. Paul and Hazel Delcourt and David Shafer of the Center of Quaternary Studies at The University of Tennessee (Fig. 5b) and Dr. Dan Pittillo of Western Carolina University, conducted a study of Flat Laurel Gap. The objective was to determine if the site would yield information of the vegetational history during full glacial period. It was hypothesized that the area would be dominated by tundra vegetation 18,000 years before present (ybp). The oldest sediment of the site was estimated to be around 12,500 ybp (Shafer 1984, 1986, 1988). The data indicated that around 12,000 ybp the permafrost melted and an ocre-colored silt was deposited in the basin. Sometime between 12,500 and 10,000 ybp, rapid warming and deluges of rain caused considerable mass wasting of the slopes. A debris avalanche around 7,400 ybp blocked drainage from the basin, but the deposits were eroded and lost

Fig. 2a. Craggy Pinnacle (left) and Craggy Dome (right horizon) photographed by William A. Barnhill in 1915 (Smathers 1982). Trees in photograph are buckeye (*Aesculus flava*) and shrubs are blooming purple rhododendron (*Rhododendron catawbiense*). Note smoother texture on ridge of Craggy Pinnacle.

Fig. 2b. Approximate same location as in "a" with larger shrubs, more branched buckeye, and shrubby texture of Craggy Pinnacle ridge. Note tunnel of parkway (middle) with visitor center building below.

from the site between 7,000 and 3,000 ybp. From 3,000 ybp and continuing today, the basin has been dominated by heath including most of today's species: *Rhododendron catawbiense* and *R. maximum* L., *Kalmia latifolia* L., *Vaccinium corymbosum*, etc. Some species left pollen or fossil records, but have been subsequently extirpated, such as leatherleaf, *Chamaedaphne calyculata* (L.) Moench and bog rosemary, *Andromeda polifolia* L. In the late 1800's there was a loss of fraser fir, *Abies fraseri* (Pursh) Poir. but it was subsequently replanted in the site about 50 years ago. In 1930's the chestnut [*Castanea dentata* (Marsh.) Borkh] disappeared.

Today, the Flat Laurel basin is within a campground built on the north and south sides and flanked by the Pisgah Inn and Blue RidgeParkway to the east. Recently, another

Fig. 3. Smooth-barked bigtooth aspen (*Populus grandidentata*) of ridge of Pinnacle Dome (center to right).

Fig. 4a. Ridge northwest of Craggy Pinnacle. June, 1965, 50 mm lens. Note lowest shrubs are blueberry (*Vaccinium corymbosum*) and numerous blooms on purple rhododendron (*Rhododendron catawbiense*). Medium size trees are blooming mountain ash (*Sorbus americana* Marsh).

Fig. 4b. Same as "a" but photographed October, 1977 with a 55 mm lens. Grass appears lighter colored and most mountain ash have shed their leaves; one at lower center is in fruit.

glacial relict species, dwarf moonwort (*Botrychium simplex* E. Hitchc.) was discovered in the grassy road shoulder at the overlook north of the site. The Flat Laurel Gap

Fig. 5a. Flat Laurel Gap heath flat with red spruce at border (*Picea rubens* Sarg., upper center). Mount Pisgah is at center horizon.

Fig. 5b. Paleoecologic team at sample site of Flat Laurel Gap. Paul Delcourt, David Shafer, and Hazel Delcourt (left to right). Sedge dominates central area and heath surrounds the site.

paleoecological site can be seen today, for the most part, intact with only minor impact from wash surrounding the basin flats.

Recent Vegetational History: The Quaternary Period

Much of the understanding of geologic history and vegetational change during the past 50,000 years has occurred during the past two decades. Paleoecologists (Delcourt and Delcourt 1981) have generally been able to piece together the patterns of vegetational history from extensive corings of old lakes and bogs throughout the East (Fig. 6A). Remnants of spores, pollen grains, pre-fossils, animal remains, and debris provide the data from which past events can be reconstructed. Palynologists usually identify 300 grains of pollen, sorting the counts by groups of species (or families for some groups) and obtain an estimate of the forest trees present for a given time period. This sample, related to a series of sites across a landscape, enables production of vegetation maps for the region back 40,000 or 50,000 years. In this fashion, Delcourt and Delcourt (1981) constructed the vegetational history for the eastern United States (Fig. 6A-F).

The vegetational patterns for the southern Blue Ridge Province has changed little during the past 200 years (Fig. 6F). There have been changes, such as the loss of the chestnut (*Castanea dentata*), that have affected the compositional pattern, but the overall presence of deciduous oak forests have dominated the region throughout this period of intense forest manipulation by humans. On the other hand, at 10,000 ybp a more notable difference in the vegetational patterns can be seen (Fig. 6D). At that time, the climate was warming with the melting of the remaining continental glacial masses in central Canada. In the southern Blue Ridge, a more mesic forest composed of species characteristic of the regional valleys or coves predominated. A much different vegetational pattern occurred between 14,000 and 18,000 ybp (Fig. 6C). At full glacial, 18,000 ybp (Fig. 6B), the region was dominated by spruce (*Picea rubens* Sarg.) and northern pines (*Pinus banksiana* Lamb.) primarily. There was probably an extensive treeless tundra zone at higher elevations at this time (Fig. 6B-D.). While high elevation wetlands above 4500 ft. (southern bogs) have not yielded pollen profiles back beyond 12,000 years, debris avalanches and other features suggest that there has been considerable change in the vegetation during the time. The loss of the sediments of the full-glacial is probably best explained by heavy rains that followed the breakup of the last glacial advance.

Past Vegetational History: Tertiary to Triassic Periods

The glacial cycles extended through the Quaternary Period from about 2.5 million ybp to present. This period has been marked with progressively greater magnitudes of warmer and cooler climates (Delcourt et al. 1993). A temperature contrast of 18C° between the glacialand interglacial extremes has been estimated. In the last glacial maximum, the ice sheet reached its greatest southward extent at about 40° N latitude, about the position of the Ohio River. Vegetational patterns during this period are thought to have shifted north and south with each episode.

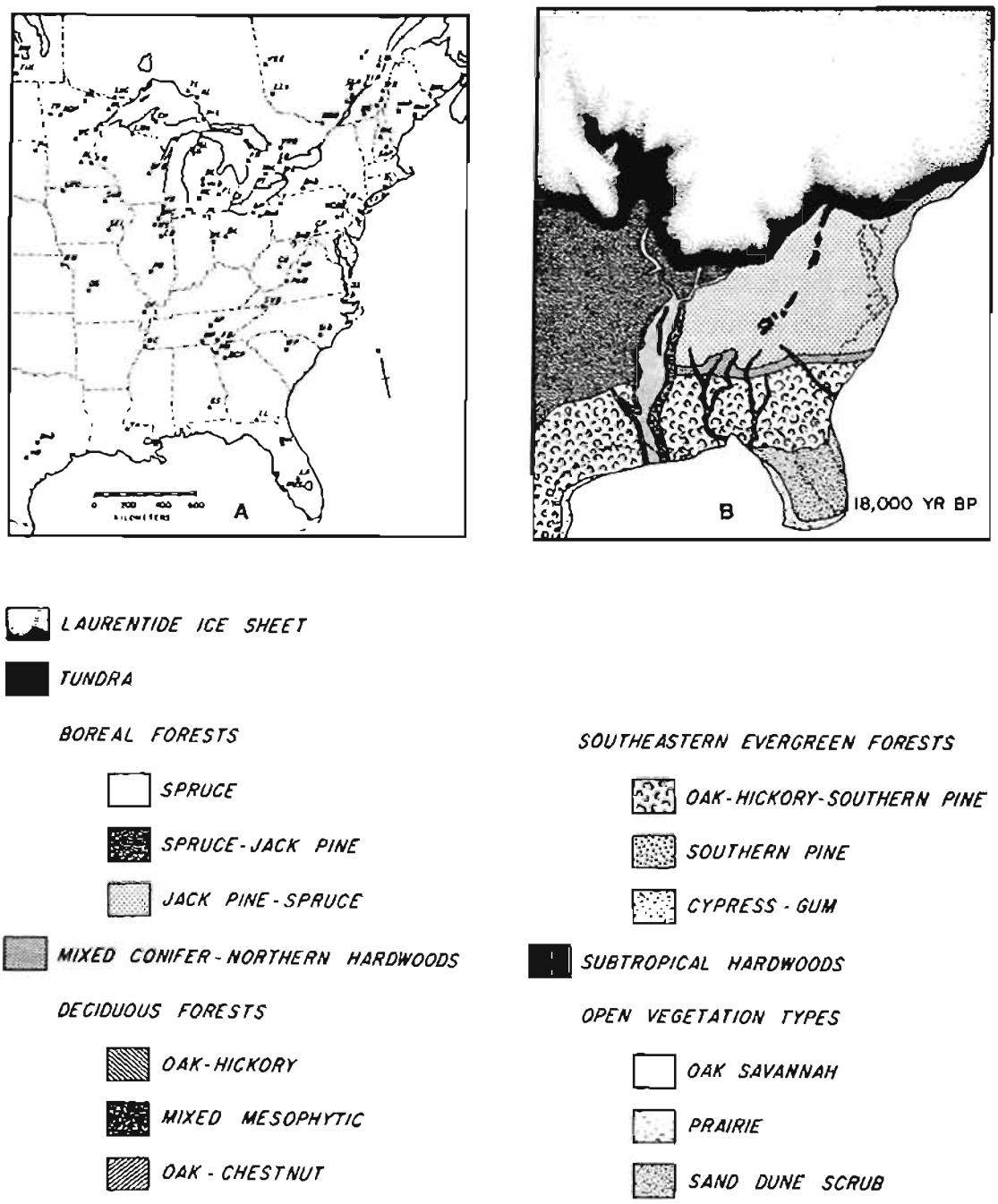

Fig. 6. Reconstructed vegetational patterns for the eastern United States. Maps by Paul and Hazel Delcourt (1981). © Plenum Publ. Corp. (used by permission).

Prior to the Quaternary glacial cycles, the climate was much warmer and vegetation of theregion was much more reflective of this condition (Delcourt et al. 1993). During the later part of the Tertiary Period cool-temperate deciduous forests extended to the Interior, but as cooling and drying progressed, these shifted eastward and the grasslands occupied much of this region. Some 66-58 million ybp, the forests were very diverse with many of the same oak, birch, walnut, and elm families we have today. Angiosperms arose about 120-130 million ybp during the Early Cretaceous, comprising up to 40% of the land taxa by the end of the Cretaceous. Previous to this period, about 245 to 120 million ybp, much of the Southeastern flora consisted of tropical species dominated by advanced conifers, seed-ferns, cycads, and

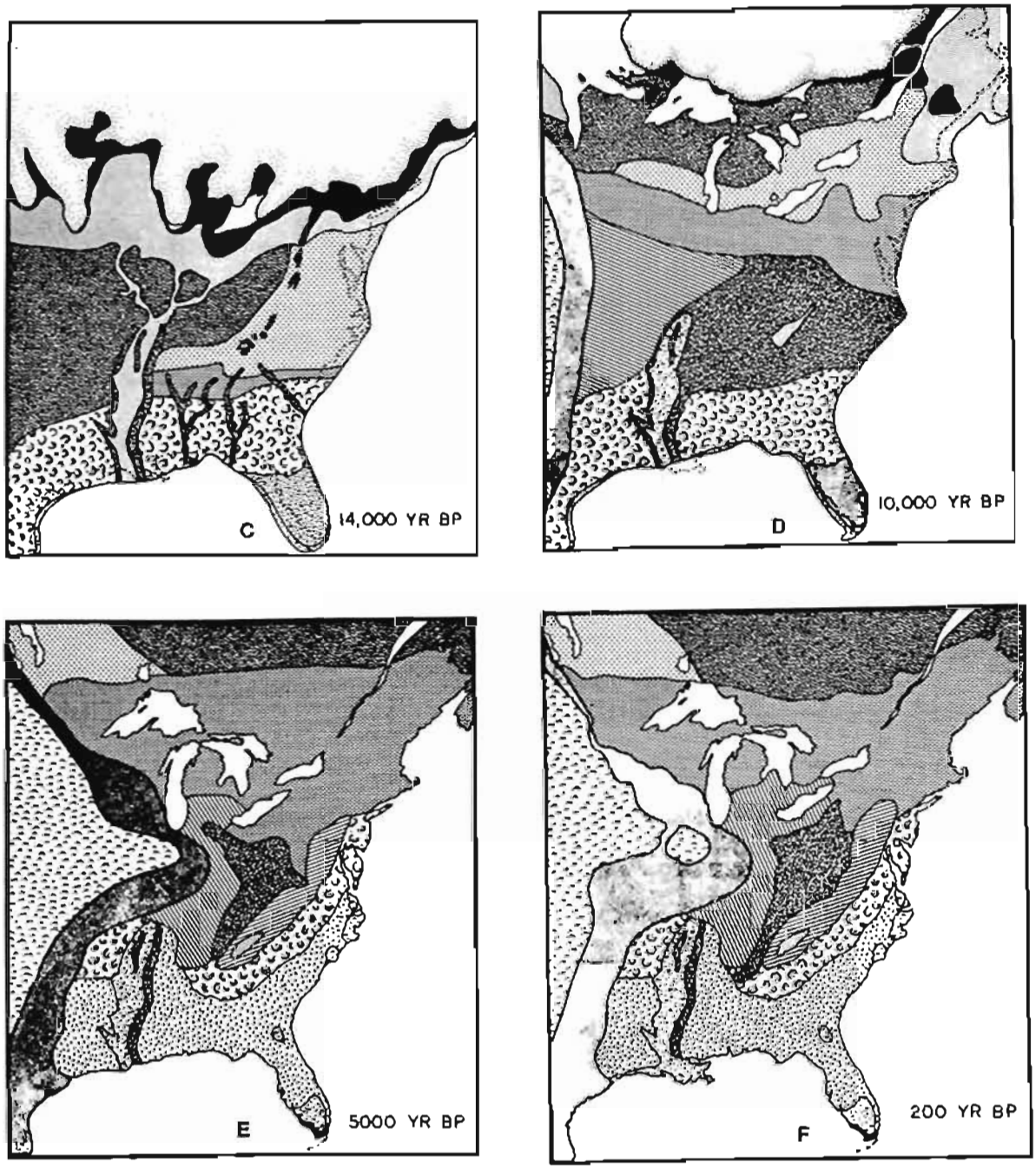

Fig. 6. (continued)

cyadeoids.

Interpreting Vegetational Diversity

It is always interesting to speculate on the origins of a given vegetation type. Given that the southern Appalachians represent an ancient land mass that has been exposed for lengthy periods to terrestrial vegetation, botanists have long considered this region as a site of stable vegetational patterns. Many of the tropical elements are found here, such as magnolias (*Liriodendron tulipifera*, *Magnolia* spp.), oaks and beeches (*Quercus* spp., *Fagus grandifolia* Ehrh.), laurels (*Sassafras albidum* (Nutt.) Nees., *Lindera benzoin* (L.) Blume, birthworts (*Aristolochia macrophylla* Lam., *Hexastylis* spp.), and filmy ferns (*Hymenophyllum* spp., *Trichomanes* spp.). On the other hand, boreal and alpine elements are also found here, such as club mosses (*Huperzia porophila* (Lloyd &

Underw.) Holub, *H. appalachiana*), avens (*Geum radiatum*), rushes (*Juncus trifidus*), and sedges (*Scirpus cespitosus*). It is difficult to understand how these very divergent groups were able to become established in the same region. The climates have changed considerably, which probably allowed many of these species to migrate to this region. Among the varied habitats and long periods of time for adaptation, these varied assemblages of plants have found habitats suitable for their survival and providing the diverse flora for which the region has become well known.

Acknowledgments

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South Carolina Natural Areas of the Society of American Foresters

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Abstract: The Society of American Foresters adopted policy for the selection, protection, and management of natural areas in 1971. Society of American Foresters Natural Areas are established for scientific study and educational opportunities to examine different types of forest cover. There are 15 natural areas in the Society of American Foresters program in South Carolina that range in size from 9 acres to over 1,000 acres. These natural areas represent forest cover types from the coast through the midlands to the mountains.

Keywords: Society of American Foresters, natural areas, South Carolina

As early as 1917, ecologists in the United States recognized the importance of natural areas for scientific and educational purposes. Interest in the preservation of forest natural areas began in the 1920's when foresters of the United States Department of Agriculture, Forest Service, began designating natural areas on national forests. In 1927, the Santa Catalina Research and Natural Area on the Coronado National Forest in Arizona was formally designated as the first U.S. Forest Service (USFS) natural area (Buckman and Quintus 1972).

Society of American Foresters Natural Areas Program

Today, the natural areas program managed by the Society of American Foresters (SAF) includes an inventory of more than 420 natural areas in the U.S. and Puerto Rico. SAF defines a natural area as a physical and biological unit in as near a natural condition as possible. Natural areas are important benchmarks that can be used to assess changes from baseline data.

Purpose and Use

SAF Natural Areas are established primarily for purposes of science and education to: provide outdoor laboratories of study of natural processes in relatively undisturbed ecosystems, provide benchmarks against which both harmful and beneficial effects of man-caused changes can be assessed, serve as reservoirs of genetic diversity, and serve as outdoor classrooms for education in natural forest landscapes. Those using SAF Natural Areas include research foresters, biologists, soil scientists, microclimatologists, geologists, and educators. Scientific and educational use of natural areas are mostly observational, and for the collection of soil samples, increment cores, and plant and animal specimens. Uses not allowed are camping, tree cutting, grazing, and prescribed burning (except to maintain vegetative type).

For protection the landowner or custodian must be notified and acknowledgment should be given in writing for use with restrictions.

Criteria for Selection

The SAF interest is establishment of natural areas representative of all forest and forest-related vegetation types.

Forest Cover Types of US & Canada (1980 SAF publication by F.H. Eyre) is the basis for classification (forest cover types, crop type, stand type-category of forest defined by its vegetation---composition and/or local factors). Highest priority is given to establishment of natural areas which:

Represent typical undisturbed examples of major, commercially important forest types. (Where typical examples of undisturbed forest types are not available, sample areas of those types which will return to nearly natural conditions are sought).

Protect rare and endangered species of forest plants and animals.

South Carolina Register of SAF Natural Areas Illustrates the Program

There are 15 natural areas in South Carolina that range in size from approximately 10 acres to

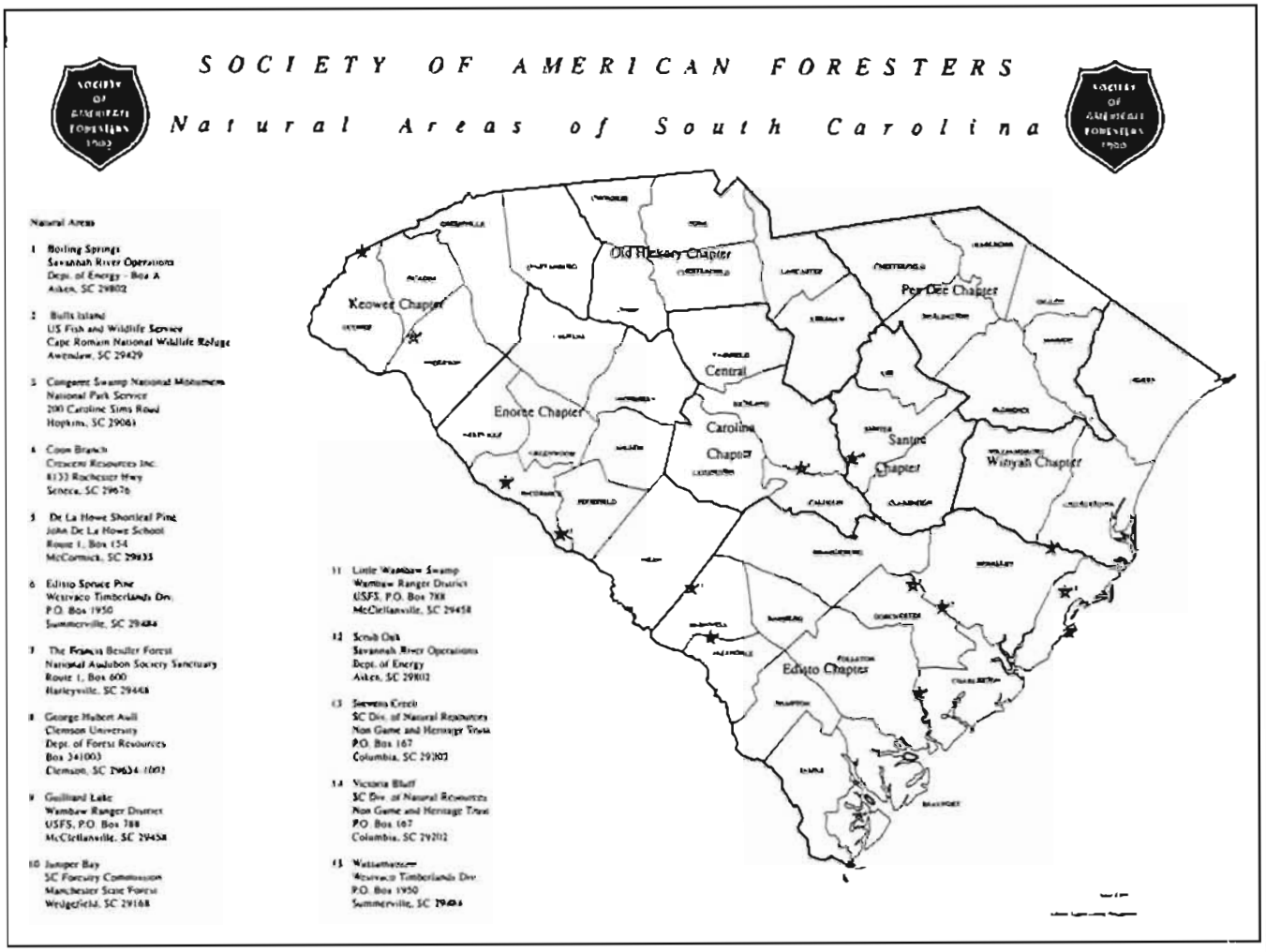

Fig. 1. Society of American Foresters natural areas of South Carolina

over 1,000 acres, with approximately 4, 428 total acres in natural areas. These natural areas are found from the coast through the midlands to the mountains, and represent forest species of southern yellow pines, oaks, bald cypress, water tupelo, etc:

George H. Aull Natural Area is on forest land of Clemson University. The 12.5 acre site is covered with northern red oak and white oak that average 140 years of age. The red oaks average 103 feet tall with a diameter of 34 inches and the white oak has an average height of 126 feet with a diameter of 28 inches.

Boiling Springs Natural Area was established by the Atomic Energy Commission in 1957 on lands acquired for the Savannah River Project in 1950. The 9 acre natural area is located along lower Three Runs Creek. This area is now managed by the US Department of Energy. The most significant feature is old-growth loblolly pine, which averages 130 feet tall with an average diameter of 40 inches.

Bulls Island Natural Area is 1,000 acres managed by the US Fish and Wildlife Service of the Department of Interior. Bulls Island is part of the Cape Romain National Wildlife Refuge. The Refuge includes some of the last undeveloped beach sections in South Carolina. In 1989, Hurricane Hugo removed many of the large trees and altered several of the shallow fresh and brackish water ponds. The refuge still provides attractive habitat for a great variety and number of birds throughout the year, and is still one of the most important wildlife areas on the Atlantic Coast.

Congaree Swamp Natural Area is 100 acres within the Congaree Swamp National Monument, US Department of the Interior, National Park Service. The area is a southern hardwood forest in the Congaree River

floodplain. The overstory includes sweetgum/mixed hardwoods, laural oak, sugarberry, overcup oak, swamp chestnut oak, red maple, and persimmon.

Coon Branch Natural Area is on forest land of Crescent Resources, Inc. The 15 acre natural area is a small drainage basin, or cove, on the west bank of the Whitewater River along the South Carolina/North Carolina state line. The cove lies midway between the Upper and Lower Falls of the Whitewater River. Falling 417 feet, the Upper Falls is one of the highest waterfalls in the eastern United States. The Coon Branch drainage seems to be undisturbed and large chestnut oak, yellow poplar, and hemlock trees appear to be 300 to 400 years old.

De La Howe Natural Area is 120 acres that is state-owned. The natural area is primarily shortleaf pine and oak. The stand of shortleaf pine is unique in the South Carolina Piedmont, a region where the land has been worked for two centuries and has undergone drastic change. The forest surrounding this area was cut by pioneers and farmed.

Edisto Spruce Pine Natural Area is on forest land of Westvaco Corporation. The natural area is 45 acres of 50 year old spruce pine mixed with hardwood species. The understory contains typical Coastal Plain shrubs and vines.

Francis Beidler Forest Natural Area is owned and managed by the National Audubon Society and The Nature Conservancy. This superb old-growth tract of 1,783 acres represents the largest remaining virgin stand of blackwater bald cypress-tupelo forest. Hurricane Hugo caused some damage to the forest. There are no records or evidence of human disturbance throughout most of the tract, except for incidental removal of individual mature trees for shingle-making earlier in this century.

Guilliard Lake Natural Area is on land of the USFS. It is an 18 acre remnant of old growth timber located on a narrow strip of bottomland along the Santee River. It is a good example of an alluvial river swamp type. It also was damaged by Hurricane Hugo. Some very large bald cypress trees, centuries old, occur here along with large cypress knees, some nine feet tall and three feet in diameter.

Juniper Bay Natural Area consists of 10 acres and is the property of the US Defense Department, Air Force. It is located at the headwaters of Pinetree Creek within Big Bay, a swampy area east of the confluence of the Congaree and Wateree rivers. Atlantic White Cedar is the primary forest type. The older trees were destroyed by Hurricane Hugo.

Little Wambaw Swamp Natural Area is 60 acres on land of the USFS. The forest cover, damaged by Hurricane Hugo, was a relatively uniform stand dominated by exceptionally fine swamp tupelo mixed with bald cypress, and scattered water tupelo. The tupelo diameters are not exceptional, ranging from only 20 to 30 inches, but the trees have very good form and are unusually tall, many exceeding 80 feet.

Scrub Oak Natural Area is 52 acres managed by the Department of Energy, and represents a transition from wet marshland to a dry sandy ridge top. Longleaf pine and scrub oak are the principal species.

Stevens Creek Natural Area is on land of the South Carolina Department of Natural Resources, Wildlife and Freshwater Fisheries Division, Wildlife Diversity Section. The 138 acres feature steep terrain covered with a variety of species that include red oak, chestnut oak, pignut hickory, bitternut hickory, sugar hackberry, and southern sugar maple. Florida Gooseberry, a federally endangered species, grows here; this location is the only other natural site outside of Florida.

Victoria Bluff Natural Area is 1,050 acres managed by the South Carolina Department of Natural Resources, Wildlife and Freshwater Fisheries Division, Wildlife Diversity Section. The area is an excellent example of the pine flatwood type that is common in the Lower Coastal Plain. Longleaf pine-saw palmetto flatwood type predominates with some slash pine-saw palmetto flatwoods.

Wassamassaw Natural Area is a 15 acre site of mixed bald cypress and tupelo on forest land of Westvaco Corporation. It includes a two-acre island located within a swamp hardwood timber type, surrounded by shallow streams having typical swamp characteristics. The surrounding streams and vegetation have been designated as part of the total protected area. Wassamassaw Swamp has evidence of early timber harvesting. The most recent harvesting occurred about 50 years ago as a selection harvest. The island and surrounding buffer zone were not cut at that time.

Conclusion

To paraphrase Aldo Leopold, the science of land health needs, first of all, a base datum of normality, a picture of how healthy land maintains itself (such as representative forest types). Natural areas of forest cover types, such

as those registered with the SAF, are an integral part of multiple use forest management, and are examples of the multiple use forest management philosophy.

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Management of Pseudo-wilderness

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Abstract: The Principles of Wilderness Management, enunciated by Bloedel (1987) to guide the management of federal Wilderness Areas, are adaptable and applicable to management of much smaller and less pure areas, dubbed pseudo-wilderness. Four categories of pseudo-wilderness may provide visitors with many of the benefits associated with official Wilderness Areas. Exceptions include benefits related to the vastness of the wilderness or to physical challenges. The common ingredient is nature—not necessarily "pure" or "untouched" nature, but an environment that appears natural to its largely non-purist visitors. Most adaptations of the Principles to a pseudo-wilderness ease the rules necessary to maintain purity. Mechanized equipment can be used when visitors are absent; higher quality trails, signs, benches, bridges, and even restrooms are permissible in most situations, but the basic concept and purpose of the Principles remain. On the down side, education and rule enforcement are vital if the pseudo-wilderness is not to be overrun with visitors with no appreciation for a natural environment.
Keywords: pseudo-wilderness, Principles of Wilderness Management, wilderness character

Wilderness advocates can be rightfully proud of getting the Wilderness Act passed in 1964, and of adding nearly 100,000,000 acres to the National Wilderness Preservation System (NWPS) since then, but they have seemingly ignored other areas with the potential of providing a wilderness experience to their visitors. Michael Pollan (1991), in a short essay in *Orion*, has pointed out the irony of this situation. It is as if all areas not suitable for inclusion in the federal NWPS are abandoned to whatever use *laissez-faire* economics may dictate. But there is a need, particularly in areas easily accessible to visitors from urban centers, for land that resembles wilderness, but which, for one reason or another, does not qualify for inclusion in the NWPS. This paper addresses the benefits that a less-than-pure wilderness, or pseudo-wilderness, may provide a visitor, as well as management strategies that will promote those benefits. Wilderness management principles, as outlined by Bloedel(1987) and Hendee, et al. (1990), may be applied to pseudo-wilderness and other categories of natural or quasi-natural areas.

Pseudo-wilderness is an area that appears natural to most laypersons, is off-limits to mechanized conveyances, and is large enough to offer a semblance of separateness, if not remoteness. While it may have amenities such as improved trails, boardwalks or bridges, benches, signs, and perhaps a restroom, the area still retains a "wilderness character," an attribute that is called for in the Wilderness Act, and which is a key item in Bloedel's 4th and 6th Wilderness Management Principles.

VALUES OF PSEUDO-WILDERNESS

Wilderness characteristics that are highly valued by the "wilderness community" include vast size, potential for experiencing solitude in a remote area, and "purity," i.e., lack of any noticeable sign of development, management, habitation, etc. The typical urban resident's priority of needs does not include any of these attributes; they want merely "nature." According to research reported by Kaplan and Kaplan (1989), "nature," however one defines it, is universally seen as good, and if it is *perceived* to be unaltered, it is better. One of the most commonly enjoyed benefits of a wilderness experience is simply being surrounded by seemingly unaltered nature. Most forested tracts would qualify as "natural" if there is no obvious evidence (to a layperson) of recent logging or other manipulation, development, or resource

use. Unfortunately, most such nature that is readily accessible to urban residents is found on relatively small tracts of land which lack the potential for remoteness and solitude that a wilderness would provide.[1] But the enjoyment of nature on the small tracts can be increased by the adaptation of long accepted wilderness management principles, which tend to promote the perception of unaltered nature, and which may heighten the enjoyment of solitude. Management procedures can be used and visitor amenities can be provided that would not be acceptable in an official Wilderness.

Most of the values and benefits received by visitors to a Wilderness Area can be enjoyed in a smaller, less pristine area. Cook and English (1988) found that the generally smaller natural areas could not provide the physical challenges of a Wilderness Area, such as long hikes, backpacking, and traveling off-trail, and obviously the visitor could not enjoy being remote from human development, but they did offer most of the psychological benefits derived from a close association with nature.

Kaplan and Kaplan (1989) refer to the "restorative environment" of nature as beneficial to relieving "mental fatigue," or stress. Visiting a restorative environment—some would call it "escape"—rests and "restores" the mind. Nature, whether in a backyard garden or a natural park, provides this environment. Employees and volunteers at the Dodge County (Georgia) Hospital recognized this value when they established a short walking trail, with several benches, in a tiny pine plantation adjacent to the hospital. While it is far from natural by most anyone's standards, the area offers solace and tranquillity for the staff, mobile patients, and visitors.

Certainly, what Frederick Law Olmsted called "contemplative recreation" may be enjoyed in a pseudo-wilderness. Small tracts of undeveloped land, whether they are formally protected as a natural area, are part of a park, or are some other type of pseudo-wilderness, offer a visitor an opportunity to contemplate and appreciate "the truly good aspects of our modern, mechanized, electrified, and computerized society. When one spends some time away from unnatural sources of power, communication, or personal comfort, one returns home with a sharpened perspective of what is music and what is noise" (Cook and English 1988). Other values of pseudo-wilderness include exploring and learning about nature, family cohesiveness and solidarity, physical fitness, enjoyment of natural beauty, development of spiritual values, and mental stimulation. Perhaps most important for society is an increased awareness, appreciation, and respect for nature, which leads to a sense of humility and a tendency to become an advocate of environmental protection (Driver, Nash, and Haas 1987).

APPLICATION OF PRINCIPLES OF WILDERNESS MANAGEMENT

For the remainder of this paper, I will describe how Bloedel's (1988) Wilderness Management Principles can be applied to management of pseudo-wilderness. For convenience in referring to the Principles, I will paraphrase them here, and refer to them in the text by number.

1. Wilderness is a distinct resource;
2. Manage other resources in a compatible manner;
3. Allow natural processes to operate freely;
4. Strive for the purist wilderness character;
5. Preserve wilderness air and water quality;
6. Produce human benefits but preserve wild character;
7. Preserve opportunities for solitude;
8. Use education and minimum regulation wherever possible;
9. Favor wilderness dependent activities;
10. Exclude evidence of motorized equipment;
11. Remove non-essential structures and activities;
12. Perform necessary management with the "minimum tool;
13. Develop a management plan for each wilderness;
14. Harmonize wilderness with adjacent land management;
15. Manage with interdisciplinary scientific skills;
16. Manage exceptions with minimum impact on the wilderness.

The above Principles and other practices presented as appropriate for wilderness management are designed to adhere to the requirements of the 1964 Wilderness Act and subsequent wilderness legislation. But there is no such requirement for managing pseudo-wilderness; whatever works for a particular area

or situation is "allowed." The *objective* of such management, however, should be to provide an environment that is "natural" or "apparently natural." Four categories of pseudo-wilderness will be described, and appropriate Principles suggested for each.

Formally Dedicated Natural Areas

Management of formally protected natural areas, typified by The Nature Conservancy's Preserves, will likely resemble that of federal Wilderness Areas. These areas are managed to protect rare or endangered plants, animals, and ecosystems, or unique geological formations. Enjoyment of these areas by the public is often restricted to tours led by professionals, and in some cases, no public visitation is permitted. A common strategy is to allow natural processes to operate freely (Principle 3), although aggressive species and exotic species that threaten the preserve's purpose may be controlled by herbicides or mechanical equipment. Depending on the target species' requirements, natural processes may be simulated by prescribed fire or mowing. The Preserves' management objective is largely indifferent to purity of wilderness character, the opportunity for solitude, and most other Principles pertaining to public enjoyment. Most Preserve management will be directed at educating and regulating visitors to ensure the survival and prosperity of the target species (Principle 8).

Nevertheless, the nation's formally protected natural areas, totaling more than five million acres in 1988, can provide a much needed resource for a wilderness-like experience (Cook and English 1988), although some areas are not open to the public, due to fear of liability for injury to a visitor.

Parks, Greenways, Trailways, and Nature Centers

A second category of pseudo-wilderness is exemplified by undeveloped portions of nature centers and state and county parks and greenways; corridors along hiking trails are also included.

The greenway along Philadelphia's Wissahickon Creek is probably typical of many urban greenways in that it includes highly developed portions, but is undeveloped beyond the edge of the city. Although development may be close, it is not obtrusive, and the corridor presents a quiet, forested environment with only a narrow dirt path.

A similar environment exists in the four-mile-long Sandy Creek Greenway near Athens, Georgia, connecting a 225-acre nature center with a 600-acre county park. A dirt trail, punctuated by numerous boardwalks and four steel bridges, allows visitors to enjoy an essentially natural environment. Although one can occasionally see a house on the hill above the floodplain swamp, a visitor soon forgets that one end of the trail is less than one mile from the downtown of a community of 100,000 people.

The management of both greenways is quite minimal—keep the trail free of brush and windfalls, and pick up the occasional piece of litter. Visitors enjoy being immersed in nature—trees, wildflowers, birds, deer, and occasionally a beaver. They also enjoy the *sense* of being remote, even though they are not. One sees more wildlife than people, except on weekends. In the Athens example, one could argue that Principles 4 and 6 were being ignored, since the numerous boardwalks, bridges, benches, and trail signs do not preserve the wilderness character; they do, however, produce human values and benefits, since the area would be totally inaccessible without some of those improvements.

Again, in the Athens example, Principle 10 is frequently ignored—mountain bikers, while not numerous, leave tracks that are nearly always visible. In this case, the minimum regulation called for in Principle 8 is insufficient to prevent the adverse impacts. Principle 12 (the minimum tool rule) is usually followed, not because of a desire to limit motorized equipment, but because of the difficulty in getting a machine to the site. A large portion of the nature center is also undeveloped and there is no direct human value or benefit, which is contrary to Principle 6. The area does serve as a wildlife refuge, however, which indirectly provides the enjoyment of seeing wildlife as they cross into the developed part of the center.

The Wissahickon greenway is favored by the adoption of a written management plan (Principle 13), which includes the objective of maintaining the rural portion in a natural condition. Sandy Creek Greenway has no such plan, but the nature center does have a plan that includes Principle 3. No exotic plants are permitted to be planted (although there is a vast quantity that "came with the property"), and the removal of any native species of plant or animal is prohibited, thus allowing natural process to operate freely.

The Appalachian Trail (AT) through Georgia's Chattahoochee National Forest provides an excellent example of applying the wilderness management principles to a non-wilderness area. The Chattahoochee-Oconee National Forests *Land and Resource Management Plan* (USDA Forest Service c.1986) has formally recognized a zone along the AT in those parts of the Forest that are not in dedicated Wilderness Areas. The zone is a minimum of 200 feet wide (100 feet on each side of the trail), but it averages 744 feet wide. The Plan's objectives include: 1) protecting the trail from incompatible uses; 2) minimizing visual impact resulting from management activities (outside the trail zone); 3) providing a "semi-primitive non-motorized recreation experience."

These objectives are compatible with a pseudo-wilderness area. Horses, bicycles, and all motorized vehicles are prohibited. Water quality is protected by careful siting of shelters, toilets, and campsites; brochures and posted information educate visitors on low impact camping methods that protect water quality. Development is "limited to shelters, privies, stiles, spring boxes, registers, and trail heads" for parking.

A comparison of these management guidelines with the Wilderness Management Principles will show a pattern similar to the previous examples—an effort to minimize obtrusive uses that would interfere with or limit a visitor's enjoyment of the natural environment, but with certain amenities allowed.

Tourist Resorts[2]

Wilderness tourism should not be confused with eco-tourism. While they are close relatives, the former emphasizes the lack of mechanical intrusions and large groups of people, while the latter emphasizes unique natural systems or phenomena.

What may seem to be an oxymoron—wilderness tourism—is another example of the pseudo-wilderness management concept. A resort or similar tourist business with an adjacent undeveloped but attractive area can provide its clientele with an opportunity for a limited wilderness experience. Guided or unguided day trips on foot or horseback can be offered along with the more traditional activities. To manage such an enterprise, one must understand the tastes and expectations of typical resort visitors

- they are not looking for a physical challenge;
- they do not want to abandon all comfort;
- they know little about the natural environment;
- they may feel insecure in a real wilderness;
- they may not have come to the resort to enjoy wilderness, but it may be a diversion from golf, tennis, and swimming.

A forested tract can be literally saturated with trails as close as one-quarter mile if they are carefully designed so that visitors cannot see or hear those on another trail. Ideally, the trails will be laid out in independent loops, all originating near the resort's central area; All trails should be one-way, to minimize encounters. To further promote the illusion of solitude, groups can start at scheduled times, much like the resort's program director would schedule tee-off times on the golf course (Principle 7).

The strict rules based on the Principles of Wilderness Management may be relaxed even more than for nature preserves and park-related areas. Much of the maintenance of the trails can be done in the off-season when the visitors are not present, allowing Principles 2 and 10 to be relaxed; maintenance crews can use chainsaws to clear the trails, taking care to trim neatly and dispose of the trimmings discreetly. Similarly, careful use of herbicides to control exotics or poison ivy would be an acceptable exception to Principle 3; dangerous snags would need to be removed because of liability for injury. Attractive native species could be added to increase the interest and attractiveness, or for visual screens.

Resort-based areas are ideally suited for education (Principle 8). Visitors to a vacation resort are less likely to be as knowledgeable or environmentally aware as nature preserve visitors. A visit to a pseudo-wilderness should include an interpretive program, emphasizing basic but interesting ecological information and rules of behavior in natural settings. Most important is to promote a wilderness ethic and instill the idea of wilderness—its characteristics, values, and benefits.

Wilderness character is a difficult concept to define, and its meaning may vary from person to person—as Nash (1979) pointed out, "wilderness is all in your mind." But retaining the wilderness character in a resort-related pseudo-wilderness is important. The manager's attitude, knowledge of wilderness and of the clientele are all very critical. In installing amenities such as benches, comfort stations, and

signs, one must be careful to design and site them appropriately.

Residential Subdivisions

The fourth category presents perhaps the greatest challenge to the concept of managing to maintain a pseudo-wilderness, but it also offers the greatest opportunities. Instead of totally dividing a property into lots, a considerable portion of the area is left in a "commons," owned by all the lot owners. In the following two examples, the common land is forested, mostly steep land that has foot trails built or planned for the exclusive use of the lot owners and their guests.

Three Oaks is a 132-acre subdivision on the outskirts of Athens, Georgia; the commons is a 17-acre area of forested hillside, separated from the residential lots by a 100-foot powerline easement. While this small tract does not resemble a wilderness, the concept of managing it as a pseudo-wilderness is quite appropriate. The residences are hidden from view from the common area by the slope, while the view in the other direction is protected by a neighboring property in a permanent trust. The foot trail in the 17 acres is quite popular with the residents.

Three Creeks is a 225-acre "planned residential community" in the Blue Ridge foothills north of Lake Lure, North Carolina. The 14 non-contiguous lots occupy 30 per cent of the area, and only one is larger than 4.5 acres. The land is very steep and heavily wooded; the largest of the three creeks has two very attractive waterfalls.

The developers have designed a comprehensive set of covenants and restrictions relating to the building size, style, and color, parking areas, the rights of the lot owners and their guests to use the commons, and assessments for the maintenance of the commons.[3]

Common Area restrictions prohibit:

- Removal of live vegetation, wildlife or rocks.
- Horses and motorized vehicles, except for maintenance.
- Unaccompanied pets.
- Damage to any vegetation while hiking off-trail.
- Hunting, fishing, and trapping.
- Guests of a lot owner who live within commuting distance may not use the Common Area unless accompanied by the lot owner.

In addition, removal of dead trees (standing or down), use of pesticides, feeding deer, playing loud stereos, and automatic security lights are among the items and activities that are prohibited or restricted on the individual lots. A lot owners association has the responsibility of maintaining the Common Area, and enforcing the covenants and restrictions. The positioning of the residential lots leaves a substantial (100-800 feet) buffer around the periphery of the subdivision, one core area of about 25 acres, and the spaces between the lots, which increases the privacy each owner will enjoy. One excellent trail has been opened through the central common area.

The application of the Wilderness Management Principles to these and similar subdivisions does not differ substantially from the three previous applications. In both subdivisions, the developers have designed the rules to match their particular idealism, rather than the more pragmatic inclinations of resort owners or park managers. For example, neither of the subdivisions permit pesticides or herbicides (Principle 3), although both allow mechanized maintenance (Principle 10). Both tend to be more purist than the other three categories (Principles 6 and 4). The lot owners, having bought into the concept of a pseudo-wilderness commons, are more likely to defend the Principles than a profit-motivated developer.

This issue brings up an important problem: that of protecting a pseudo-wilderness against incompatible uses. As noted, a "closed society" in a private subdivision could likely be its own protection. The same could be said of a private resort owner, although the motive might not be as strongly held. But on a public area, e.g. a greenway, park, or on a nature preserve that is not closely patrolled or the rules enforced, the successful invasion of incompatible uses is very likely; such uses include jogging and running, mountain biking, littering, running uncontrolled dogs, and stealing native wildflowers.[4]

A recent article in *American Forests* (Donahue 1996) highlighted a pseudo-wilderness in Portland, Oregon. The "largest self-contained urban forest" (5000 acres) has two problems that may be unique to pseudo-wilderness areas *within* urban areas. Established subdivisions bound the forest in many places, and others will surely be added as the city expands. Exotic plants spill over from residential gardens and lawns, especially English ivy (*Hedera helix*), which has occupied about 500 acres of the forest. The other problem

is occupation by transients, who bring in litter and scraps of lumber and cardboard for shelter. In referring to this problem, the manager made a statement to the author of the article that illustrates the concept of pseudo-wilderness management very aptly: "It's ugly, and part of my job is to pull the wool over people's eyes, to make them think they are in wilderness."

SUMMARY

The Principles of Wilderness Management, enunciated by Bloedel (1987) to guide the management of Congressionally declared Wilderness Areas, are shown to be adaptable and applicable to the management of much smaller and less pure areas, dubbed pseudo-wilderness. Four categories of pseudo-wilderness may provide visitors with many of the benefits normally associated with the official Wilderness Areas. Exceptions include benefits related to the vastness of the wilderness or to physical challenges they may require. The common ingredient in these areas is nature—not necessarily "pure" or "untouched" nature, but an environment that appears natural to its largely non-purist visitors.

Adaptations of the Principles of Wilderness Management to a pseudo-wilderness situation are mostly those which ease the rules necessary to maintain the purity of the federal areas. Mechanized equipment can be used when visitors are absent; higher quality trails, signs, benches, bridges, and even restrooms are permissible in most situations, but the basic concept and purpose of the Principles remain. On the down side, education and rule enforcement are vital if the pseudo-wilderness areas are not to be overrun with visitors who have no appreciation for a natural environment.

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Footnotes

[1]Remoteness and solitude may actually be a negative attribute for many urban residents (Kaplan and Kaplan 1989). A "True wilderness experience" is not only not required, it may be frightening to the uninitiated.

[2]Much of this discussion was presented in Cook (1992).

[3]Information on Three Creeks came from a personal visit to the site, and from "*Three Creeks -- a Planned Residential Community, Lake Lure, North Carolina,*" comprising three documents: ByLaws of Three Creeks Homeowners Association, Inc.; Declaration of Covenants, Conditions, and Restrictions of Three Creeks, Inc.; and Covenants, Conditions and Restrictions Relating to Construction.

[4]All of these activities are common on a park on the University of Georgia campus that was planned to provide tranquillity, contemplation, and nature appreciation; total lack of enforcement by the campus police has given the message that anything goes, in spite of posted rules and regulations.

Insects and Pathogens in Eastern Wilderness and Natural Areas

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Abstract: Native insects and pathogens are normal parts of all forest ecosystems. They function as cyclers of carbon and other nutrients; as food sources for other organisms; as creators of wildlife habitat; as pollinators and mycorrhizal symbionts; and as direct and indirect regulators of woody and herbaceous plant populations. In this later role, they are both primary and contributing change agents. Their actions will result in changes to the existing forest composition and structure that might be unforeseen and perhaps even undesirable to some users of these resources. It is important for natural area managers to educate people regarding these changes and influences. Case studies with relevance for the Southern Appalachian Mountains and the Great Smoky Mountains National Park including oak decline, European gypsy moth, southern pine beetle, and beech bark disease are discussed in terms of forest structure and composition changes.
Keywords: disturbance, forest composition and structure, insect and pathogen effects.

Forests are dynamic and in a constant state of change. Fire, climatic conditions, insects, pathogens, and people exert many influences that guide and direct these changes. In fact, present forest composition and structure reflect the cumulative effects of these disturbance agents as they have operated in the past.

Wilderness and natural area management objectives aim to limit human influences to the extent feasible in order that plants and animals develop and respond freely to the forces of natural ecological succession (The Wilderness Act of 1964 amended October 21, 1978; 36 Code of Federal Regulations 1994). Ecosystem processes are to be preserved, rather than specific plant communities, but people who use natural areas often have expectations of certain forest conditions, and landscapes free of noticeable disturbance (Shrader-Frechette and McCoy 1995). However, past disturbances, including those of human origin, greatly influence the susceptibility of forests to insects and pathogens long after natural areas are designated. Changes in structure and composition may occur that are unexpected and undesirable to some users. The purposes of this paper are to describe the roles of insects and pathogens in forest ecosystems, the ways they function as agents of disturbance, and their effects in eastern wilderness and natural areas past, present, and future.

INSECT AND PATHOGEN ROLES

In the past, insects and pathogens were often viewed as disruptive impediments in most forest management systems. Attempts to eradicate or suppress outbreaks were initiated when they produced effects that were in conflict with the human values of aesthetics, production of fiber or solid wood products, or desirable wildlife habitat. More recent management models have recognized insects and pathogens as integral parts of functioning forest ecosystems and their beneficial effects (USDA Forest Service 1988).

Native insects and pathogens are normal parts of all forest ecosystems. Haack and Byler (1993) summarized their roles as cyclers of carbon and other nutrients; as food sources for vertebrates, invertebrates and other microorganisms; as pollinators affecting seed production for many plants, including trees; as mycorrhizal symbionts enhancing tree growth, disease resistance, and overall vigor; as creators of wildlife habitat; and as regulators of woody and herbaceous plant populations. In this later role, they can have profound effects on forest structure, species composition, and diversity at

all levels from genetic to landscape.

By contrast, introduced insects and pathogens are not normal parts of the ecosystems they have come to influence. The types of effects they have caused are similar to natives for the most part, but the magnitude of the changes are more extreme. This is due to the lack of co-evolved resistance mechanisms in their new hosts, and the absence of parasites, predators, and diseases that served to regulate their populations in their ecosystems of origin.

INSECTS AND PATHOGENS AS DISTURBANCE AGENTS

Mortality and growth loss are the two direct effects that insects and pathogens have on their hosts. The distribution of susceptible individuals on the landscape is translated into changes in community structure and composition during outbreaks or epidemics. There is a common perception that native insects and pathogens prey only on the weaker members of the population, culling the less fit and thereby increasing the overall vigor of the population. If the population is normally distributed with respect to vigor, and the low-vigor individuals are randomly distributed on the landscape, then the impacts are minimal and may be barely noticeable. However, these conditions do not always prevail. Large segments of a population may be susceptible, and/or outbreak conditions can overwhelm even the most vigorous individuals. Changes are driven by numerous processes and the results can be highly variable based on existing community structures, host susceptibility, and the virulence or aggressiveness of the agent. Insects and pathogens can regulate host population size and genetic composition, restrict host distribution at various spatial scales, promote or reduce community diversity, mediate herbaceous plant interactions by changing light relationships at the forest floor, alter relative competitive advantage, create canopy gaps ranging in size from single-tree to large landscapes, and reduce growth or reproduction and thereby affect the availability of food for animals (Gilbert and Hubbell 1996).

Though human disturbances are minimized once a natural area is designated, this does not negate those influences which occurred in the past and which have shaped present composition and structure. In the eastern U.S., the human influence has been especially pervasive. Among these are agriculture, fire, logging, and the introduction of non-native plants, insects, and pathogens.

At the turn of the century, the population was smaller but agricultural production less efficient than today. Proportionally larger acreage was required to supply food. As production efficiency improved, former pastures and cropland reverted to forests. Fire was used extensively, first by native people and then by European settlers to aid hunting and woods grazing by reducing understory density, prepare land for farming, or reducing logging debris. Logging impacted millions of acres, as wood was used for building materials, fuel (raw wood or charcoal), tanbark, and other uses for the growing society. Immigrants and international trade in nursery stock and wood products brought plants from around the world to North America, but often with unwanted pests. The list of introduced insects and diseases affecting forested ecosystems in eastern North America is legion—Dutch elm disease, chestnut blight, white pine blister rust, gypsy moth, balsam woolly adelgid, hemlock woolly adelgid, butternut canker, dogwood anthracnose. All of these disturbances have interacted to shape present composition and structure to the point where today's forests are like nothing that have ever existed in the past. This composition and structure influence insect and pathogen susceptibility. Several pervasive conditions will now be discussed as case studies in eastern wilderness and natural areas from the perspective of past influences, present effects, and future prospects.

Chestnut Blight-Oak Decline-Gypsy Moth

The chestnut blight epidemic represents the most profound set of changes ever recorded in North American forest ecosystems. The disease is caused by *Cryphonectria parasitica* (Murrill) Barr, a native of Asia, and was first discovered in North America in the New York Zoological Park in 1904. Asian chestnut species imported to the U.S. demonstrated resistance, in keeping with their co-evolved resistance, but the native American chestnut [*Castanea dentata* (Marsh) Borkh] had none. By about 1940, virtually all of the trees throughout the range were infected and soon thereafter, they were dead (Hepting 1974). With the loss of this most important of North American hardwood species (and perhaps many unknown associated organisms), unparalleled ecosystem changes were set into motion that are still with us today.

Newly available growing space was occupied by mid—and understory species positioned to exploit their competitive advantage. Replacement was variable, but typically oak species (especially northern red oak {*Quercus rubra* L.}, chestnut oak {*Q. prinus* L.}, and black oak {*Q. velutina* Lam.}) filled much of the void (Korstian and Stickel 1927, Stephenson 1986). Past disturbance, especially frequent fires of both natural and human origin, had given an early advantage to oaks compared with other light seeded, thin-barked, or less vigorously sprouting species. On sites where previous fire was not as important, red maple (*Acer rubrum* L.), black gum (*Nyssa sylvatiha* Marsh.), and yellow poplar (*Lirodendron tulipifera* L.) succeeded along with the oaks (Lorimer 1980, Arends and McCormick 1987). These new oak forests have aged relatively free of disturbance since the chestnut blight epidemic but have incompletely filled the ecological niches once occupied by American chestnut.

These maturing, historically unprecedented oak forests are now subject to oak decline, a disease of complex etiology. Oak decline has been known in the Southern Appalachians since the earliest descriptions of forest conditions in the late 1800's (Beal 1926, Balch 1927). Physiologically mature trees come under stress (usually from prolonged drought) which disturbs carbohydrate physiology and makes them subject to the opportunistic root disease fungus, *Armillaria mellea* Vahl. Ordinarily a saprophyte, this fungus can recognize the chemical changes that take place in stressed trees and becomes an aggressive pathogen (Wargo 1977). Susceptible trees die back over several years or even decades before succumbing to the combined effects of the root disease and inner bark boring insects. Defoliation by spring-feeding insects accelerates the chemical changes and can compress the oak decline timeline from decades to 1-3 years. Native insects such as the elm spanworm have caused severe, protracted defoliation in outbreaks during the 1880's and again in the late 1950's (Drooz 1960) but the European gypsy moth [(*Lymantria dispar* (L.)] has caused a more lasting and severe impact. Introduced to this country in the mid-1860's in a failed breeding experiment with silk worms, it has been expanding its range south and west since that time. Oaks are a favored food and the lack of diseases, parasites, and predators from its country of origin makes it a key interaction with oak-dominated forests and the oak decline complex.

Ecosystem changes that accompany oak decline and the oak decline-gypsy moth interaction include the gradual loss of oak (especially those in the more susceptible red oak group) and replacement with more shade tolerant species such as black gum and red maple on drier sites, and yellow poplar, white ash (*Fraxinus americana* L.), and sugar maple (*A. saccharum* Marsh.) on more moist sites (McGee 1986, Abrams and Downs 1990); canopy gaps of variable size corresponding to the distribution of susceptible oaks (single-tree in landscapes with a sparse red oak component to complete loss of the overstory in landscapes with large oak components that are defoliated repeatedly by the gypsy moth); loss of hard mast food for wildlife (Oak and others 1988); an increase in soft mast sources due to understory response to increased light; increase in denning sites in standing dead trees; and increased coarse woody debris as dead trees fall. In the long term, the new stands may be less susceptible to oak decline and gypsy moth, but the loss of hard mast may compound the prior loss of dependable American chestnut mast for some wildlife species.

These impacts have been in conflict with wilderness/natural area management objectives in several cases over the last 10 years. The National Park Service routinely applies biorational insecticides (diseases caused by *Bacillus thuringiensis* {Bt} and nucleopolyhedrosis virus {NPV}) to suppress gypsy moth defoliation in heavily used road corridors and developed recreation sites, and in one case, the habitat of an endangered salamander (J. Witcosky, personal communication). In addition Peters Mountain Wilderness Area (Jefferson National Forest, VA) was the site of a 1988 eradication project with Bt and a gypsy moth mating disruption treatment in 1995 (D. Leonard, personal communication).

Southern Pine Beetle-Fire

Pervasive fire, both natural and human in origin, helped to maintain the yellow pine component throughout the Southern Appalachians until human population pressures and public policies intervened in the early part of this century. Fire suppression was instituted as one of the primary goals of the U.S. Forest Service and other public land management

agencies, as well on state and private lands through cooperative fire management programs. As a result, this disturbance agent has ceased to operate freely on forested landscapes for nearly half a century. Yellow pine and yellow pine-hardwood mixtures have since matured without fire or substitute disturbance on millions of acres. This situation is especially important for fire-dependent species such as table mountain and pitch pines (the cones of which will not open without the heat of a stand-replacing fire), and to a lesser extent in shortleaf and Virginia pines. A mosaic of stands representing all age classes from regeneration to overmature have been replaced by uniform, dense, mature stands with slow radial growth that are highly susceptible to attack by the southern pine beetle [(*Dendroctonus frontalis* (Zimm.)].

This native insect causes tree death after egg-laying adults and feeding brood tunnel throughout the inner bark. It has a pheromone-mediated mass attack behavior that results in spot kills ranging in size from a few trees to hundreds of acres. Wildernesses established in pine lands in eastern Texas were particularly hard hit between 1991 and 1993. Outbreaks were suppressed in four wildernesses during that time when trade-offs between the goal of unencumbered ecosystem processes, endangered species, and the threat of spread to private lands adjacent to the wilderness became necessary (W. Nettleton, personal comm.).

Species composition changes when conditions adequate for pine regeneration are absent. Hardwoods already on the site in lower crown positions exploit the newly available growing space which results in new hardwood stands or hardwood-pine mixtures. Structural changes include canopy gaps or complete loss of overstory, increased snags and large wood debris, and understory growth response.

Beech Bark Disease

Beech bark disease is a complex or two introduced agents, the beech scale, *Cryptococcus fagisuga* Lind. and a fungus *Nectria coccinea* var. *faginata* Lohman, Watson, and Ayers. Both were introduced in North America in 1890 to Nova Scotia and have since spread through most of the range of American beech [*Fagus grandiflora* (Ehrh.)] south to WVA, with isolated outbreaks as far south as the Great Smoky Mountains National Park. The insect creates tiny wounds into the inner bark which are then colonized by the fungus. The tree dies when millions of individual fungus infections coalesce and girdle the tree (Houston and O'Brien 1983).

The dynamics of beech bark disease outbreaks begin with initial colonization followed by disease intensification along a killing front. After most of the beech has been killed, a condition known as the aftermath forest develops. Remaining beech are riddled with non-lethal infections that deform the trees into grotesque forms.

Structural changes include the loss of the beech overstory, increased canopy gaps, increases in snags and down wood debris, understory growth response, and the unique features of the aftermath forest. Most of the population lacks genetic resistance to the disease but a few resistant individuals have been found. Because of this small bit of resistance, the elimination of American beech from the ecosystem is uncertain but the loss of certain unique habitats known as beech gaps is a possibility (K. Johnson, personal communication). These are high elevation stands of clonal origin that could be lost to associated species like sugar maple and yellow birch (*Betula alleghaniensis* Britton) or reverted to grass or shrub lands.

SUMMARY

The interactions of insects and pathogens with their hosts and the attendant ecosystem responses are complex. Managers of wilderness and natural areas should educate the public as to the nature of insects and pathogens as disturbance agents and the ways they interact with forest ecosystems. An understanding of the role of past and present disturbances in shaping the composition and structure of today's forests is critical for interpreting the contemporary influences of forest insects and pathogens. Human disturbances including agriculture, fire, and logging have had profound roles in the past, and continue to affect changes inside designated boundaries.

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Southern Pine Beetle Outbreaks—Impact on Texas Wilderness and Adjacent Private Lands

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Abstract: In 1984, Congress established five wilderness areas in the piney woods of east Texas totaling 37,000 acres. Unlike in the western United States, wildernesses in Texas contain second-growth forests, the product of more than 50 years of forest management and protection. Favored by a current federal policy that largely precludes direct suppression, populations of the southern pine beetle (*Dendroctonus frontalis* Zimmermann) recently increased to unprecedented levels, destroying nearly 40% of the mature pine overstory. The massive beetle infestations also rapidly invaded adjacent private lands, causing economic and emotional hardships to private landowners within several east Texas counties. In excess of 12,000 acres of dead trees have created a potentially catastrophic wildfire situation that further threatens private and public lands. A more rational approach to southern pine beetle management on pine-dominated wildernesses is recommended as a means to better protect wilderness values and adjacent private lands in the future.
Keywords: southern pine beetle, U. S. Forest Service, Congress, wildfire

Wilderness and natural areas in the southeastern United States are subject to impacts from numerous natural disturbances, including fire, wind storms, insects and diseases. One of the most dynamic of these agents in pine-dominated areas is the southern pine beetle (SPB), *Dendroctonus frontalis* Zimmermann (Coleoptera: Scolytidae). Nowhere in the South has the destructive potential of uncontrolled populations of this native insect been more evident than in recently-designated wildernesses in east Texas. Since 1987, following implementation of federal policies that no longer allow prompt direct control, Texas wildernesses have provided breeding grounds for massive SPB populations. Uncontrolled beetle infestations not only caused predictable and preventable perturbations to these previously-managed areas, but, more importantly, they spread to adjacent private forests, causing uncompensated hardships to local landowners.

Southern Pine Beetle Attributes

The southern pine beetle has been a chronic pest of commercial pine forests in the South since before the turn of the century (Price and Doggett 1978). The destructive potential of this native bark beetle is attributed to several unique life history and behavioral attributes. These include: 1) a high reproductive potential with seven generations per year in Texas; 2) a strong tendency during periodic outbreaks to kill pine trees in concentrated groups (termed spots) which may rapidly expand in the absence of control; 3) the capability to infest pines of all ages (five years or older) as infestations expand, regardless of the vigor of the tree or the level of host resistance; and 5) dispersal and attack patterns that change predictably with season (Billings 1986b, 1995. Schowalter et al. 1981, Thatcher et al. 1980).

Management of SPB

In commercial forest situations, forest managers have learned to cope with periodic outbreaks of this native bark beetle pest. Successful prevention involves maintaining healthy stands by means of proper selection of tree species for planting on a given site, periodic thinning, and harvesting before trees become overmature. During cyclic outbreaks, which reach peak levels every 6-9 years in Texas, direct control is often required to prevent beetle infestations from growing to a large size and destroying valuable forest resources (Billings 1980, Redmond and Nettleton 1990).

Direct control methods employed since 1970 consist almost exclusively of cut-and-remove

(salvage) and cut-and-leave (Billings 1980, Swain and Remion 1981). Both methods serve to halt the tree-to-tree expansion typical of SPB infestations. In commercial forests, cut-and-remove has an additional advantage in that the landowner recovers some of his losses by harvesting felled trees.

OBJECTIVE

The purpose of this paper is to discuss the events leading up to the massive SPB outbreaks on Texas wildernesses and to document the impacts that uncontrolled infestations have had on wilderness and adjacent private lands. Recommendations for a more rational approach to SPB management in pine-dominated wildernesses also are provided.

METHODS

To document the impact of SPB infestations on five recently-designated wildernesses and non-wilderness federal lands in east Texas, operational data collected by USDA Forest Service personnel over a nine-year interval (1985-1993) were analyzed. Infestation measurements included mean density of SPB spots (five or more infested trees) per unit area, mean spot size per year, total area infested, and percent of pine type killed. Results for a total of 33,345 acres of pine type on five wilderness areas where little or no control was applied after 1986 were compared to those for 258,856 acres of pine type on five non-wilderness areas (Ranger Districts). Expanding SPB spots located on non-wilderness areas were treated promptly after detection and ground evaluation, primarily with cut-and-remove or cut-and-leave. The five Ranger Districts represented in this study were the Raven (Sam Houston National Forest), Neches (Davy Crockett National Forest), Angelina (Angelina National Forest), Yellowpine and Tenaha (Sabine National Forest). As an additional measure of treatment efficacy, SPB-caused timber losses on the same five wildernesses in Texas for the two-year period 1985-1986 (with control) were compared to those for 1992-1993 (little or no control).

To document the extent to which a control versus no control policy for SPB populations on wilderness influenced the initiation of new infestations on adjacent private lands, a separate analysis of the frequency of SPB infestations was made from Texas Forest Service aerial detection records. Mean numbers of infestations (≥ 10 trees) per Texas Forest Service grid block (18,000 acre unit) were compared for private lands within 40 grid blocks (720,000 acres) adjacent to Indian Mounds, Turkey Hill, and Upland Island wildernesses during the 1985-86 SPB outbreak (with direct control) versus the most recent outbreak in 1990-1993(without control). Infestation density on private lands immediately adjacent to wilderness also was compared to that on 117 grid blocks (2,106,000) situated at least 15 miles from wilderness for the same outbreak intervals.

CHRONOLOGY OF EVENTS

A brief summary of events associated with the National Forests, wilderness, and southern pine beetle control in Texas is essential to fully understand the current situation and the need for appropriate changes in SPB policies on Texas wildernesses:

1880—1930 During this interval, nearly all the virgin forests in east Texas were clear-cut and harvested by early loggers. In Angelina, San Augustine, and Sabine counties (location of Upland Island, Turkey Hill, and Indian Mounds wildernesses), the virgin pine forests were composed primarily of longleaf pine (*Pinus palustris* Mill). (Foster et al. 1917).

1930—1935 Some 650,000 acres of mostly cut-over land in east Texas were acquired by the U.S. government. These lands, administered and managed by the USDA Forest Service, became the Angelina, Davy Crockett, Sabine, and Sam Houston National Forests.

1935—1984 Fifty years of reforestation and forest management efforts by professional foresters, with early assistance by Civilian Conservation Corps crews, led to the reestablishment of mature pine and mixed pine/hardwood forests on the National Forests in Texas. Unlike the virgin forests, the second-growth forests consisted predominately of loblolly pine (*P. taeda* L.) and shortleaf pine (*P. echinata* Mill.). These species are known to be more susceptible to SPB attack than is longleaf pine (Thatcher et al. 1980). Until 1984, these public forests were managed for multiple uses, including the production of pine timber for a growing nation. To protect this valuable forest resource, infestations of the southern pine beetle were promptly controlled first with insecticides (1960-1975), then with mechanical methods of cut-and-remove and cut-and-leave (Billings 1980).

1976 A lawsuit filed by Mr. Edward Fritz,

chairman of the Dallas-based Texas Committee on Natural Resources (TCONR), interrupted the planned harvest, regeneration, and even-aged management of the National Forests in Texas. By 1985, over 75% of the pine stands on the National Forests were over 40 years of age, rendering them extremely susceptible to SPB infestation (USDA Forest Service 1987).

1982—1984 Several small SPB infestations were detected on the Four Notch Further Planning Unit, a 4,400 acre tract being considered for wilderness designation on the Sam Houston National Forest. Due to its classification as proposed wilderness and in response to protests from Edward Fritz and other environmentalists, direct control was delayed until the late summer of 1983. By this time, beetle infestations had grown rapidly and coalesced into a 1,500 acre outbreak that was advancing at 50 feet per day along a 3-mile front. A 250-foot buffer strip and helicopter logging were used to successfully stop the advancing beetle infestation, but not before 3,400 acres of timber were lost (valued at $4,000,000), including several colony sites of the endangered Red-cockaded Woodpecker (Billings and Varner 1986, Miles 1987). Ironically, at the request of these same environmentalists, the Four Notch tract was dropped from wilderness consideration, in favor of five less disturbed (but equally beetle-prone) tracts.

1984 These five National Forest tracts, totally some 34,000 acres of previously-managed pine and pine-hardwood forests, were designated wilderness in late 1984. These areas have since been expanded to a total of 37,157 acres and consist of Indian Mounds Wilderness (11,037 ac) in Sabine County, Turkey Hill Wilderness (5,473 ac) in San Augustine County, Upland Island Wilderness (13,468 ac) in Angelina County, Big Slough Wilderness (3,369 ac) in Houston County, and Little Lake Creek Wilderness (3,810 ac) in Montgomery County. The USDA Forest Service (1987) classified the second and third generation forest cover on these areas as 90% pine or mixed pine/hardwood forests. Despite the presence of numerous young pine plantations, woods roads, and gas/oil development, wilderness proponents cited the extensive stands of 50- to 60-year old pine trees as a primary attribute of Texas wilderness (Evans 1986). Wilderness boundaries are shared about equally between multiple-use National Forest land and private landowners.

1985—1986 In the worst outbreak in Texas history, southern pine beetle populations in east Texas reached unprecedented levels. During 1985, more than 15,000 infestations occurred on public and private lands (Texas Forest Service, unpublished data). From 1984 - 1986, SPB infestations on Texas wildernesses were evaluated for spread potential. Expanding infestations were treated by cut-and-remove (salvage) or cut-and-leave, effectively limiting losses to 1,739 acres or 5.7% of the available host type, despite protests and lawsuits from environmentalists who again favored a no control policy (Miles 1987). Beetle populations declined from natural causes throughout east Texas in 1986.

1987—1988 The Final Environmental Impact Statement (EIS) for Suppression of the Southern Pine Beetle - Southern Region (USDA Forest Service 1987) was prepared and implemented. This document drastically changed procedures for SPB control on wilderness. Past procedures of prompt detection, evaluation, and timely control of infestations while they were still small were discontinued on wilderness, but continued on general forest areas of the National Forests and most private lands. Based on guidelines of the EIS, coupled with later rulings by federal judges, beetle infestations on wilderness are now left to run their course with no intervention by man unless they threaten private lands or resources required by the endangered Red-cockaded Woodpecker. Even then, no control is implemented until several criteria are met: 1) a site specific evaluation is conducted by a professional entomologist, 2) the infestation occurs (or expands to) within 1/4 mile of private lands, 3) the private landowner is willing to control beetle infestations on his/her property, and 4) the USDA Forest Service is assured of a reasonable prospect for control. (As would soon be demonstrated once again, by the time expanding infestations meet criteria 2, they are often too large for the USDA Forest Service to meet criteria 4).

1989—1991 Beetle infestations began to increase again in east Texas, particularly on the wildernesses. Direct control was applied on Little Lake Creek Wilderness to protect Red-cockaded Woodpecker colonies (precipitating more lawsuits from environmentalists), but little control was applied to infestations on other wildernesses.

1992—1993 As a direct result of current

wilderness policies restricting timely beetle control, certain wilderness infestations grew to massive sizes (as predicted by Billings 1986a and Billings and Varner 1986). Losses were particularly severe on Indian Mounds Wilderness and Turkey Hill Wilderness (Table 1). In 1992 and 1993 alone, 12,600 acres of pine forest were killed by SPB within Texas wildernesses. This represents 38% of the pine host type on these areas. Delayed control efforts by the USDA Forest Service were applied in some cases, but, for the most part, buffer-cutting and insecticides were ineffective in halting the rapid spread of several large infestations to adjacent private lands. At least 24 private and industrial landowners suffered losses amounting to an estimated 662 acres as beetles spread directly across wilderness boundaries on Indian Mounds, Turkey Hill, and Upland Island wildernesses (Texas Forest Service, unpublished data). These losses would have been much greater if the affected landowners had not taken prompt action to control the infestations once the beetles invaded their property. Additional acreage had to be prematurely harvested on National Forest lands when unchecked beetle populations spread from wilderness.

1994—1995 Fortunately, beetle populations declined drastically in 1994 and 1995 from peak levels experienced in 1992 and 1993. Only 557 and 238 SPB infestations were detected statewide in 1994 and 1995, respectively. Indeed, most of the beetle activity in 1993 was limited to Indian Mounds Wilderness, Turkey Hill Wilderness, and surrounding counties. The decline was attributed to natural causes. If historical patterns prevail, beetle populations may remain low for a few years, but can be expected to return once favorable conditions again prevail.

CONSEQUENCES OF CONTROL VERSUS NO CONTROL

It is important to realize that the 12,600 acres within wilderness areas and the 662 acres of private lands lost to wilderness-generated beetles in 1992 and 1993 could have been largely prevented had the USDA Forest Service been able to practice the same level of control on wilderness as they routinely do in non-wilderness forests. A comparison of beetle control on wilderness and non-wilderness lands in Texas documents the effectiveness of prompt direct control. Southern pine beetle infestations in 1992 and 1993 averaged 41 acres per infestation on wilderness compared to an average of one acre per infestation on non-wilderness areas of the National Forests in Texas (Table 2). By treating 67% of the beetle infestations on non-wilderness (those in the process of expansion), losses were limited to less than 2% of the host type (pine forests) compared to 38% loss on wilderness. Under current policies, beetles have rapidly and needlessly eliminated nearly half of the 50-60 year-old pine overstory, the primary attribute for which these areas were selected as wilderness (Evans 1986).

Had the same prompt control procedures been applied to wilderness, losses from the 307 beetle infestations detected within wilderness areas in 1992 and 1993 would have been reduced by 98% (based on an average size of one acre per treated infestation, Table 3). If one assumes an average size of three acres per treated infestation (the mean size for wilderness infestations controlled during the record 1985 outbreak), total resource losses on wildernesses would have amounted to less than 1,000 acres in 1992 and 1993. This represents a reduction of 93% from losses actually experienced during 1992 and 1993.

An analysis of Texas Forest Service beetle detection records provides evidence that private lands at considerable distances from Indian Mounds, Turkey Hill, and Upland Island wildernesses also suffered increased beetle infestations in 1992 and 1993 as a result of wilderness policies (Table 4). The frequency of infestations per unit area on private lands within approximately 15 miles of these wildernesses, was three times higher in 1992 and 1993 than on more distant private lands. Yet, during 1990-91, prior to the most recent beetle population explosion on Texas wildernesses, private lands adjacent to wilderness supported the same infestation levels as those on the check area (distant from wilderness). Infestation levels on private lands near wilderness were nearly twice as high in 1992 and 1993 as in 1985 and 1986 (Table 4), the worst outbreak on record in east Texas. These data provide convincing evidence that beetles from the huge populations allowed to develop on federal wildernesses not only may spread directly across to adjacent private properties, but are capable of dispersing considerable distances. Presumably, beetles dispersing from wilderness were responsible for the abnormally high level of new infestations on

Table 1: Acres of pine host type killed by the southern pine beetle on five Texas wilderness areas under the current federal policy of little or no direct control (1987-1993).

Wilderness	Acreage of pine	Acreage killed	% Killed
Indian Mounds	10,917	7,533	69%
Turkey Hill	4,549	2,093	46%
Upland Island	13,230	1,984	15%
Little Lake Creek	3,338	1,435	43%
Big Slough	1,306	156	12%
Total	33,340	13,336	40%

Table 2: Summary of the impact of southern pine beetle infestations on wilderness with prompt control (1985-86), wilderness with little or no control (1992-93), and non-wilderness with prompt control (1992-93). National Forests in Texas.

Criteria	1985-86 Wilderness[1]	1992-93 Wilderness[1]	1992-93 Non-wilderness[2]
Control policy	Prompt control	No control[3]	Prompt control
Total area of host type (ac)	30,530	33,340	258,880
Mean spots/1000 ac/yr[4]	9.8	6.2	8.7
% of spots controlled	44%	8%	67%
Mean acres/spot	3.0	41.1	1.0
Host type killed (ac)	1,739	12,621	4,373
% of total host type killed	5.7%	37%	1.7%

[1]Little Lake Creek, Big Slough, Upland Island, Turkey Hill, and Indian Mounds Wildernesses.

[2]Raven, Neches, Angelina, Tenaha, and Yellowpine Ranger Districts.

[3]Except when necessary to protect adjacent private lands or endangered Red-cockaded Woodpecker habitat.

[4]Spot = southern pine beetle infestation with 5 affected trees at detection.

Table 3: Estimated losses on Texas wilderness that would have occurred had direct control been applied to all (307) expanding infestations versus actual losses in 1992 and 1993.

Level of SPB Control	Mean Spot Size (acres)	Total Losses (acres)[1]	Percent Reduction
Actual	41.1	12,621	—
Prompt	1.0[2]	307	98%
Delayed	3.0[3]	921	93%

1 Based on 307 spots on 5 wildernesses and mean spot size with and without control.

2 Mean acreage for non-wilderness SPB spots in 1992 and 1993.

3 Mean acreage for wilderness SPB spots in 1985 and 1986.

Table 4: Comparison of southern pine beetle infestation density on private lands adjacent to wilderness versus private lands located more than 15 miles from wilderness in Sabine, San Augustine and Angelina counties, Texas during intervals of prompt direct control (1985-1986) versus delayed or no control (1990-1993) on wilderness.

Location	No. of grid blocks[1]	Mean Infestations/Grid Block/Yr 1985-86 [2]	1990-91[3]	1992-93[4]
Adjacent to wilderness (720,000 acres)	40	9.4	2.6	15.6
More than 15 miles from wilderness (2,106,000 acres)	117	9.6	2.1	5.0

1 One grid block = 18,000 acres

2 During the previous outbreak when direct control was promptly applied within wilderness

3 Before large infestations developed on the wilderness areas

4 During the period when massive infestations occurred on the wilderness areas

private lands, adversely impacting a wide area in Sabine, San Augustine, and Angelina counties in 1992 and 1993.

RECOMMENDATIONS FOR FUTURE SPB MANAGEMENT ON WILDERNESS

Research (Billings and Pase 1979b, Fitzgerald et al. 1994, Hedden and Billings 1979, Schowalter et al. 1981, Thatcher et al. 1980 among many) and forty years of practical experience (Billings 1980, 1995, Carter et al. 1991, Redmond and Nettleton 1990), have provided overwhelming evidence that resource losses to the southern pine beetle can be greatly reduced through programs of prevention (periodic thinning, harvesting forests at maturity) and timely direct control (cut-and-remove, cut-and-leave) (Swain and Remion 1981). Whereas silvicultural manipulations to increase the resistance of forest stands to SPB are not appropriate for wilderness, I believe that for the next few decades judicious direct control of expanding infestations is essential, given the small size of Texas wilderness units, the shared boundaries with private lands, and the unnatural preponderance of previously-managed, beetle-susceptible pine forests that remain on these areas.

Direct control would not need to be applied to each and every wilderness infestation, since only a small proportion ever grow to large size (Billings 1980, 1995). Entomologists and foresters have the technology to evaluate SPB infestations early in their development and accurately predict which ones will continue to enlarge in size if not controlled (Stephen and Lih 1985). This expertise allows infestations to be effectively treated early in their development (when direct control methods are most effective). Prompt treatment also would curtail the development of massive and unnatural SPB outbreaks that rapidly and adversely alter the existing wilderness landscape.

I recommend that methods for setting control priorities (Billings and Pase 1979a), validated infestation growth models (Stephen and Lih 1985), expert systems to aid southern pine beetle decision-making (Coulson et al. 1995), and other available technology (Thatcher et al. 1980) be used to evaluate each infestation within wilderness that exceeds twenty affected trees in size at detection. In turn, each infestation predicted to grow in size to over 100 infested trees in the absence of direct control (regardless of its location within wilderness) would be treated promptly with the most effective and least environmentally-destructive control method available. The only exceptions would be for those infestations that provide no threat to private lands due to the absence of continuous pine host type. If applied when SPB infestations are still small (<100 trees), a simple cut-and-leave operation would be sufficient to disrupt the continued expansion of these infestations and prevent their eventual spread to private lands (Billings 1980, 1986a,b, 1995; Carter et al. 1991).

Verbenone, an inhibitory pheromone produced by male southern pine beetles, has shown considerable promise as a future control method (Billings 1995, Billings et al. 1995, Payne and Billings 1989). Operational use of this behavioral chemical for control purposes on wildernesses must await further testing in other areas of the South and registration by the Environmental Protection Agency. The USDA Forest Service and the Texas Forest Service are working cooperatively toward this goal and hope to have this tactic available by the next beetle outbreak.

It is important to emphasize that verbenone is no panacea for protecting wilderness or private landowners from beetle attack. Tests to date (Payne and Billings 1989, Billings et al. 1995) have clearly demonstrated that verbenone is most effective when 1) applied to infestations with less than 100 infested trees, and 2) combined with the felling of infested trees as a means to reduce natural sources of attraction (pheromones). Clearly, if verbenone or other direct control tactics are to be effectively applied in Texas wilderness, federal policies must first be changed to permit control of expanding infestations early in their development, regardless of their location within wilderness.

With beetle populations in an endemic phase throughout east Texas, an opportunity is now available to evaluate the outcome of wilderness policies established in 1987 and to strive for improvement. If no changes are made, both private and public lands are destined to suffer similar consequences during future beetle outbreaks, because some 20,000 acres of susceptible pine forests remain on Texas wildernesses.

SUMMARY

Recent experiences in Texas have demonstrated that the current wilderness policy of delayed control of southern pine beetle infestations is ineffective for protecting existing

wilderness values or adjacent public and private lands. The USDA Forest Service has the tools and expertise to prevent excessive and rapid losses from occurring on and off wilderness in the future. Judicious and more timely control, when deemed necessary by professional entomologists, would provide a means to effectively avoid the many adverse consequences suffered in recent years. Indeed, had a policy of prompt control of wilderness infestations prevailed during 1992 and 1993, intervention by man would likely have:

- prevented the spread of uncontrolled beetle infestations across wilderness boundaries and resulting loss of 662 acres on adjoining private properties,
- reduced the level of proliferation of new infestations on adjacent private lands in Sabine, San Augustine, and Angelina counties in 1992 and 1993 by as much as two-thirds,
- protected more than 11,000 acres of mature pine forests within five wildernesses from needless losses to beetles,
- prevented the occurrence of several thousand contiguous acres of dead and dying trees that are now producing high hazard conditions for wildfire and recreation in Sabine, San Augustine, and Angelina counties,
- created over 300 openings (controlled beetle infestations) averaging 1-3 acres in size scattered throughout wilderness, eventually favoring a greater diversity of tree species and age classes instead of total and rapid loss of the pine overstory. The latter event favors regeneration of more sun-loving pines rather than shade-tolerant hardwoods, setting the stage for repeated SPB outbreaks.

In my opinion, light-handed intervention by man during periodic beetle outbreaks would serve to prolong existing wilderness attributes while gradually and gently converting these beetle-prone areas to a more natural and stable forest condition. Once a climax forest of varied tree species and age classes is attained, further interaction for bark beetle control would seldom be necessary within Texas wilderness.

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Southern Pine Beetle and Fire in Wilderness Areas: The Kisatchie Hills Wilderness, Kisatchie National Forest

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Abstract: Southern pine beetle infestations affect wilderness areas in the southeastern United States. In the Kisatchie Hills Wilderness area in Louisiana, a southern pine beetle outbreak resulted in widespread destruction of longleaf pine. Nest trees of the red-cockaded woodpecker, an endangered species, also were killed. Following the epidemic, a fire fueled by beetle-killed pines went through the wilderness. Forest structure, species composition, successional processes and general ecosystem function were substantially altered as a result of these two related disturbances. Most wilderness areas containing southern pines were managed for pine timber before being designated as wilderness. Bark beetle outbreaks are a predictable form of negative feedback when all management is suddenly withdrawn. Resultant large areas of dead pine create conditions conducive to intense wildfires. Judicious use of bark beetle control tactics and prescribed fire can smooth the transition from managed forest to wilderness by protecting wilderness attributes and red-cockaded woodpecker habitat and cavity trees.

Keywords: southern pine beetle, Kisatchie Hills Wilderness, fire, longleaf pine, red-cockaded woodpecker, endangered species

Wilderness and natural areas in the southeastern United States with substantial areas of mature, dense stands of pine, especially loblolly, *Pinus taeda* ,and shortleaf, *P. echinata*, are often susceptible to outbreaks of the southern pine beetle, *Dendroctonus frontalis* Zimmermann (SPB), active in recent years. At the "Wilderness and Natural Areas in the Eastern United States: A Management Challenge" conference in 1985, emphasis on forest protection included a discussion of forest insects and disease as they impact wilderness and natural areas in the eastern United States. Billings and Varner (1986) presented an overview of the southern pine beetle in wilderness and natural areas. They emphasized the protection of these areas and indicated the challenge to wilderness managers. They stated "Several scenarios are possible:

"1) a wasteland of brush and dead pine snags that may eventually develop into a natural forest ecosystem,
2) an uneven-aged perpetual pine forest or
3) a climax forest of shade tolerant hardwoods, primarily oaks and hickories.
Choice No. 1 is perhaps the easiest to obtain. Just exclude beetle control and let a massive southern pine beetle outbreak eliminate the existing pine overstory." (p. 125).

Billings and Varner cite additional investigations that details control of southern pine beetle (Morris and Copony 1974, Texas Forest Service, 1978, Smith and Conner 1985).

Smith and Nettleton (1986) presented hazard rating for southern pine beetles on wilderness areas on National Forests in Texas. These wilderness areas were designated in 1984 and included Little Lake Creek, Upland Island, Turkey Hill, Big Slough and Indian Mounds. Billings documents the events in Indian Mounds as part of the current volume (Billings this

volume). In 1985, Smith and Nettleton, for planning purposes, rated these wilderness areas in Texas based on Mason et al. (1985). They found a higher amount of the areas in higher hazard classes (Table 1). Turkey Hill (42 %) and Little Lake Creek (25 %) and Upland Island (16 %) had the greatest percentages of high hazard ratings. On Ranger Districts, Raven Ranger District had the highest rating (18 % high hazard). Medium hazard was highest in wilderness areas in Indian Mounds (54 %), Little Lake Creek (53 %), Upland Island (41 %) and Turkey Hill (34 %).

Within the Ranger Districts, southern pine beetle hazard and risk rating was completed using the Texas Forest Service Grid Block System. (Billings and Bryant 1983). The wilderness areas in Texas with the highest hazard were Little Lake Creek and Upland Island (Table 2) with grid block 684, 89 % (Turkey Hill Wilderness), grid block 316, 75 % (Little Lake Creek Wilderness) and grid block 623, 75 % (Big Slough Wilderness). By 1995, the hazard rating based on the grid block system had increased to extreme in parts of Little Lake Creek and high in parts of Little Lake Creek, Upland Island, Turkey Hill and Indian Mounds.

Southwide in 1987, southern pine beetle in wilderness areas were summarized (USDA Forest Service 1987). Of the total of 117,263 acres surveyed, 5567 acres (4.8 %) were infested (Table 3). The largest acreage was the Kisatchie Hills Wilderness (3930 acres), followed by Little Lake Creek (520 acres), Upland Island (457 acres), Indian Mounds 358 acres) and Turkey Hill (115 acres), all in Texas wilderness areas. By 1993, the acreages in wilderness areas in Texas had increased to 13,336 acres or 40 % of the 33,340 acres of wilderness areas in Texas (Billings, this volume).

Hazard and risk rating systems allow the manager to rate a stand's susceptibility to attack by the southern pine beetle and to estimate future stand conditions. Nebeker et al. (1995) rated red-cockaded woodpecker clusters in Mississippi. The term "hazard" refers to the susceptibility of an area to insect infestations based on site, stand and host factors; "risk" refers to the probability an infestation will occur within a given time span (Billings et al. 1985). Mitchell (Mitchell 1987, Mitchell et al. 1991) rated red-cockaded woodpecker clusters in loblolly and shortleaf pine stands in the Angelina Ranger District of the Angelina National Forest.

Nettleton and Smith (1983) compared wilderness areas versus Ranger Districts for numbers of southern pine beetle spots/ 1000 acres. Smith and Nettleton (1986) emphasize "that the areas chosen for wilderness attributes are also areas where southern pine beetle can be expected to cause extensive losses. This danger is highly evident during outbreak years which we are now experiencing. More importantly, these areas will continue to provide highly susceptible host type for the southern pine beetle during endemic periods." (p. 127).

Billings and Varner (1986) chronicled the Four Notch and Huntsville State Park experiences for control or no control of southern pine beetle. In the Four Notch Further Planning area on the Raven District of the Sam Houston National Forest, a 6,832 acre (2767 ha) tract was a candidate for wilderness designation. According to the final USDA Forest Service figures (Forrest Oliveria, USDA Forest Service, Pineville, LA), 3736 acres (1512 ha) were affected by the southern pine beetle outbreak representing 55 % of the Four Notch Further Planning Area. Of the total, 2927 acres (1185 ha) were salvaged by helicopter or by conventional means, 77 acres (31 ha) felled and left and 732 acres (296 ha) killed by southern pine beetle and left standing. The Four Notch unit was excluded from wilderness consideration. This is summarized as a case study in the southern pine beetle Environmental Impact Statement (USDA Forest Service 1987).

In the Huntsville State Park, Billings and Varner (1986) emphasize "Preservation of southern pine forests as wilderness, particularly those forest that are a product of intensive forest management, will necessarily require protection by man to preserve or prolong these valued attributes." (p. 133). (See also list of reference material at end of this article.)

Hertel et al. (1986) investigated integrated pest management concepts and their application in wilderness and natural areas management. Pest management is the component of forest management concerned with minimizing the negative impacts of insects, diseases, weeds and animals on a forest landscape. Integrated Pest Management is directed at the entire forest and is part of planned forest management. The strategies for Integrated Pest Management must be based on knowledge gained from research and development activities, on the ground experience and integration of results into an over all management plan.

The Final Environmental Impact Statement for the Southern Pine Beetle (USDA For. Serv. So. Reg. 1987) presents the case history of the Four Notch RARE II Study Area complete with chronological maps. The Big Thicket National Preserve, a 84, 555 acre areas managed by the USDI National Park Service, a total of 8677 acres of 51,184 acres of susceptible host type was infested (16.9%). The largest areas infested included the Lance Rosier Unit (2000 of 18,700 acres infested); the Big Sandy Creek Unit 2000 of 14,300 acres infested; and the Beech Creek Unit (3000 of 4856 acres infested). In 1977, the National Park Service formulated four criteria before suppression efforts for southern pine beetle would be undertaken:

1) the southern pine beetle infestation had to be within 1/4 mile of a unit boundary;

2) host type had to be of sufficient density to provide for spot expansion to a unit boundary;

3) sufficient density of host type had to exist on adjacent private timberland; and

4) monitoring data had to indicate that the spot was expanding towards a unit boundary. An exception to these criteria was permitted if an southern pine beetle infestation immediately threatened a red-cockaded woodpecker cavity tree.

Kisatchie Hills Wilderness Area Kisatchie National Forest

An important case study of bark beetle effects on wilderness areas and associated values may be seen from the 1986 southern pine beetle outbreak in the Kisatchie Hills Wilderness Area in the Kisatchie National Forest in Louisiana. The Kisatchie Hills Wilderness Area contains 8700 acres of pine and pine-hardwood forest.

The southern pine beetle affects both the pine resource and potentially cavity trees of the red-cockaded woodpecker, an endangered species. The seasonal behavior of the southern pine beetle leads to two different types of impact on the red-cockaded woodpecker. First, behavior associated with the southern pine beetle in refuge hosts (Coulson et al. 1985) can result in mortality to cavity trees (Conner et al. 1991, Rudolph and Conner 1995). Second, behavior associated with growth of southern pine beetle infestations can result in destruction of red-cockaded woodpecker foraging habitat (Coulson et al. 1995). On National Forests in Texas, the southern pine beetle was responsible for more than 50% of cavity tree mortality when bark beetle populations were at a non-epidemic level (Conner et al. 1991).

A significant portion of red-cockaded foraging habitat consists of mature older age-class loblolly, shortleaf or longleaf pine. The proximity of cavity trees and potentially high hazard foraging habitat creates a forest environment that may be conducive to southern pine beetle outbreaks.

Longleaf pine is the predominant species in the Kisatchie Hills Wilderness area as a result of reforestation efforts prior to wilderness designation. Longleaf pine generally are highly resistant to bark beetle attack because of their resin system (Wahlenberg 1946). In this case, longleaf pine were readily killed by this unusually explosive southern pine beetle outbreak. By mid-January, 1986, roughly 3900 acres (45% of the wilderness area) had been affected (Kulhavy et al. 1988).

Cut-and-leave was the only control tactic employed, with pines felled on about 3300 acres. Pines on the remaining acreage had been vacated by the beetles and were left standing as snags. Pine felling in mixed pine-hardwood stands resulted in residual stands dominated by hardwoods, particularly oaks (*Quercus* sp.), hickory (*Carya* sp.) and sweetgum (*Liquidambar styraciflua*). Bark beetle mortality along with control activities thus drastically altered normal succession.

On April 10, 1987, a lightning strike ignited a fire in the southern pine beetle cut and leave area. Heavy ground fuel, dry hot winds, rugged terrain and no use of mechanical or motorized equipment limited the response. By April 15, 2000 acres had burned threatening private land near Bayou Seep in the northeast quadrant. Fire hand crews from Arkansas, Louisiana and Texas attempted to build fire lines, then planned back fires to eliminate ground fuels. By the evening of April 15, following high winds and lack of success from back fires, the fire spread to 3000 acres. At the April 15 fire meeting, the decision was made to set fire lines at the boundary of the wilderness area. On April 16, the fire had spread to within 1/4 mile of Longleaf Pine Vista, an important historic site. Helicopters and air tankers and fire trucks were used to slow the fire spread. The Kisatchie Hills Wilderness Area fire affected 7500 acres, employed 500 fire fighters from 6 states and 4 agencies and the U. S. Army. It was the largest wildfire in Louisiana history.

Fire doesn't burn uniformly over large areas (Spurr and Barnes 1980), thus creating mosaics on a landscape scale. Although many trees were killed, many remained. Tree basal area was reduced and grasses were stimulated, effects that may favor longleaf pine recovery in the area.

Red-cockaded Woodpecker in Wilderness Areas

Jackson et al. (1986) summarized the status of red-cockaded woodpecker in wilderness areas in the southeastern United States. In 1986, there were an estimated 5 active, 16

Table 1. Acres by percent of southern pine beetle hazard class (includes all forest types within wilderness areas and associated Ranger Districts in Texas (from Smith and Nettleton 1986).

Wilderness Area/ Ranger District	Hazard Class High	Medium	Low
Little Lake Creek	25	53	22
Raven Ranger District	18	21	59
Upland Island	16	41	43
Turkey Hill	42	34	24
Angelina Ranger District	4	15	81
Big Slough	10	17	73
Neches Ranger District	12	20	68
Indian Mounds	13	54	34
Yellowpine Ranger District	6	8	85

Table 2. Southern pine beetle hazard rating of Texas Wilderness Areas using the Texas Forest Service Grid Block System (Billings and Bryant 1983) (from Smith and Nettleton 1986).

Wilderness Area	Grid Block	Appox. % of WA	SPB Hazard	SPB Risk 1984	1985
Little Lake Creek	316	75	High	High	High
	266	21	High	High	Extreme
	265	4	High	Moderate	Extreme
Upland Island	882	47	Low	Low	Low
	832	39	High	Moderate	High
	833	9	High	High	High
	883	5	Moderate	Moderate	Moderate
Big Slough	623	75	Moderate	High	Moderate
	573	25	Low	Moderate	Moderate
Turkey Hill	684	89	High	Extreme	High
	685	11	Low	Moderate	Low
Indian Mounds	690	38	Low	Moderate	Low
	689	27	Moderate	High	Moderate
	740	18	Low	Moderate	Low
	739	17	Moderate	High	Moderate
	738	Adjacent	High	Extreme	High
	789	Adjacent	High	Extreme	High

1 Based from an analysis of pine host abundance and suitability for southern pine beetle infestations, derived from aerial photographs

2 Based on a combination of hazard class and 1982-1983 southern pine beetle activity.

3 Based on a combination of hazard class and 1983-1984 southern pine beetle activity.

Table 3. Percent of southern pine beetle infestations by wilderness area as of September 30, 1986 (USDA Forest Service 1987).

Wilderness	Acreage	Infested Acreage	Percent Infestation
Cheaha	6780	7	0.1
Sipsey	12,726	85	0.7
BlackForkMountain	7568	0	0
Caney Creek	14,344	15	0.1
Dry Creek	6310	0	0
Flatside	10,105	0	0
Poteau Mountain	10,844	0	0
Kisatchie Hills	8700	3930	45.2
Black Creek	4560	53	1.2
Leaf	940	0	0
Big Slough	3000	27	0.9
Indian Mounds	9946	358	3.5
Little Lake Creek	4000	520	13.0
Turkey Hill	5400	115	2.1
Upland Island	12,000	457	3.8
Totals	117,263	5567	4.8[1]

[1] Denotes average

inactive and 33 of unknown status. In 1993, there were approximately 25 active clusters in five wilderness areas: Little Lake Creek and Upland Island in Texas; Kisatchie Hills in Louisiana; and Mud Swamp/ New River and Brawl Bay, both in Florida (USDA Forest Service 1995). On state land in Oklahoma, there were 29 active clusters in the McCurtain County Wilderness (Wood 1977, Wood and Lewis 1977). A more extensive survey in 1989-1990 located 14 active groups with 31 individuals (Kelly 1991). Masters et al. (1995) reported 9 active clusters with 22 birds. They outlined historical fire occurrence in the McCurtain County Wilderness Area. On the Okefenokee National Wildlife Refuge in Georgia, managed by the USDI Fish and Wildlife Service, there were 26+ clusters of unknown status (Jackson et al. 1986). In 1995, Masters et al. reviewed the fire history and frequency of the McCurtain County Wilderness Area.

In developing the Environmental Impact Statement for managing the red-cockaded woodpecker , the need to control southern pine beetle outbreaks that threatened red-cockaded woodpecker habitat was evaluated. Under the Final Environmental Impact Statement for the Suppression of the Southern Pine Beetle (USDA Forest Service 1987) control activities would be initiated in wilderness if a southern pine beetle infestation was within one-half mile of an essential woodpecker group, adverse effects are likely to occur within the next 30 days, and the group's continued existence is threatened. The current status of management favoring red-cockaded woodpeckers and controlling southern pine beetle outbreaks in wilderness is ambiguous. The Record of Decision, Final Environmental Impact Statement for the Management of the Red-cockaded Woodpecker and its Habitat on National Forests in the Southern Region (1995) states the following (page 4):"Originally Alternative E (the selected alternative) eliminated the inclusion of wilderness in HMAs (habitat management areas) and designated wilderness RCW clusters as non-essential. It was pointed out during the review that wilderness comprised of forest types which could be maintained as suitable RCW habitat primarily with prescribed burning should be considered for inclusion in HMAs. Therefore the flexibility to place wilderness within HMAs has been included. If this occurs, wilderness direction in Forest Plans will provide the appropriate management activities to sustain RCW habitat, compatible with individual wilderness direction." Although prescribed fire is emphasized, midstory control also may be applied (page 18). Wilderness woodpecker groups are still considered non-essential (page 19). "Alternative E does allow control of southern pine beetles within wilderness to protect RCW groups within 1/4 mile of, but outside the wilderness boundary or their foraging habitat." (USDA Forest Service, 1995).

The 1982 decision to control infestations in the Caney Creek Wilderness Area on the Ouachita National Forest in Arkansas was based on an environmental assessment of appropriate control techniques. The eight spots detected in the fall of 1982 were treated by cut and hand spray and cut and leave. Approximately 75 acres were treated to control the eight spots. Two small spots detected in October 1983 were monitored and went inactive (USDA Forest Service 1987). On the Black Creek Wilderness Area in Mississippi, southern pine beetle infestations were treated by cut and hand spray and cut and leave. Three southern pine beetle infestations were treated over a five acre area using chemical treatment (cut and spray) and two acres by cut and leave. Forty-six acres were killed by the southern pine beetle. A total of 22 infections were detected and 19 were not treated. On wilderness areas in Texas, there were a total of 599 southern pine beetle infestations in 1985 and 1986. Fifty-six percent (337 spots) were not treated, but were monitored until they became inactive; forty-four percent (262 infestations) were controlled to protect adjacent lands or RCW clusters. Cut and leave was used to control 190 infestations and cut and remove was used to control 72 spots. Of the 34,346 wilderness acres, 1393 or 4 percent were cut for southern pine beetle. An additional 85 acres of trees were killed by southern pine beetle.

In the Limits of Acceptable Change initiative on Turkey Hill and Upland Island Wilderness areas in Texas, endangered, threatened and sensitive communities; fire as a management tool; and southern pine beetle were the three highest ranked concerns on the Upland Island wilderness; and fire as a management tool, southern pine beetle, water quality, recreation and endangered, threatened and sensitive communities on Turkey Hill Wilderness (Rebori 1994). Within opportunity classes, areas subject to southern pine beetle management had low to medium opportunities for solitude; areas characterized by a 0.25 mile perimeter inside the wilderness for areas bordering private lands (or sensitive area). Fire is proposed to bring back presettlement vegetation and to ensure perpetuation of sensitive plant species (Rebori 1994, Rebori and Legg, this volume).

Disturbances, defined as a physical force or process that can cause a sudden change in a system, can be described from

1) the initial predominant effect;
2) frequency;
3) spatial distribution; and
4) temporal distribution.

These characteristics define the magnitude of the disturbance on the system (White 1979, Rykiel 1985).

As stated by Billings (1998, this volume), much of the southern pine dominated wilderness was previously managed for pine timber. Bark beetle outbreaks are a predictable consequence of suddenly withdrawing management from previously managed mature pine forests. From 1987 to 1993 about 40 percent of the pines in Texas wilderness have been killed by bark beetles (Billings 1998). Substantial impacts on wilderness attributes occur as a result of this negative feedback. In the future, judicious management activities such as hazard reduction by thinning, prescribed fire, and prompt beetle control may lessen the danger of drastic impact from bark beetle epidemics and wildfire.

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Wetland Identification and Functional Assessment of Plant Communities in Harrison Bayou

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Wetland Identification and Functional Assessment of Plant Communities in Harrison Bayou

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Abstract: Jurisdictional wetlands will be identified and a functional assessment performed on Harrison Bayou, within the confines of the Longhorn Army Ammunition Plant (LHAAP), Karnack, Texas. Satellite imagery, aerial photos, and area maps have been utilized to create a Geographic Information System (GIS) database. Classification routines have been performed on this database, which have identified about 13 major vegetation communities. Each community is being field checked to verify its bounds and composition. Vegetation communities will be identified as wetland, according to procedures described in the U.S. Army Engineer 1987 Wetland Identification and Delineation Manual. Using the Harrison Bayou wetlands as a reference, two bottomland hardwood wetlands will be qualitatively assessed for 5 water quality functions. These functions include: Floodflow Alteration, Removal of Elements and Compounds, Organic Carbon Export, Sediment Stabilization, and Nutrient Cycling. Functions will be assessed using the U.S. Army Engineer Hydrogeomorphic Assessment Technique for Riverine Wetlands. The results of the wetland identification and functional assessment will be entered into the GIS database.

Keywords: bottomland hardwood wetlands, wetland identification and delineation, wetland functional assessment, Hydrogeomorphic Assessment Method, floodflow alteration, sediment stabilization, nutrient cycling, removal of elements and compounds, organic carbon export, Geographic Information Systems.

INTRODUCTION

With the passage of the National Environmental Policy Act (NEPA) in 1970, environmental assessment and impact statements became required for those federal projects which "significantly affect the quality of human environment" (Jain et al. 1993). Also, during the 1970's, the federal government began to increase the protection of wetlands through legislation, especially with the passing of the 1977 Clean Water Act amendments (National Research Council, 1995). As a result, resource managers are often called upon to evaluate the impact of a proposed project on a specific wetland or a series of wetlands. First, the wetlands must be identified and their boundaries determined. Then project impacts to wetland functions can be assessed after a determination of what wetland functions are being performed under current, pre-project conditions. Resource managers require accurate, simple, and expedient methods for identifying and delineating wetlands and for assessing wetland functions.

Bottomland hardwood ecosystems are riparian wetlands that have an abundance of species diversity and also a high species density. Like other wetland types, bottomland hardwoods are capable of performing a variety of functions. For example, they can perform water quality functions such as floodflow alteration, nutrient cycling, organic carbon export, sediment stabilization, and the removal of elements and compounds (Mitsch and Gosselink, 1993). Not all of these functions are performed by all bottomland hardwood wetlands, nor are they performed at equal rates.

Harrison Bayou, a tributary of Caddo Lake on the Texas-Louisiana border, is a bottomland hardwood area that has been minimally impacted by man as compared to the rest of East Texas. When loggers first moved into the Caddo Lake region, there were many bottomland hardwood sites that were not harvested due to their

inaccessibility and the primitive logging equipment of the time (Walker, 1983). By the time technology had advanced to the point where these areas were accessible, much of Harrison Bayou had been incorporated into U.S. Department of Defense (DoD) holdings and placed off-limits. While many of the bottomland hardwood forests in the region have been harvested, Harrison Bayou remains as perhaps the best example of how bottomland hardwood forests in East Texas may have appeared at the time of European settlement.

The project described below proposes to augment the current natural resource inventory of Harrison Bayou with a vegetative community characterization, wetland community identification, and wetland functional assessment. The project is funded by DoD through the Texas Regional Institute for Environmental Studies (TRIES).

LOCATION OF STUDY AREAS

Longhorn Army Ammunition Plant (LHAAP) lies on the southeast shore of Lake Caddo. It is just east of Karnack, Texas, and about 15 miles northeast of Marshall, Texas. Harrison Bayou runs for about 3 miles within the bounds of LHAAP in the eastern half of the plant.

The Hydrogeomorphic Assessment technique will be performed on two bottomland hardwood wetland sites, using Harrison Bayou wetland plant communities as a reference. Within the Caddo Lake, Texas, region, an area along Black Cypress Creek and a site on Big Cypress Bayou, just below Lake O' the Pines, will be utilized as additional study sites.

METHODS

GIS Database Development

A GIS database was created using a AIX PC computer platform and various software packages, including *ArcInfo*, *ArcView*, and *Imagine*. Landsat imagery of the area was obtained from EROS Data Center in Sioux Falls, SD, and used as the base layer. A Harrison County, Texas, Soil Survey (Soil Conservation Service, 1994) was obtained and the soil map of the LHAAP area was digitized. The GIS database will be used to identify plant communities. It will also be used to graphically depict the location of wetland plant communities and their differences in water quality function capabilities.

Identification Of Plant Communities

After registering and rectifying the satellite imagery, the *Imagine* pixel classification routine was used to identify the major plant communities of Harrison Bayou, Big Cypress Bayou, and Black Cypress Creek. Stereoscopic viewing of aerial photos was used in conjunction with the output of this classification to estimate the bounds of the major plant communities. The boundaries were field checked using reconnaissance surveys. The locations of these boundaries were then adjusted as needed to more accurately represent the actual plant community locations.

A series of descriptive categories will be developed that will be used to classify the plant communities. Each plant community will be placed into one of these categories based upon the dominant vegetation found in that community. So far, ten such categories have been created. It is predicted that ten to fifteen more such categories will be created.

Wetland Identification of Plant Communities in Harrison Bayou

Sample Point Placement

Sampling is done at four points within each plant community. The estimated plant community boundaries are entered as a layer into the GIS database. They are then displayed over a digitized U.S. Geological Survey (USGS) topographic map of the area. Sample points are then placed onto this map using ocular estimation to provide uniform coverage of the community. These points are then located in the field. Care is taken to keep the points far enough from community edges to prevent accidental overlap and edge effects.

Sampling

At each sample point, sampling will be done in accordance with the 1987 U.S Army Engineer Wetland Delineation Manual (Environmental Laboratory, 1987). Each plant community in Harrison Bayou will be observed for the presence of hydrophytic vegetation, hydric soils and wetland hydrology. The presence of hydrophytic vegetation is determined by sampling the vegetation at each sample point to identify the dominant plant species in each stratum (trees, saplings and shrubs, woody vines, and herbaceous). For hydrophytic vegetation to be present, the majority of the plant species, considering all strata, must be classified as hydrophytic. Hydrophytic plant species for

Texas, including the Caddo Lake region are described by Reed (1988). Hydric soils are indicated by the presence of the soil series on the U.S. Natural Resource Conservation Service (NRCS) county hydric soils list and/or the observation of redoximorphic features in the upper part of the soil profile. Redoximorphic features include gleyed soils, mottling and concretions. The presence of wetland hydrology is indicated by features such as drift lines, water marks, and standing water. Hydrophytic vegetation, hydric soils and wetland hydrology must be present before a plant community can be identified as wetland.

Function Assessment Sampling Procedure

The following procedure will be performed on Harrison Bayou, Black Cypress Creek and Big Cypress Bayou.

Identification of Wetland Sites

Plant communities within the three study areas will be identified as wetlands. The identification procedure will be performed in accordance with the guidelines set in the 1987 U.S. Army Engineer Wetland Delineation Manual (Environmental Laboratory 1987). Plant community boundaries will first be identified and then a representative observation point will be placed at random within each community. At each point, the presence of hydrophytic vegetation, hydric soils, and wetland hydrology will be determined. If the point has all three of these wetland parameters, the plant community will be identified as a wetland.

Assessment Technique

In determining the level at which each wetland plant community in each study area functions in terms of floodflow alteration, removal of elements and compounds, nutrient cycling, sediment stabilization, and organic carbon export, the (Draft) Guidebook for Application of Hydrogeomorphic Assessments to Riverine Wetlands will be utilized (Brinson et al., 1994).

Each of the above functions is described by a set of variables. For each plant community, these variables will be rated from 0-1, depending upon their similarity to conditions found within corresponding plant communities within the reference wetland: Harrison Bayou. The more similar a variable is to conditions found within the same plant community in Harrison Bayou, the greater the value that variable receives. Resulting scores for each variable will then be incorporated into an equation for each function which will result in an index of function. This index will describe how closely the function within that plant community resembles that of the corresponding plant community within Harrison Bayou.

Floodflow Alteration

In order to determine the level at which a wetland performs the function of floodflow alteration, five variables must be taken into account. These are: frequency of overbank flow, average depth of inundation, microtopographic complexity, woody vegetation roughness, and coarse woody debris.

Annual frequency of overbank flow (V_{of}) will be visually assessed for each wetland cover type as to the degree of similarity it shows to the reference wetland. Average depth of inundation (V_{di}) is determined using a reconnaissance survey to observe the average height of water stains on trees. Microtopographic complexity (V_{mc}) is a measure of the frequency of occurrence of hummocks and depressions. A scale ranging from 1 to 5 will be established to measure the relative amounts of microtopographic complexity. The rating of a site will be determined by visual estimation.

Woody vegetation roughness (V_{wvr}) is a variable that measures the number of woody stems of trees and shrubs. Three plots representative of the cover type will be established in which the average number of shrub stems/acre and tree basal area will be determined.

The frequency of fallen stems will be used to determine coarse woody debris (V_{cwd}) within each cover type. A scale from 1 to 5 will be established to measure this variable.

The model for determining the function level for floodflow alteration depends on the presence of overbank flooding. If the value for overbank flooding is zero, then the index of function is zero. The variables are combined to depict the index of function in the following manner:

Index of Function =

$$\left(V_{of}\left(\frac{V_{di} + V_{mc} + V_{wvr} + V_{cwd}}{4} \right) \right)^{\frac{1}{2}}$$

where: V_{of} = frequency of overbank flow
V_{di} = average depth of inundation
V_{mc} = microtopographic complexity

V_{wvr} = woody vegetation roughness
V_{cwd} = coarse woody debris

Nutrient Cycling

Nutrient cycling will be characterized by two variables: net primary productivity (V_{npp}) and detritus turnover (V_{dt}). The first indicates the level at which plants take up available nutrients and the second indicates the rate at which nutrients are decomposed and made available to plants.

V_{npp} will be determined for each wetland cover type on the wetland sites by visual assessment. The canopy, subcanopy, shrub and ground covers within each cover type will be assessed separately on a percent basis, divided by 4, and then added for a total percent cover.

The second variable, annual detritus turnover (V_{dt}), will be determined by a visual scoring method. Cover types will be assigned a score between 1 and 5, depending on their relative amounts of snags, downed dead woody debris, leaf litter, fermentation and humus layers, and fungal fruiting bodies.

If $V_{npp} > V_{dt}$, then the index of function for nutrient cycling is V_{dt}. If not, then the index of function is V_{npp}, where:

V_{npp} = aerial net primary productivity
V_{dt} = annual turnover of detritus

Since this is a cyclic process, both variables should be roughly in balance with one another. Taking the lesser variable as the index of function should insure that the index is not overestimated. If one variable is significantly less than the other, then the function is not performing normally.

Removal of Elements and Compounds

Six variables must be taken into account for the determination of the level at which a wetland can remove imported nutrients, contaminants, and other elements. The first, overbank flooding frequency (V_{of}), has already been described under the function of floodflow alteration.

The second variable, riparian source (V_{rs}), is a determination of the source of water that feeds a wetland. By examining the topography and aerial photos of both the impacted wetland sites and the reference wetland, the water source for all wetland sites will be determined.

The fourth variable, available surfaces for microbial activity, (V_{sma}), will be determined by cover type using a rating system ranging from 1 through 5. Those areas with higher levels of litter layer, humus stratum, woody debris, and floating submerged and herbaceous emergents will receive higher scores.

The index of the fifth variable, sorptive properties of soils (V_{sps}), will be determined by the similarity of soil texture and organic material content between each impacted wetland site and the reference standard by cover type.

The last variable for the function of element removal is tree basal area (V_{tba}). The index for this variable will be determined using three plots for each cover type on each site.

The variables are separated into two categories. The first are those variables that involve hydrologic transport mechanisms that are responsible for bringing nutrients into the wetland (V_{of} and V_{rs}). The other four variables are in the category that is responsible for contributing to the removal of elements and compounds. The index of function is determined in the following manner:

$$\left(\frac{\left(\frac{V_{of} + V_{rs}}{2} \right) + \left(\frac{V_{mc} + V_{sma} + V_{sps}}{3} \right) + V_{tba}}{3} \right)$$

If the characteristic vegetation is herbaceous, then V_{tba} can be removed:

$$\left(\frac{\left(\frac{V_{of} + V_{rs}}{2} \right) + \left(\frac{V_{mc} + V_{sma} + V_{sps}}{3} \right)}{2} \right)$$

where:

V_{of} = frequency of overbank flow
V_{rs} = riparian source
V_{mc} = microtopographic complexity
V_{sma} = surfaces for microbial activity
V_{sps} = sorptive properties of soils
V_{tba} = tree basal area

Sediment Stabilization

The function of sediment stabilization will be determined by the measurement of seven variables. Frequency of overbank flow, roughness due to woody plants, coarse woody debris and microtopographic complexity have been previously described under the function of floodflow alteration. Also, the variable of riparian source has been described under the function of element and compound removal.

Herbaceous vegetation roughness (V_{hvr}) will be scored by visual assessment for each wetland cover using a scale ranging from 1-5.

Retained sediments (V_{rsed}) will be determined by plant community through visual assessment of silt and/or sediment layering on surfaces or buried root collars or buried levees of the reference and impacted wetland sites.

The variables depict the function in the following manner:

$$\left(\left(\frac{V_{of} + V_{rsed}}{2}\right)\left(\frac{V_{wvr} + V_{hvr} + V_{mc} + V_{cwd}}{4}\right)\right)^{\frac{1}{2}}$$

where:

V_{of} = frequency of overbank flow
V_{rsed} = retained sediments
V_{wvr} = woody vegetation roughness
V_{mc} = microtopographic complexity
V_{hvr} = herbaceous vegetation roughness
V_{cwd} = coarse woody debris

Organic Carbon Export

Determining the index of function for organic carbon export requires the use of four variables, two of which have already been described (V_{rsed}, V_{of}). The variable describing the frequency of surface hydraulic connection with the main channel (V_{shc}) will be determined using a GIS database, aerial photos, and visual assessment to determine the level of frequency between the impacted wetland sites and the reference standard.

The index of the variable that describes the amount of organic matter in the wetland (V_{om}) will be determined through visual assessment by cover type. A scale ranging from 1-5 will be established to denote the amount of organic matter in a wetland by visual examination of the amount of litter, coarse woody debris, live woody vegetation, dead or live herbaceous vegetation and/or organic rich mineral soils.

The index of function can be calculated as:

$$\left(\left(\frac{V_{of} + V_{rsed} + V_{shc}}{3}\right)(V_{om})\right)^{\frac{1}{2}}$$

where:

V_{of} = frequency of overbank flow
V_{rsed} = retained sediments
V_{shc} = surface hydraulic connection
V_{om} = organic matter

if V_{om}, is 0, then the function of organic carbon export is absent.

RESULTS

The wetland identification of plant communities in Harrison Bayou began during the summer, 1995, and the assessment is about two-thirds complete. The water quality functional assessment of the wetland communities at Harrison Bayou, Black Cypress Creek and big cypress bayou will begin during the summer, 1996. The wetland identification and functional assessment work is scheduled for completion by September 1997. The results will provide the natural resource managers at the LHAAP information useful in the management of this unique bottomland hardwood resource.

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Characterization of an Old-Growth Bottomland Hardwood Wetland Forest in Northeast Texas: Harrison Bayou

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Abstract: Most wetland losses in the southern region over the past 200 years have occurred in bottomland hardwood forests. By 1980 the original extent of palustrine bottomland in Texas had been reduced by 63%, from roughly 16 to 6 million acres. Additional losses have occurred during more recent years as a result of conversion to agriculture and timber harvests; these factors and the need to supply new hardwood chip mills in the region pose a potential threat to the remaining hardwood resource. The Harrison Bayou watershed in northeast Texas contains one of the few relatively undisturbed bottomland hardwood wetland forests in the State. Harrison Bayou is part of the Caddo Lake wetlands complex, most of which was designated a Wetland of International Importance under the Ramsar Treaty in October of 1993. Caddo Lake State Park is one of fifteen "Ramsar" wetlands in the United States; it is the only wetland with this designation in the State of Texas. Harrison Bayou is an important component of the Caddo Lake watershed; it represents a model bottomland hardwood wetland in both structure and ecological function. Three major forest cover types illustrate the diversity of the 600-hectare bottomland hardwood/baldcypress forest at Harrison Bayou. Comparison of wetland forest extent and species composition in 1977 with 1993 revealed very little change in wetland forest community structure.

Keywords: natural area, bottomland hardwoods, Caddo Lake, Longhorn Army AmmunitionPlant, wetlands, Harrison Bayou, baldcypress, forested wetland, old-growth forest

In 1977, Laurence Walker, Tom Brantley and several faculty members from Stephen F. Austin State University conducted vegetation and wildlife surveys of the bottomland hardwood forest and baldcypress swamp of the Longhorn Army Ammunition Plant along Harrison Bayou. At the time, the U.S. Army was considering designating the area as a "special management area". Though no official action was taken regarding the designation, the area has been set aside from logging and development activities. During October-December, 1993, Brantley and Virginia Burkett re-surveyed the vegetation type map of the area that was produced by Walker and Brantley in 1977, with the aid of low-altitude, 1:600-scale aerial photographs taken in 1990. Additional photography of the area was acquired and interpreted by the National Biological Service in January, 1994. Some changes in forest cover were observed in 1993-1994 and are reported herein.

Much of this report is based upon the original unpublished survey and report prepared by Walker and Brantley. It is primarily descriptive in nature because of the survey methodology used in 1977. This report characterizes the ecology of this unique wetland system. It documents the type and extent of one of the few remaining "old-growth" bottomland hardwood forests in the south.

BACKGROUND

The United States has lost approximately

one half of the wetland acreage that existed in the lower 48 States prior to European settlement. The Department of Interior's National Wetlands Inventory estimated that, on average, over 60 acres of wetlands were lost every hour in the lower 48 states during the 200-year timespan between the 1780's and the 1980's (Dahl, 1990). Losses have been particularly acute in the southern region, where more than 85% of U.S. wetland losses have occurred since the 1970's. Most of these recent wetland losses have occurred in bottomland hardwood forests. By 1980, the original extent of bottomland hardwood wetland forests in Texas had been reduced by 63%, from roughly 16 to 6 million acres (Frye, 1986).

One of the few undisturbed bottomland hardwood stands in the East Texas pine-hardwood region is a 120-hectare tract of palustrine wetland along Harrison Bayou, not far from its outlet into Caddo Lake in Northeast Texas (Fig. 1). That old growth stand joins several other tracts of bottomland hardwoods and southern baldcypress (*Taxodium distichum*), totaling roughly 440 hectares, most of which was high-graded or otherwise harvested in the early 1900's.

The National Wetlands Inventory has classified the bottomland hardwood forest and baldcypress swamp of Harrison Bayou as palustrine wetland, following the criteria set forth by Cowardin and others (Cowardin et al., 1979). All habitats that are classified and mapped as wetlands by the National Wetlands Inventory are defined by plants (hydrophytes), soils (hydric soils) and frequency of flooding. Palustrine wetland systems include those non-tidal wetlands that are dominated by trees, shrubs, persistent emergent vegetation, emergent mosses and lichens where salinity due to oceanic salts is less than 0.5 parts per thousand (Cowardin et al., 1979).

The forest is located within the boundaries of the Longhorn Army Ammunition Plant, which is scheduled for partial decommissioning during the next five years. The U.S. Army's facility manager, Thiokol Corporation, has managed the Harrison Bayou tract as an unofficial "special management area" since the mid-1970's. The unusual character of the forest vegetation, especially the old growth portion, suggests that the Harrison Bayou wetland area has not been altered by silvicultural harvests and most other uses. The Harrison Bayou tract could be transferred to another federal or state agency or sold for private use when the Ammunition Plant is decommissioned by the Department of Defense.

In 1993 the U.S. Fish and Wildlife Service classified the wetlands that fringe Caddo Lake as "Category 1" wetlands for the purposes of the Fish and Wildlife Coordination Act (16 U.S.C. 661 et seq.), which grants the Fish and Wildlife Service review authority over all dredge and fill activities that are permitted by the U.S. Army Corps of Engineers and the U.S. Environmental Protection Agency. In the spring of 1993 the Texas Parks and Wildlife Department and the U.S. Department of Interior nominated Caddo Lake State Park as a Wetland of International Importance under the Ramsar Treaty. In October of 1993 Caddo Lake State Park became the United States' thirteenth "Ramsar" wetland.

SITE HISTORY AND CHARACTERIZATION

The old-growth wetland forest along Harrison Bayou was not logged in the late 1800's and early 1900's, when large tracts of other bottomland hardwoods in the region were harvested, because of its inaccessibility and the commercial isolation of the merchantable species growing there. Old stream channels, now forming small oxbow lakes, and frequent high water made felling, skidding and transport difficult. In 1942 the federal government purchased the land for the Longhorn Ordinance Works (now called the Longhorn Army Ammunition Plant) from T. J. Taylor (the father of Lady Bird Johnson) and other families. Prior to acquisition, however, large tracts of upland forest and some of the bottomland hardwood forest on the Ammunition Plant property were "cut very heavy, removing most of the merchantable trees" (Longhorn Army Ammunition Plant, 1977).

Based upon the age class of standing timber and the presence of stumps and logging debris, it appears that approximately two hundred hectares of bottomland hardwoods and pine along Harrison Bayou were logged between 1900 and 1920. Another hundred more hectares were cutover between 1920 and 1941. Fig. 1 depicts the location of the hardwood forest tracts along Harrison Bayou that have not been harvested and appear to be remnants of the virgin forest that once occupied the bottomlands of the Cypress Bayou/Caddo Lake watershed. In 1969 the U.S. Army adopted a Comprehensive Natural Resources Management

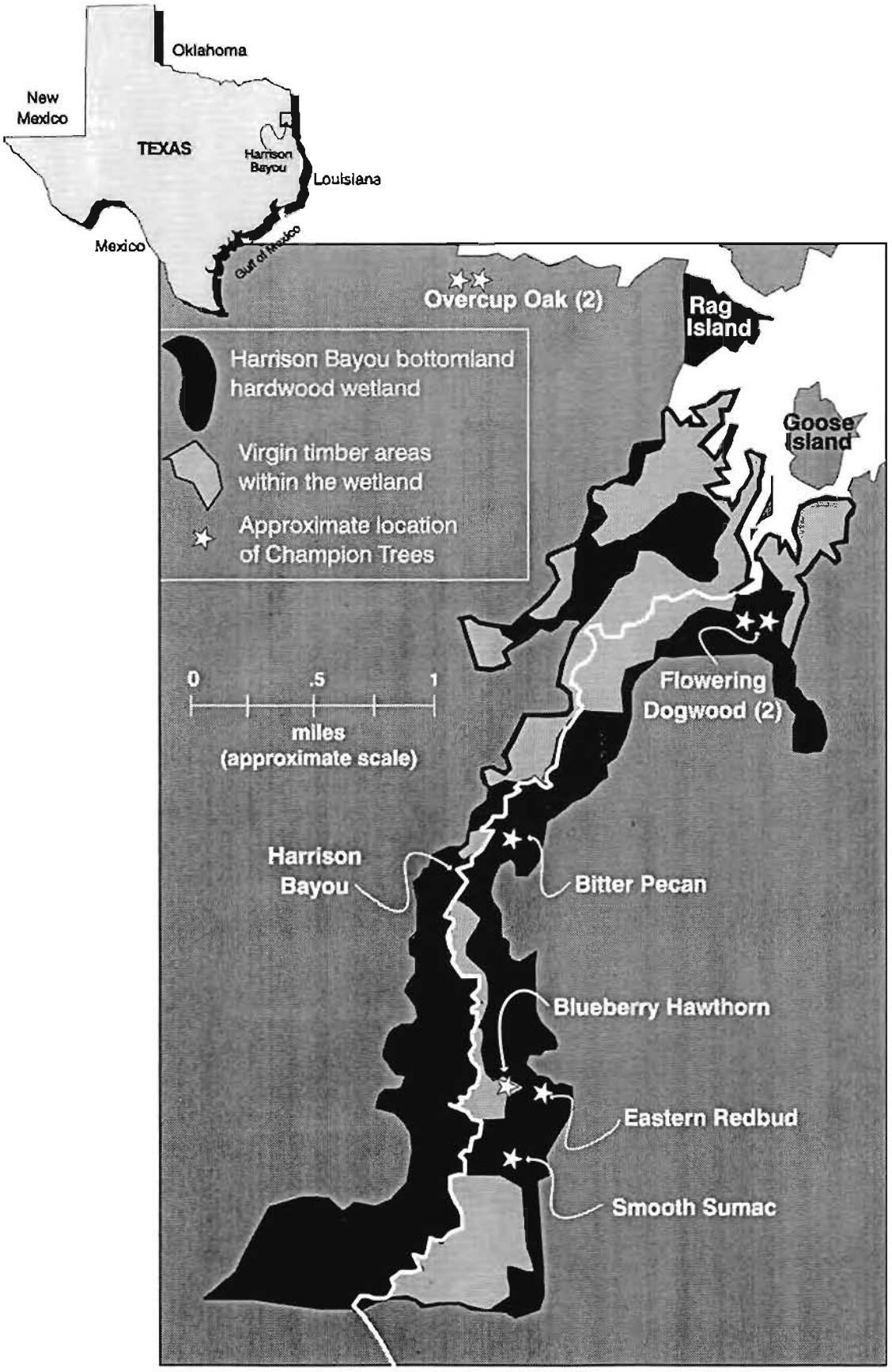

Fig. 1. General locale of Harrison Bayou and location of "old growth" forests.

Plan for the area, which included forest, fish and wildlife management, as well and grounds maintenance and pest control. As originally adopted, the Plan would have allowed the selective harvest of timber in the Harrison Bayou bottom. Through the efforts of the Texas Parks and Wildlife Department, the unique nature of the hardwood stands along Harrison Bayou were recognized and harvesting schedules were altered in 1973.

Water levels and vegetation communities of Harrison Bayou and other streams draining into Caddo Lake are determined by water levels in Caddo Lake. According to numerous historians and U.S. Army Corps of Engineers records, the water level of Caddo Lake during the early 1800's was two or more meters higher than its current level (U.S. Army Corps of Engineers, 1983). The higher water levels in Caddo Lake between the late 1700's and 1830 have been attributed to a natural logjam on the Red River. The logjam was formed by cottonwood trees and other debris from the eroding banks of the River; the so-called "great raft" was more that a hundred miles long and was solid enough for people to traverse on horseback. Evidence of these stable high water levels is exhibited by the presence of large baldcypress trees with fluted buttresses, such as those found in the open water edges of Caddo Lake, at "off site" locations extending far into the higher elevations of oak and pine habitat.

In the 1830's Captain Henry Shreve broke up the raft with a snag boat that sawed through the logs as it moved upstream. In 1873 the U.S. Army Corps of Engineers removed the logjam with explosives and snagboats (U. S. Army Corps of Engineers 1993).

A dam was constructed by the U.S. Army Corps of Engineers in 1914 (U.S. Army Corps of Engineers, 1983; Klimas, 1987) to restore Caddo Lake water levels to a height that would permit navigation, a use that had developed during the 30- to 50-year period that the logjam existed on the Red River. In 1913-14 a team of ecologists, geologists and surveyors from the U.S. Department of Interior investigated the water bottoms and sloughs of Caddo lake to reconstruct the history of the Lake to determine the ownership of the oil reserves. Based upon the state of decay of bottomland hardwood stumps in the lake bottom and other relic features, the DOI team concluded that the lake was formed in 1777. Other historical accounts from the Caddo Indians and John Sibley, an early resident of Natchitoches, LA, place the lake's formation closer to 1800 (U.S. Army Corps of Engineers, 1993).

The lowering of the water level in Caddo Lake after the logjam was removed in 1873 resulted in the emergence of the present-day Harrison Bayou wetland. The succession of forest types discussed in subsequent sections was, and still is, heavily influenced by water levels and man's activities in Caddo Lake. Harrison Bayou is a secondary stream. It has never been significant for transportation or settlement, probably as a result of the high variation in water levels. Those who lived near it hunted, fished, grazed their hogs and cattle, and cut timber. Because of the series of unlikely circumstances alluded to above, the Harrison Bayou bottom has not been available for these pursuits. Had the stands of valuable hardwood and baldcypress timber been located in Louisiana or eastward, they likely would have been harvested in the "cut-out-and-get-out" days before 1900. In Northeast Texas, forests were subject to cutting pressures at a later date. Thus this inaccessible virgin remnant was preserved until the Government took it over during World War II. Now the Harrison Bayou wetland is a relic, an example of what the vegetation of many small stream courses was like before they were harvested or inundated for reservoirs.

Harrison County, locale of the Bayou, covers about 2260 square kilometers and drains into Sabine and Red River tributaries, among which are the Big and Little Cypress bayous that spread to form Caddo Lake. Overflow water from Caddo Lake and Harrison Bayou may cover the Bayou for a depth of one meter or more for long periods in winter. The Lake, eventually emptying into the Red River, drains 7161 square kilometers; its size is estimated at 10,850 ha. Specifically, the site is in the eastern part of the Ammunition Plant property, Northeast of Karnack, west of Farm Road 9 and Big Lake Camp near the mouth of Harrison Bayou, and on the north edge of Harrison County in East Texas. Elevation ranges from 45 to 50 m above mean sea level.

Climate

Climate of the Caddo Lake region is humid subtropical. The growing season is about 240 days. Annual precipitation averages 115 cm, and critical droughts are frequent. Annual tallies have measured from less than 93 cm to more than 175 cm. A few less than 50 days a year

have thunderstorms. These for the most-part occur while the forest is in full foliage; hence raindrop impact does minimal damage to the soil. Rain interception by tree crowns and trunks may reduce direct precipitation by 25 percent during any one growing season. This intensifies evaporation loss and the seasonal distribution of rainfall so that the region is drier than other climatic indicators might suggest. Lightning strikes from electrical storms often kill trees, though they rarely start forest fires in this area.

Soils

Soils of the Harrison Bayou area fall into two main groups, fluvatile soils of floodplains and corresponding soils of wind-modified terraces (Golden et al., 1994). The current landscape of the area probably formed about 11 to 14 thousand years ago during the Holocene glacial retreat. Ocean levels changed and streams cut deeper into the geological strata. This area may have been exposed to a desert type climate for a few hundred years. During this time the wind blew soil materials into mounds on the terrace areas and the stream bottoms were partially refilled. The alluvial soils are generally wet and receive deposition from annual flooding. During periods of intense cultivation, varied sediments were deposited in large quantities on the bottomland areas. This created loamy to sandy natural levees and clayey depressions in the landscape. The terrace soils are old alluvial materials modified by wind forming a mounded landscape. Much of the Harrison Bayou area is characterized by small depressions and broad flats, interspersed with mounds about 1 to 1.5 m in height and 15 to 35 m in diameter.

Two main soils of the floodplain in this region are Socagee and Mathiston soils. Socagee soils have a grayish brown silty clay loam surface over a grayish clay loam. Taxonomic classification places these soils in the fine-silty family of siliceous, thermic Typic Fluvaquents. Mathiston soils have a brownish silt loam surface over a grayish silt loam. Mathiston soils are classified in the fine-silty family of siliceous, thermic, Aeric Fluvaquents. The most important soil of the terraces in the area is the Scottsville soil. This soil has brown, very fine sandy loam surface layer over a yellowish loam subsoil. Taxonomic classification places this soil in the fine-loamy over clayey family of siliceous, thermic. Glossaquic Paledalfs (Personal communication, Raymond Dolezel, USDA Soil Conservation Service, Lufkin, TX, March, 1993).

Due to the degree of wetness, texture and chemical characteristics the undisturbed alluvial soils are covered with hardwoods. In contrasts, the terrace soils nearby are capable of supporting pine hardwood forest types. Isolated areas of the bottomland have salinization problems. These areas commonly known as "salt licks" form a whitish crust when dry. Once denuded it is difficult to reestablish vegetation on these soils.

Archaeology

Evidence of man in the area include the small pieces of Indian pottery rather readily found in the soil on a bluff immediately adjacent to Harrison Bayou. Projectile points are not uncommon. The Caddo tribe, long dominating the region, was good at crafting implements, even though flint had to be brought from the mountains to the north. One collection in the local area is reported to have more than twelve thousand points and pieces. Although most mounds in this area were formed from wind activity (e.g., Loess), Indian-made hillocks, some of which are called "pimple mounds", occur in the Caddo country and adjacent to the Lake. These probably were built by Indians to avoid inundation by high water, just as current-day fishermen build weekend cottages on stilts. Indians may have mined clay from the area for making pottery. If so, this could help to explain the presence of some openings in the forest canopy for which there is no other apparent cause.

A few faint, abandoned wagon roads can still be found near Harrison Bayou. One section of the old Port Caddo/Swanson's Landing road that dates back to the 1800's is easily located on western side of Harrison Bayou (Fig. 2).

GENERAL DESCRIPTION OF TWO BROAD FOREST TYPES

The vegetation of Harrison Bayou and surrounding lands is typical of the forest that once extended from East Texas to the mid-Atlantic Seaboard. Two broad silvical regimes predominate in the wetland area: bottomland hardwood and southern baldcypress. Although the principal vegetation, and certainly the most obvious, is arboreal, a diverse understory of grasses, shrubs, and vines also occurs.

This section broadly outlines the species composition and ecology of bottomland and

Fig. 2. Photo of the old Port Caddo/ Swanson's Landing wagon road (Oct. 1993).

swamp sites that are typical of the South and the Harrison Bayou area. It also discusses physiographic limitations and injurious agents likely to influence the old growth forest along this watercourse. A broad narrative is provided to assist those concerned with setting aside natural areas in developing some perspective on the uniqueness of this site and the probability of the site remaining as it now appears.

Bottomland Hardwoods

Bottomland hardwood forests occupy about 30 million acres and contain about one-third of the hardwood volume in the southern region. Typical species along rivers are eastern cottonwood (*Populus deltoides*) and willows (*Salix* spp.), grading away from the streamsides into stands of sweetgum (*Liquidambar styraciflua*), water oak (*Quercus nigra*), white oak (*Quercus alba*), or green ash (*Fraxinus pennsylvanica*). Mixed stands on the ridges (i.e.slight rises of a few cm to 1 m above a surrounding flat) may be predominantly white, southern red (Quercus falcata), water oak, hickories (*Carya* spp.), sweetgum, blackgum (*Nyssa sylvatica*), and water tupelo (*Nyssa aquatica*).

Southern baldcypress is often found along with hardwoods in bottomlands where water is too deep for competitive species. It generally occurs in pure, dense, evenaged stands. Where isolated baldcypress trees are found mixed with predominately hardwood forests, a change in the hydrology of the site, such as channel alteration, during the life of the stand has probably occurred.

Regeneration of bottomland hardwoods is difficult to obtain where coarse, loose, sandy soils are at the surface or just below a thin veneer of fine material. In such soils, especially where occurring between natural levees, the water table in summer is likely to be too deep to enable delivery of the moisture by capillarity through the sand. Other difficult sites are those with plastic clay, as on the low flats, and the hardpan and silty clay basins of the terraces. There, because moisture and aeration are unfavorable for many kinds of trees, willow oak (*Quercus phellos*) may occur as the principal species.

Baldcypress

Southern baldcypress, an ecological pioneer, becomes established when water is low during relatively dry seasons. A saturated, but not inundated, seedbed is essential for seed germination. Seedlings must grow fast enough to maintain some portion of their foliage above floodwaters for most of the growing season. Baldcypress does not compete well with bottomland hardwood species in drained soils so periodic flooding and the resulting reduction in competition is generally considered necessary for baldcypress regeneration. Because of these exacting requirements, baldcypress often occurs in pure even aged stands with 30 to 50 years between cohorts (Walker, 1967).

Seeds are produced annually, but abundant seed production occurs every 3 to 5 years (U.S. Department of Agriculture, 1974). The seeds are not preferred by wildlife due to their thick, horny seed coats; however, squirrels eat some seeds and often hasten the release of cones (Wilhite and Toliver, 1990). In October or November, the ripe seeds may be scattered by floodwaters, the most important means of seed dissemination (Schneider and Sharitz, 1988). Germination, in the spring, is usually poor except in seedbeds of sphagnum moss and soft wet muck.

Baldcypress is one of the few conifer species that sprouts, however, the shoots from cutover stumps are usually unsatisfactory for

regenerating a forest. The strongest sprouts are generally produced from stumps of young trees, but trees 60-200 years old may produce healthy sprouts. However, the long-term survival is generally poor and the resulting stems are often poorly shaped (U.S. Department of Agriculture, Forest Service, 1965). Sprouts grow faster than seedlings, and on occasion may compete effectively. Following harvest, baldcypress sites are frequently captured by sweetgum, Nuttall oak (*Quercus nuttallii*), willow oak, and red maple (*Acer rubrum*).

The present forest that occupies most of the flooded area of Caddo lake and the northern end of Harrison Bayou is a pure stand of baldcypress (Fig. 3). In 1993 Bob Keeland of the National Biological Service's National Wetlands Research Center collected cores from Caddo Lake baldcypress trees and crossdated them using a method that allowed discrimination of missing, locally absent and false rings that are common in this species. Most of the trees on Caddo Lake, especially those on the numerous small islands appear to be approximately 90-100 years old. These tress probably became established after the Corps of Engineers lowered water levels in the Red River during the late 1800's. Many trees in the western portion of the lake, however, are much older. A large number of trees are older than 250 years and two in the Willowson's Woodyard area are greater than 350 years in age (Bob Keeland, personal communication, October 22, 1993).

Fig. 3. Baldcypress forest at the mouth of Harrison Bayou on Caddo Lake.

The oldest documented baldcypress stand in the South is located along the Black River, a tributary of Cape Fear River in southeastern North Carolina. Living baldcypress trees ranging up to 1700 years old have been discovered at this site (Stahle et al., 1988). In southern Louisiana and Mississippi living baldcypress trees up to 1300 years old have been found along the Pearl River drainage. Such ancient trees are rare, but it is not uncommon to find baldcypress stands that are hundreds of years old (Frey, 1954; Walker, 1963; Stahle et al., 1992).

The total acreage of baldcypress stands throughout the southeast was dramatically reduced during a period of extensive logging in the early 1900's (Conner, 1988). Many of the cutover lands were not replanted due to difficulty of planting in such wet areas and many restored areas have now been destroyed by nutria (*Myocastor coypus*). Most second growth stands are now less than 100 years old (U.S. Department of Agriculture, Forest Service, 1960).

Two of the most picturesque and intriguing features of baldcypress tress are the buttressed trunks and knees (Brown and Montz, 1986). Buttressing of the lower stem of baldcypress is a common result of water level fluctuation, and is formed in response to the air-water surface moving up and down the tree. An interaction between ethylene and auxin produced by the tree has been suggested as the causative agent (Yamamoto, 1992).

In periodically flooded areas where the soil surface is occasionally exposed during the growing season and flood levels are quite high, the buttress will be the widest at the soil surface and taper to about the mean high water level. The buttressing of most trees in a stand will end at about the same height and the stems will assume a more gradual taper above the buttress. Normally, unbuttressed trunks or only slight swelling occurs on trees not subjected to periods of high water.

The most unique feature of baldcypress trees are the knees produced along many of their roots. Like buttresses, these organs grow in response to fluctuations of the air-water interface. A likely explanation of the knee's function involves mechanical support of the tree, especially in soft, organic soils. Baldcypress trees have been shown to be very tolerant of hurricane force winds (Duever and McCollom, 1993). Wind resistance is indicative of efficient anchorage, especially in view of the numerous shallow-rooted hardwood species that are easily uprooted by hurricanes. Baldcypress trees have deep descending roots at the base of the stems and, in addition, the knees have a dense mat of roots similar to that of the main stem (Mattoon, 1915). Such a dense and deep penetrating root system provides the necessary anchorage for

these trees to proliferate in southeastern coastal areas where they are commonly subjected to hurricane-force winds.

Injurious agents

Much decay in bottomland hardwood forests and baldcypress swamps is attributed to fire. Fire-wounded trees, regardless of species, are likely to contain rot. Fire wounds allow fungi to enter the stems which may, over a long period of time, destroy trees. Although injuries as small as 1 or 2 cm in diameter will allow fungal entry and later destruction of the lower portion of the tree, wounds less than 5 cm in width are generally not important points of infection. Up to 4 years may be required for rot to reach the heartwood but, once there, spread is rapid. The interior of a tree at its base may be totally consumed in the 15 to 20 years required for fire scars to heal. High temperature and high humidity, typical of southern bottomlands, encourage spread of decay.

Beavers (*Castor canadensis*) are a frequent source of damage to mature bottomland hardwoods in this region. Partial girdling results in a wound subject to attack by decay-causing fungi. Decay may be as deep as 10 cm after 6 years in ash trees and 8 years in sweetgum. Wounds extending more than one-quarter of the way around the circumference indicate a strong probability of mortality within 10 years. An examination of 1983 and 1990 1:660-scale black and white photography maintained by the Harrison County Soil and Water Conservation District Office in 1983 and 1989 shows the development of a 13.3 hectare beaver pond on the southeastern corner of the wetland (Fig/ 4). The area was a mixed oak-baldcypress-sweetgum forest in 1977. Today it is a baldcypress/emergent marsh wetland with many dead hardwoods (Fig. 5).

Grazing of domestic livestock has been detrimental to bottomland hardwood forests. Cattle trample reproduction, browse valuable stems, and compact soil. The soft floor of many bottomland forests, especially border areas of reeds and swamps, discourages cattle encroachment. Cattle were commonly grazed in the Harrison Bayou area until 1955; since then they have been excluded.

Free oxygen is considered the limiting factor in the germination of bottomland hardwood seeds in flooded sites. Inundation for up to one month does not appear to reduce germinative capacity unless seeds are covered too deeply by sediment. Consequently, normal seasonal flooding is not a major cause of selective regeneration among species until after germination. But, in frequently inundated areas, production of great quantities of seeds is essential to offset the hazards of submergence.

The forest tent caterpillar (*Malacosoma disstria*) defoliates tupelo, blackgum, sweetgum, willow oak/overcup oak, and river birch (*Betula nigra*) in southern bottomlands. Larvae spin cocoons in early May; moths are in flight 2 weeks later. By June, defoliated trees may put on new leaves, but this foliage will be smaller and sparser than normal. Natural checks on tent caterpillars may stop outbreaks, but occasionally trees are killed.

Baldcypress is notably less susceptible than bottomland hardwoods to insect damage. The most serious pest is the cypress leaf beetle (*Systena marginalis*) that causes foliage to discolor in mid-summer. Damage is done by small (less than 5 mm length), flattened, dull yellowish-tan adults. The insects do not remain on trees more than three days, and leaves are not totally consumed, but turn red within a few days after attack. Heavy feeding is evidenced by linear gouges that seldom pierce both leaf surfaces. Defoliation reduces growth and vigor, enabling secondary pests to further weaken and kill trees. On an occasional basis the cypress looper (*Anacamptodes pergracilis*) has resulted in severe defoliation in baldcypress in Texas and Louisiana. Fruit tree leaf-roller (*Archips argyrospila*) infestations have been observed in southern Louisiana since 1983, and are particularly detrimental to baldcypress saplings (Goyer and Lenhard, 1988).

Baldcypress stands are relatively free of fungi infections. "Pecky cypress", however, results from infection by *Stereum taxodii*. The fungus probably enters the crown and works downward in the heartwood. Damage, characterized by cavities which eventually occur throughout the heartwood of a tree, can be serious on older stems.

Swamp rabbits (*Silvilagus aquaticus*) may be a serious problem in young baldcypress stands. They clip seedlings above ground, making a smooth-angle cut. Damage occurs only on non-flooded sites. Clipped stems generally resprout, but the short shoots are killed when inundated. Nutria, introduced from South America in the 1930s, uproot seedlings, eat bark from tap roots and, in some cases, consume whole roots. Damage occurs on

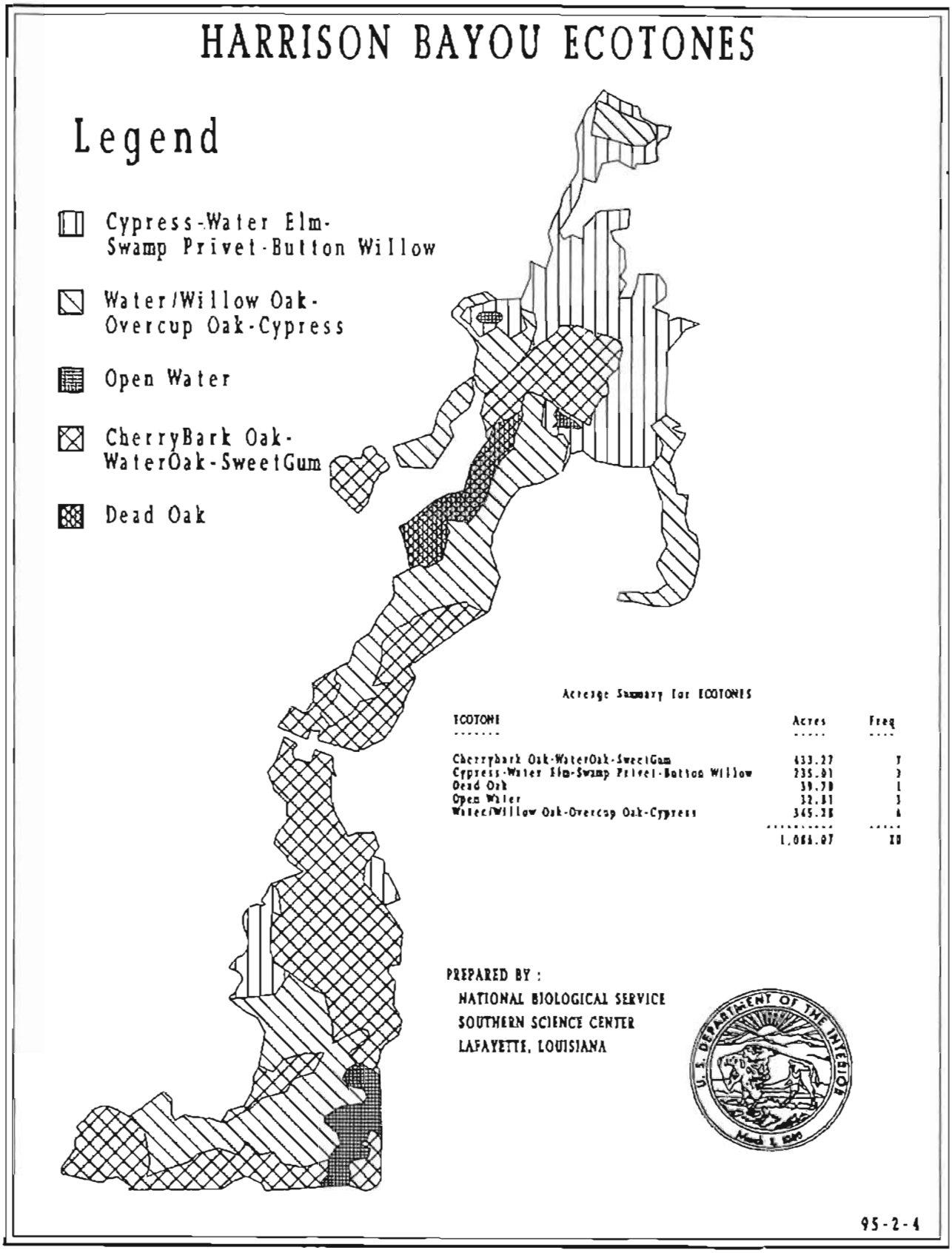

Fig. 4. Wetland boundary and major cover forest types or ecotones in the Harrison Bayou area.

Fig. 5. Hardwood forest damaged by beaver in the southeastern corner of the Harrison Bayou wetland.

flooded sites first and then on adjacent non-flooded areas. In contrast to swamp rabbit injury, the cut is rough and at an angle of about 45 degrees. As seedlings are carried back to the water to be eaten, sections of debarked roots and seedling tops are found strewn upon the surface of the pond (Blair and Langlinais 1960).

Floods overtopping baldcypress seedlings during their first year for more than three weeks can cause mortality. While it is detrimental for plant tips to be submerged for briefer periods after trees are in leaf, death may not result. Sometimes stems re-leaf in late summer after being inundated for several months during the growing season. Warm water and deep deposits of silt and clay sediments, along with oxygen deficiency, contribute to poor survival of submerged seedlings.

Although set aside from most of man's activities at the ammunition plant, one small area of the Harrison Bayou tract may have been damaged when several large rockets were fired in the direction of the forest around 1990. Some trees in this westcentral section of the Harrison Bayou wetland are dead and others appear to be severely stressed (Fig. 4). The damaged area is approximately 15 ha in size and is dominated by water, willow and overcup oaks.

COVER TYPES IN THE HARRISON BAYOU FOREST

Twelve different wetland forest plant communities were identified at the Harrison Bayou site when it was considered for designation as a special management area in 1977. These are now aggregated and mapped as three major cover types or ecotones of the Harrison Bayou wetland (Fig. 4). Other exceptionally large trees found in the area include a persimmon (*Diospyros virginiana*), water elm, overcup oak (*Quercus lyrata*), water locust (*Gleditsia aquatica*), hawthorn (*Crataegus* spp.), and two state champions (as determined by the Texas Forest Service), a water hickory (Carya aquatica) and a flowering dogwood (*Cornus flora*) (Fig. 1).

I. Cherrybark oak-Water oak-Sweetgum

The cherrybark oak (*Quercus falcata* var. *pagodaefolia*)-water oak-sweetgum forest-cover type extends over about 175 hectares, in flat bottoms that are slightly higher in elevation than sites that are more typified by the presence of either baldcypress or overcup oak. Cherrybark oak often reach heights of 30 to 40 m and diameters of 1 to 2 m, which classes them among the largest of the southern oaks (Harlow and Harrar, 1941). Because of the high quality of the wood, these trees are among the most valuable of the region. *Quercus falcata* var. *luecophylla* occurs on the same sites and is difficult to distinguish from the *pagodaefolia* variety. For both, Caddo Lake is the western edge of the range.

The soil of this forest type generally has a clay loam surface which overlies a clay zone, beginning at a depth of 15 cm. At 45 cm, the soil is dense and hard when dry. Bright redoximorphic concentrations in a gray matrix indicates hydric conditions at depths of 50 cm. These soils remain moist most of the time due to wicking from the water table, even after periods of relatively low rainfall.

Quality of forest sites may be described by a Site Index, which is the average total height of the dominant and codominant trees at age 50 years. The Site Index of the Harrison Bayou area is about 100 for sweetgum and cherrybark oak. Average increment growth of sweetgum is typically about 10 rings per cm, regularly, for a radius of 25 cm (the length of the increment borer used). Diameter growth is slow in contrast to that in second-growth managed bottomland hardwood stands. This may be due to the effect of close spacing in these natural stands.

Stems of the species named range from seedlings to 100 cm dbh, the average being about 40 cm. Heights of 30 m are common, such trees having 12 m of relatively clear bole. Baldcypress occurs only as isolated trees or in small groups along the stream channel and in sloughs. Other species found in this type include osage-orange (*Maclura pomifera*) and deciduous holly (*Ilex decidua*).

II. Overcup Oak-Water/Willow Oak-Baldcypress

A moist flat zone astride Harrison Bayou is principally characterized by overcup oak. However, water oak, willow oak and shumard oak (*Quercus shumardii*) are other important components. Site index for shumard oak is probably more than 80, although reliable tabular data are lacking. Current growth rate is slow and steady; 8 rings to a cm of radius. Heights of 30 m are not uncommon. The understory is so sparse that one may see 100 m or more through the forest. Baldcypress trees occur in abundance at the Bayou edge, with many knees protruding from the water. This forest type occupies approximately 140 ha, which is about 10 percent of the Harrison Bayou wetland.

The soil surface in this type is typically 0.3 m above the water in Harrison Bayou. Soil characteristics are directly related to the water that flows over the land. The surface layer is clay loam to clay at a depth of 2-3 cm. A hardpan occurs at 45-50 cm. Crumb to clod structure is found to that depth. No mottling occurs in the top 20 cm, indicating good drainage. Organic matter content is high in the top 5cm, forming an A1 horizon.

One overcup oak measured 137 cm dbh and 37 m tall. It is the third largest known tree of this species in Texas. Many large overcup oaks in the "old growth" tracts of Harrison Bayou are dying. It appears that the overcup oak-type is converted to cherrybark oak-sweetgum if the soil moisture is consistently lowered for a duration of several years.

III. Baldcypress-Water Elm-Swamp Privet

The forest at the mouth of Harrison Bayou is characterized by a dense, homogeneous growth of baldcypress. Moving away from the lakeshore, water elm (*Planera aquatica*) and swamp privet (*Forestiera acuminata*) become significant. One stand of this type also contains one of the largest know water locust stems. It measures 115 cm in circumference, 20-21 m tall, and has a crown diameter of over 11 m. The soil has a rich organic layer in the 5-cm thick A1 horizon, though the litter layer is, by early August, almost entirely decomposed. There is 10 cm zone of reddish-blue mottling. From 15 to 25 cm, the clay is bright yellow (suggesting hydration of the iron coatings on the silt and clay particles) and permeated with various shades of red, and some blue. At 45 cm, the soil is almost solid blue-gray (without mottling), indicating reduction of the iron in the soil, often associated with waterlogging.

This soil is the most "gumbo-like" of the locale. Drainage is poor. The many baldcypress trees here are directly related to the presence of water that often, and for long periods, stands on the land. Baldcypress trees show 6 to 8 rings per cm in trees of 35 cm diameter. Heights are about 23 m. For the broadleaf stems, heights are usually about 20 m. These poorly formed, fairly dense stands of baldcypress are often called pond cypress, a colloquialism; they are not the variety *ascendens*, found elsewhere in cutover southern swamps and bottomlands.

Most of the undisturbed "old growth" forest tracts in the area belong to this cover type (Fig. 1), which accounts for approximately 25 percent of the total area of the Harrison Bayou wetland.

Summary

Over 80 percent of the original bottomland hardwood forests in the South have been lost due to man's activities. Much of what remains is fragmented and degraded, and the few remaining undisturbed tracts are of great ecological and societal significance. An overview is given of bottomland hardwood and baldcypress forests, the two broad silvical regimes to which most southern wetland forests belong. Three major cover types illustrate the diversity of the bottomland hardwoods and baldcypress vegetation in a relatively-undisturbed wetland forest adjacent to Harrison Bayou as it feeds into Caddo Lake in Northeast Texas. These are cherrybark oak-water oak-sweetgum, overcup oak-water/willow oak-baldcypress and baldcypress-water elm-swamp privet. Harrison Bayou represents a model southern bottomland hardwood wetland in both structure and ecological function. For a variety of reasons stated, the virgin hardwoods and second growth forests that still occur in this area have changed very little since 1977.

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Landtype and Vegetative Classification of the Sipsey Wilderness, Alabama

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Abstract: The Sipsey Wilderness was established in 1975 and expanded in 1988 to 11812 hectares. Prior to and since establishment, no classification of either landtypes or existing vegetation was performed to provide baseline information on present wilderness communities and future changes in community structure as the result of natural processes or anthropogenic impacts. 220 different stands were identified through existing aerial photos and topographic maps, and plots within each stand established and measured for landtypes, understory vegetation and overstory vegetation. Descriptions of landtypes and vegetative communities are reported.
Keywords: Sipsey Wilderness, landtype classification, vegetation communities

The proper management of any natural resource requires effective analysis of data regarding that resource. This is true regardless of whether it is a pine plantation, wilderness area, recreation site, wildlife resource or any of the varied uses for natural resources. It is therefore imperative that baseline data be collected so that changes over time in that resource may be evaluated, and the source of the changes determined. On the 11812 hectare Sipsey Wilderness, no such baseline data are available.

The area that is now the Sipsey Wilderness has been managed under varying management strategies across time and landscape, including farming, logging, and homesteading, and contains areas of Native American or archeological importance, as well as areas of relatively low disturbance. Because of the variety of past use, no baseline information of the entire area from the same time has been available. The objectives of this study were to evaluate the vegetative communities on the Sipsey Wilderness, and to obtain baseline information on the status of the ecological communities found within the wilderness.

METHODS

Two sets of aerial photographs covering the Sipsey Wilderness (leaf-on color IR and leaf-off natural color) were used for a preliminary delineation of the overstory communities. Initial delineation was based on obvious changes in overstory vegetation (conifer vs. hardwood); the next level of delineation was based on changes in topography that generally results in changes in vegetation not discernible in aerial photos. A total of 220 different stands were delineated and plot location within each stand was randomly determined. Of the 220 plots, 170 were sampled for vegetation composition; the remaining 50 plots are classified into vegetation communities based on similar landforms and apparent vegetation in the aerial photos, but were not confirmed on the ground.

Each plot was 1000 m2 (0.1 ha) and subdivided into 10 subplots measuring 100 m2 (0.01 ha). Most plots were oriented 2 subplots by 5 subplots; a few were laid out 1 x 10 subplots to conform to landform boundaries and tentative vegetation community boundaries. All plots were marked with rebar in each plot corner and identified with plot and subplot number. Plots did not straddle vegetation types, and as far as could be determined, subplots did not straddle soil map units.

During the 1994 growing season all 170 plots were visited. One third of the plots were sampled in the spring, one third in the summer, and the remaining third were sampled in both spring and summer in an effort to collect data on within-season understory changes. Three

subplots within each plot were randomly chosen for sampling; one subplot selected was intensively sampled (understory, overstory and soil), while the remaining two subplots were only sampled for overstory.

Each herb, shrub and tree species within each subplot was recorded in one or more of the following vegetation layers: 0-1m, 1-3m, 3-12m, and 12+m. Each species found in a vegetation layer less than 12m tall was also classified into the following cover classes: trace, 1-2%, 2-5%, 6-10%, 11-25%, 26-50%, 51-75%, 76-95% and 96-100%. All trees greater than 10 cm at dbh were measured and classified within 5 cm diameter classes, species and crown position (intermediate, co-dominant, dominant).

A subjective measure of the relative abundance of the lichen growth forms (fruticose, foliose, crustose, Usnea-like and Cladonia/Cladina) were made in each plot. Each of the five lichen forms were classified for the whole plot based on the speed with which they were found as either Abundant, Frequent, Sparse, Rare or Absent.

On all plots sampled, the landform/expected mapped soil series relationship was confirmed.

RESULTS AND DISCUSSION

Vegetative Communities Each stand visited was classified using three methods: Landtype Association Classification (Smalley 1979), SAF Cover Type Classification (Eyre 1980) and Ecological Community Classification (Allerd et al. 1994). A total of ten different landtypes were identified. Six of these were identified on only 1-3 plots over the entire wilderness, while Landtype #1 (Narrow Sandstone Ridges and Convex Upper Slopes) was found on 117 plots. Thirteen confirmed SAF Cover Types were found, as well as an additional three types that did not fit current SAF classification. These SAF Cover Types closely correlated with the Ecological Classification Units, with nine confirmed types and an additional 5 new types.

Grouping these vegetative communities into similar types show some relationships between landtypes and the supported communities (Table 1). Fifty-three percent of the sample's plots were classified as one of the various oak communities, while another 24% were pine/hardwood community types. These community types were found on seven of the landtypes, with most being found on landtypes 1 and 10, representing 81% of the visited stands. An additional 537 ha (5% of the Sipsey) was classified as oak or oak/pine mix, although not visited. A majority of the pine stands, many of which are plantations established prior to wilderness designation, are also found on landtype 1. There is little reason to expect these pine stands not to succeed toward a pine/hardwood community and then become one of the oak communities already established on similar sites.

Most of remaining landtypes supported single community types, often only once or twice. Of these, landtype 12 supported 5 stands that were classified as other hardwood. This landtype has a north aspect, and supports more mexic communities such as beech-sugar maple.

The wide distribution of oak community types across the heavily dissected landscape associated with the Sipsey Wilderness, and the apparent successional trend of the pine/hardwood and pine communities toward these same oak types, reflects the highly plastic adaptability of these oak species to varied site conditions. The lack of community diversity also highlights the small impact the dissected topography has on community structure in this region. Further studies of the understory component should clarify the relationship of topography with these communities.

Landtype Descriptions

Landtype 1: Narrow Ridges and Convex Upper Slopes. Shallow to moderately deep soils on gently sloping to steep, narrow winding ridgetops and adjacent convex slopes. 0-40% slopes. Usually no wider than 250 feet. Well drained to excessively drained. Low water supply and moderately low soil fertility. Was found on 117 of 170 plots.

Landtype 3: Broad Ridges-North Aspect. Moderately deep to deep soils on nearly level to steep north facing portions of broad ridgetops and adjoining convex upper slopes. 6-35% slopes. Well drained to moderately well drained. Medium soil water supply and moderately low to low soil fertility. Was found on 1 of 170 plots.

Landtype 4: Broad Ridges-South Aspect. Moderately deep to deep, silty and clayey soils on nearly level to steep south-facing broad ridgetops and adjoining upper slopes. 6-35% slopes. 20 inches to 5 feet to bedrock. Well-drained. Medium to low water supply and moderate to low soil fertility was found on 2 of 170 plots.

usually on dry sites. Common associates include northern and southern red oaks, black, post, scarlet and white oak; hickories, yellow-poplar, sweetgum, black gum, red and sugar maples, eastern redcedar, virginia, shortleaf and loblolly pines. Variety of shrub and herbaceous species associated. Usually dry sites, often ridgetops.

46 Eastern Redcedar (*Juniperus virginiana* L.): Pure or provides majority of stocking, often on dry uplands, abandoned fields and in glades. Associates vary greatly across range of species, which is widest of eastern conifers. Commonly found on shallow soils and limestone outcroppings. Variety of shrub and herbaceous species associated, but tend to be fewer in numbers than on many other sites.

52 White Oak-Black Oak-Northern Red Oak (*Quercus alba* L., *Q. velutina* Lam., *Q. rubra* L.): Together comprise a majority of stocking. Variety of other oaks and hickories commonly associated. This was previously named white oak-red oak-hickory (see hickory transition below). Variety of shrub and herbaceous species associated. This type is subclimax to climax, with the more moist sites supported other climax vegetation.

53 White Oak (*Quercus alba* L.): White oak is pure. Up to 20% of stocking is comprised of a variety of oaks and hickories, black gum, yellow-poplar, maples, white ash. Understory trees include dogwood, sassafras and sourwood. Variety of shrub and herbaceous species associated. Moderately dry sites, with moisture determining associated species.

55 Northern Red Oak (*Q. rubra* L.): Comprises majority of stocking, may occur in pure stands. Associated vary with site and geographic locale. In the south occurrence is spotty. Variety of shrub and herbaceous species associated.

59 Yellow-Poplar-White Oak-Northern Red Oak (*Liriodendron tulipifera* L., *Quercus alba* L., Q. rubra L.): These species constitute majority of stocking. Usually associated with coves, but can extend onto moist sites on east and north facing slopes. Variety of shrub and herbaceous species associated. Late successional community normally associated with lack of fire, which can eliminate the yellow-poplar.

60 Beech-Sugar Maple (*Fagus grandifolia* Ehrh., *Acer saccharum* Marsh): Together constitute majority of stocking, but can include a variety of overstory and understory species dependent on the region and site. Late successional community associated with coves. Found in small patches in south.

78 Virginia pine-Oak (*Pinus virginiana* Mill., *Quercus* spp. L.): Virginia pine and variety of oaks make up majority of stocking. Associated species also include red maple, yellow-poplar, shortleaf pine, dogwood, and hickories. Variety of shrub and herbaceous species associated. Usually on old fields but also on other upland sites.

79 Virginia Pine: Pure stands or majority of stocking. Associates vary with geographic locale, but in this region include shortleaf pine, oaks, hickories and eastern redcedar. Variety of shrub and herbaceous species associated. Pioneer species that is often found on disturbed sites.

81 Loblolly Pine (Pinus taeda L.): Pure stands or mix with other species but still is majority of stocking. Sweetgum is often most common. Other pines, oaks, hickories and sassafras also found. Variety of shrub and herbaceous species associated. Tends to be temporary due to succession pressures. May be old plantations.

82 Loblolly Pine-Hardwood: Loblolly pine is dominant but not more than 20% of stocking with mixture of hardwoods. Hardwoods vary with moisture conditions found throughout range of loblolly pine, including oaks, hickories, maples and elms. Variety of shrub and herbaceous species associated. Widespread but sporadic.

108 Red Maple (*Acer rubrum* L.): Comprises majority of stocking. Associates are diverse, but in this region include oaks, sweetgum, yellow-poplar, loblolly pine and virginia pine. Variety of shrub and herbaceous species associated. Rare in south, but can occur in small areas. May be increasing in area due to disturbances removing other associates that were dominant species.

These three cover types are not classified by Eyre (1980). We have presented them as cover types so that the entire Sipsey is represented, and to highlight some of the unique vegetative communities found there.

Hickory Transition (*Carya* spp. Nutt.): These cover types are dominated by various hickories, with no identifiable successional trend following below them. There is a mix of hardwood species, including red maple, oaks, and various understory trees.

Where these stands are going successionally is impossible to determine at this time.

No Overstory: These two sites represent two unique conditions within the Sipsey. They appeared as identifiable stands from the aerial photos. Plot 150 is an old CCC camp. It is currently dominated by grasses and shrubs, with small loblolly pines scattered throughout the stand. Plot 208 is an old wildlife opening, probably an old feedplot, with no trees species within the stand.

Bigleaf Magnolia-Black Gum (*Magnolia macrophylla* Michx., *Nyssa sylvatica* Marsh.): This is a unique cover type that does not appear in any forestry literature we could find. There is one stand (plot 203) that is dominated by Bigleaf Magnolia and Black Gum, both in the overstory and the smaller size classes. It is obviously a transitional stand that should develop into a more traditional (probably oak) cover type, but at this time could not be classified in any other type.

Ecological Classification and Vegetative Community Descriptions

The overall community classification and descriptions used in this project are based on the system developed by the Nature Conservancy, along with others, for the Southeastern United States (Allard et al. 1994). Descriptions and identifications are from documentation provided by the USFS in Montgomery. Where documentation does not exist to support communities found within the Sipsey, we developed similar descriptions. These latter stands are the same stands described above as not documented within the SAF Cover Types.

***Pinus taeda Upland* Forest Alliance:** This type was found on 7 plots and was equivalent to Cover Type 81 (Loblolly Pine). Total area for this type was 430 hectares. This type is successional following harvesting and planting, and on the Sipsey represents old plantations (but younger than loblolly pine-hardwood stands) currently dominated by Loblolly pine. Landtypes were 1,10,11, with five being on 1, Narrow Sandstone Ridges and Convex Upper Slopes. We are assuming these types will succeed to the various oak-dominated communities also found on these landtypes.

***Fagus grandifolia -Acer saccharum-Liriodendron tulipifera* Forest Alliance:** This type was found on 7 plots and was equivalent to Cover Type 60 (Beech-Sugar Maple). Total area for this type was 958 hectares. This is a deep soil forest type, usually mesophytic forests in coves and north or east facing slopes. These types are late-successional, climax (or near climax) types, and reflect areas where little disturbance has occurred. Landtypes were 1,10,12 and 13.

***Quercus alba-Quercus (coccinea, velutina)-Carya (alba, glabra)* Forest Alliance:** This type was found on 70 plots and was equivalent to Cover Type 52 (White Oak-Black Oak-Northern Red Oak, 66 plots) and 53 (White Oak). Total area for this type was 2567 hectares. This is possibly where the plots dominated by hickories (see below) will succeed to over time. These are usually dry-site oak-hickory forests in the interior uplands, and are obviously a major part of the Sipsey Wilderness. Landtypes were 1,5,10,12 and 13, with 50 being on landtype 1, Narrow Sandstone Ridges and Convex Upper Slopes.

***Quercus prinus-Quercus (alba, falcata, velutina)-Carya (alba, glabra)* Forest Alliance:** This type was found on 19 plots and was equivalent to Cover Type 44 (Chestnut Oak). Total area for this type was 1493 hectares. This type represented many of the drier chestnut oak-mixed species stands within the Sipsey, and may have been dominated by Chestnut (Castanea dentata (Marsh.) Borkh.) in the past. Shagbark hickory (Carya ovata (Mill.) K. Koch) was also a common associate. Understory often dominated by various shrub species. Landtypes were 1,10,12 and 13, with 12 on landtype 1.

***Quercus rubra* Forest Alliance:** This type was found once in the Sipsey and covered 564 hectares. It was the same as Cover Type 55 (Northern Red Oak). This type was not listed as occurring on the Bankhead, but did reflect all of the characteristics of such a type. It was found on landtype 1.

***Pinus taeda-Quercus (alba, falcata, stellata)* Forest Alliance:** This type was found on 27 plots and was equivalent to Cover Type 82 (Loblolly Pine-Hardwood). Total area for this type was 1790 hectares. This type was not listed as occurring on the Bankhead, but appears to be a common type. Should be considered transitional type with the loblolly pine being replaced successionally by the oaks and other hardwoods, and may be the same as the Pinus taeda Upland Forest Alliance described above, but farther along successionally. Landtypes were 1,4,6,10 and 12, with 18 on landtype 1.

***Juniperus virginiana-Fraxinus americana-Quercus muehlenbergii* Forest Alliance:** This type was found on 1 plot (461 hectares) on Landtype 1 and was equivalent to Cover Type 46 (Eastern Redcedar). This was the only stand dominated by Eastern Redcedar, and was found on a site with shallow soils with limestone outcropping. We were suprised we found only one site. Many areas of the Sipsey supported Eastern Redcedar, but those sites had not been disturbed for a period of time, and hardwood succession had taken place, usually dominating these stands.

***Pinus virginia-Quercus (alba, stellata, falcata, velutina)* Forest Alliance:** This type was found on 27 plots and was equivalent to Cover Types 78 (Virginia Pine-Oak) and 79 (Virginia Pine). Total area for this type was 1298 hectares. This type represented drier sites, often disturbed, where virginia pine was maintaining a strong presence. With fire exclusion, these stands may succeed towards oak dominated types, but weather disturbances will still maintain this type within the Sipsey. Landtypes were 1,3,6,10 and 13, with 21 on landtype 1.

***Tsuga canadensis-Liriodendron tulipifera Upland* Forest Alliance:** This type was found on 4 plots and was equivalent to Cover Type 23 (Eastern Hemlock), covering 266 hectares. These were often found in coves, and represented late successional communities. Landtypes were 1,7 and 10, with 7 and 10 representing the more traditional type of cove sites associated with Eastern Hemlock. The two plots on Landtype 1 were also on cooler sites and appeared to be relatively undisturbed areas within the Sipsey Wilderness.

The following did not fit any of the current classified communities described by the Nature Conservancy.

A: This was the hickory transition as described in the SAF Cover Type descriptions above. Various hickories were dominating the overstory with a few oaks, with most of the tree regeneration being beech and sugar maple. These 208 hectares may become beech-sugar maple types in the future if there is no disturbance.

B: This is the red maple type described in the SAF Cover Type, covering 603 hectares. We believe this is a transitional community, but there is no definite understory community from which to estimate future communities.

C: These are the 2 yellow-poplar-white oak-northern red oak communities covering 89 hectares and described in the Cover Types. They do not fit any of the communities previously described, and may be isolated types only associated with the dissected landscape in the upland hardwood forests found throughout the Sipsey Wilderness.

D: These are the two plots (242 hectares) with no overstory previously described. Both have been heavily modified by human activities, and additional time must pass before a identifiable vegetative community may be found.

E: This is the unique bigleaf magnolia-black gum stand (242 hectares) found once within the Sipsey and that does not appear to be previously identified. See the cover type description above for further information.

Stands not inventoried but estimated to be of a certain community, totaled 601 hectares and broke down as: 278 ha of loblolly pine/oak, 240 ha of chestnut oak/oak; 21 ha had no overstory; 19 ha of virginia pine/oak; and 43 ha were not classified because they were located within narrow areas along cliffs/streams which made initial classification from aerial photos almost impossible and ground inventory dangerous.

Lichen Life Forms

Eleven plots, representing six landtypes, associations or SAF Cover Types, and five ecological classification types, were found supporting lichen growth. Seven of these supported rare occurrence for all growth forms, two were sparsely occurring for all growth forms, and the Cladonia/Cladina (C/C) growth form was found alone on two plots, once rare and the other sparsely.

Mosses

A total of 85 plots supported mosses. These plots were within eight landtypes, 12 SAF Cover Types and 11 Ecological Classification Types. No identification of specific moss species was performed. Only one plot had frequent occurrence of moss, 12 were sparse and 72 were rare. The remaining plots did not support moss at the time of the evaluation.

Soil

On every plot, the expected soil series from the soil maps and descriptions provided by the USFS was confirmed. This accuracy was a bit unexpected due to the method often utilized to survey soils across heavily forested, dissected terrain. It may be that the highly dissected nature

of the Sipsey lent itself to greater accuracy since there would be less ecotone-type transition zones in soil development in this type of topography, but would result in close correlation between topographic features and soil series.

CONCLUSION

This survey provides a great deal of information about the Sipsey Wilderness. Although the landscape is very dissected and diverse, there appears to be a great deal of consistency in the vegetative communities. Over time, current human-imposed conditions such as old plantations and clearings will evolve into the type of stands found on the more remote areas of the Sipsey. The scientific data collected will provide the opportunity to investigate the community structures and successional processes associated with the little studied forests of the interior uplands.

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Forest Composition, Structure, and Disturbance History of the Alan Seeger Natural Area, Huntingdon County, Pennsylvania

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Abstract: Ten forest stands were sampled along an edapho-vegetational gradient composed of *Tsuga-Betula* on wet stream bottoms, *Tsuga-Pinus* on wet mesic stream terraces, mixed mesophytic species within a mesic upland cove, and mixed *Quercus* on dry mesic upland slopes. Evidence of logging during the mid-1840's had a profound effect on current forest composition and structure. Tree species reacted differently to major anthropogenic disturbance, with *Pinus*, *Liriodendron* and *Quercus* responding favorably and *Acer*, *Betula* and *Tsuga* recovering more slowly. Current successional trends may be altered by white-tailed deer (*Odocoileus virginianus*) overbrowsing and/or intense *Rhododendron* competition. The presumption that sampled forests have been relatively free of Euro-American activity and, thus, representative of presettlement old growth was not supported by our data. Labeling forests in protected areas as old growth is probably a common misconception throughout the East, and age structure and tree-ring data should be used to verify old-growth status.
Keywords: Disturbance frequency, age-diameter relationships, radial growth analysis, canopy structure, succession, logging, deer browsing, old growth, *Tsuga canadensis*, *Pinus strobus*, *Quercus*, *Rhododendron maximum*.

INTRODUCTION

The study of old growth has contributed substantially to ecological theory of eastern United States forests. Indeed, our fundamental knowledge of disturbance history (Cooper 1913, Sprugel 1976, Lorimer 1980, Oliver 1981), gap-phase replacement (Fox 1977; Woods 1979; Barden 1979, 1980, 1981; Runkle 1981, 1982), and forest floor/soil dynamics (Auten 1933, Hough 1942, Aquilar and Arnold 1985, MacMillan 1988) has been greatly enhanced through old-growth research. Old-growth forests often serve as important benchmarks by which human impacts on regional vegetation can be evaluated (Hough and Forbes 1943, Forman and Elfstrom 1975, Abrams and Scott 1989) or successional trends recorded (Kittredge 1934, Boggess and Bailey 1964, Whitney 1984, McCune and Menges 1986, Abrams and Downs 1990).

Old-growth forests have declined continually since European settlement of North America, and currently represent a small percentage of the total forested area in the East (Davis 1993). The rarity of old growth is particularly evident in central Pennsylvania, where forests have been intensively logged for timber and charcoal production (Goodlett 1954, Hunter and Swisher 1983, Nowacki and Abrams 1992). The Alan Seeger Natural Area (ASNA) in the Rothrock State Forest is one of the few areas where old growth reportedly exists. According to local history, the core area of ASNA escaped initial cutting efforts due to a boundary-line dispute between competing logging companies. The property was eventually acquired by the state of Pennsylvania, and protected through natural area designation in 1970.

The ecological diversity expressed in the ASNA forests coupled with their relatively pristine appearance prompted our study. Specifically, we hoped to provide information

on soil-site-vegetation relationships within an old-growth ecosystem; composition, structure, and disturbance periodicity of pre- and post-settlement forests; and anthropogenic-mediated vegetational changes linked to European settlement.

METHODS

Study Area. The Alan Seeger Natural Area (ASNA) is an 148 ha preserve located in the Rothrock State Forest, Huntingdon County, Pennsylvania (40^0 41' 30"N, 77^0 45' 30"W). The core area of 10 ha reputedly supports a virgin stand of hemlock, white pine and hardwoods (Mickalitis 1956). The terrain is representative of the Ridge and Valley Physiographic Province (Fenneman 1938), with paralleling sandstone-capped ridges interspersed by limestone- or shale-based valleys. The central portion of ASNA straddles Standing Stone Creek within a narrow, shale-underlain basin between Gettis Ridge and Broad Mountain (Fig. 1). Soils are part of the Hazleton-Laidig-Andover Association formed in residual and colluvial materials weathered from sandstone and/or shale (Merkel 1978). The soils are typically coarse-textured and nutrient poor. Topographic location plays an important role in soil-water relations, with wet to mesic conditions in bottomlands and coves and dry mesic to xeric conditions on upland slopes and ridges. The climate is affected by both dry continental and humid maritime air masses, with dry, cold winters and humid, warm summers generally prevailing. Precipitation is normally abundant during the frost-free season; however, droughts periodically occur. A detailed description of regional climate is given by Nowacki and Abrams (1992).

Field Sampling and Laboratory Analyses. Ten forest stands were sampled during the summer of 1990 within the ASNA (refer to Fig. 1 for stand location). Prior to sampling, the principal forest types in the area were identified via field reconnaissance. Only larger units displaying homogeneous vegetation and similar topography were selected for sampling. The point-quarter method was used to document forest structure and composition (Cottam and Curtis 1956). Twenty points per stand were systematically placed 20 to 30 m apart along transects depending on stand size and configuration. Sampling was conducted in the interior of each stand as best possible. At each point, quadrants were established and the closest tree (an individual ≥ 10 cm at 1.4 m) determined in each. Species name, distance from the point, diameter at breast height (dbh, 1.4 m), and canopy position (dominant, codominant, intermediate and overtopped; see Smith 1986) were recorded. Two sampled trees per plot were cored at breast height for age and tree-ring analysis. These trees were selectively chosen to best represent the overall structure (size and canopy classes) and composition of the observed stand. Trees with obvious bole defects were not cored. To maximize tree-ring chronology length and aid reconstruction of past stand histories, several large-sized trees not included in the point-quarter tally were also cored. Although some ring counts were conducted in the field (e.g., badly broken cores), most cores were labelled and transported to the laboratory for radial growth analysis. In the laboratory, ring widths were measured to the nearest 0.14 mm via a dissecting scope with an ocular micrometer. Cores from diffuse porous trees (e.g., *Betula*, *Nyssa*) were stained with phloroglucinol and sanded to aid ring detection and measurement.

Standardized tree-ring chronologies were produced for each stand by the straight-line regression procedure described by Fritts and Swetnam (1989). Standardization removes age-size related ring-width variation by fitting a regression line to the ring widths and dividing each original ring width by its corresponding value of the fitted line. Thus, ring-widths were converted into relative tree-ring indices that have a mean of 1.0 and constant variance. Five cores per stand (10 for stand SB3) were standardized in this fashion and then averaged to create master tree-ring chronologies. To maximize the length of each master tree-ring chronology, the oldest cores of each stand were normally used. However, since tree-ring measurements of ring-diffuse species were less reliable, these cores were discriminated against in this analysis if comparably-aged cores with distinct rings (e.g., *Quercus*, *Tsuga*) were available. Disturbance events were identified by observable, sustained increases in tree-ring growth (cf. Lorimer 1980, Canham 1985), and were often supported by the mass recruitment of trees (Abrams and Nowacki 1992). Tree age data for ASNA was also obtained through the International Tree Ring Data Base (ITRDB), Boulder, Colorado.

Saplings and seedlings were recorded by species using nested circular plots of 10 m^2 and 5 m^2, respectively, at each point. Saplings were

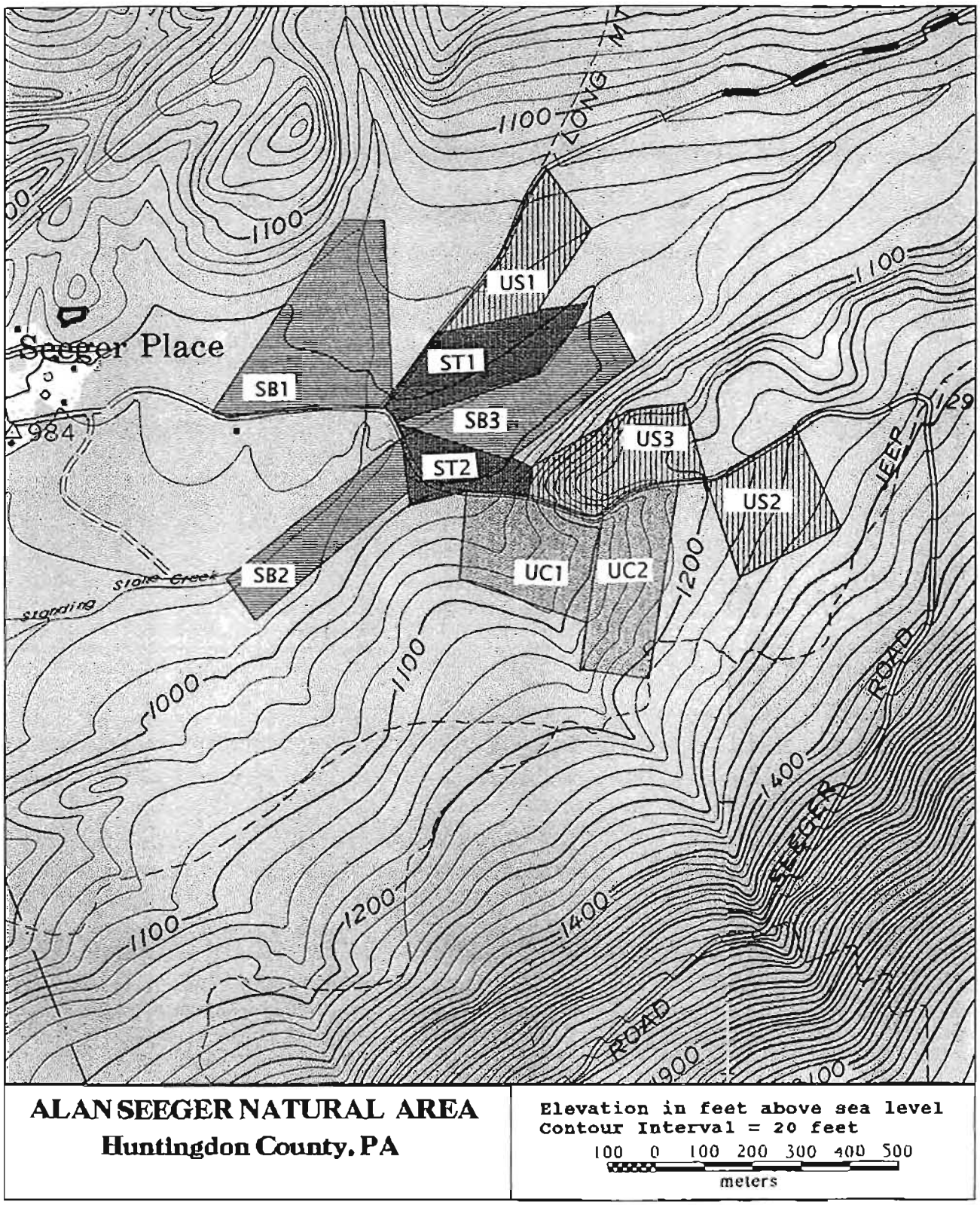

Fig. 1. Topographic relief map of the Alan Seeger Natural Area, Huntingdon County, Pennsylvania, including the approximate location and configuration of 10 sampled stands.

Table 1. General edaphic characteristics of four physiographic groups identified at Alan Seeger Natural Area, Huntingdon County, Pennsylvania.

	Stream Bottom (N=3)	Stream Terrace (N=2)	Upland Cove (N=2)	Upland Slope (N=3)
Topographic Position	proximal stream bottoms	distal stream terraces	upland notch	slopes and ridges
Drainage	poorly to somewhat poorly	poorly to moderately well	somewhat poorly to moderately well	somewhat poorly to well
General Soil Type	Typic Fluvaquents	Typic Fragiaquults	Aquic Fragiudults	Aquic/Typic Fragiudults
Mean % Sand-Silt-Clay				
of surface[1]	65-26-09	49-39-12	47-34-19	44-42-14
at 25 cm[2]	54-21-25	44-31-25	43-30-27	33-37-30
at 50 cm[3]	55-20-25	49-21-30	48-29-23	28-35-37
Mean pH				
of surface	4.1±0.3	3.6±0.2	4.5±0.2	4.2±0.2
at 25 cm	4.3±0.2	4.2±0.2	4.7±0.1	4.1±9.2
at 50 cm[4]	4.1±0.1	4.2±0.2	5.1±0.1	4.2±0.2
Mean % Slope[5]	2.0±0.6	4.5±0.5	12.5±2.5	7.3±1.8
Mean Elev. (m)	302±3	303±1	336±16	350±20

Significant differences at $P < 0.05$ among groups include:
1 Mean % sand between stream bottom and upland slope; mean % clay between stream bottom and upland cove.
2 Mean % sand and mean % silt between stream bottom and upland slope.
3 Mean % sand and mean % silt between stream bottom and upland slope.
4 Mean pH between upland cove and all other groups.
5 Mean % slope between stream bottom and upland cove.

Table 2. Importance percentages of principal trees and tree richness (# species), density (stems/ha) and basal area (m^2/ha) by stand at Alan Seeger Natural Area, Huntingdon Co., PA

	Stream Bottom			Stream Terrace		Upland Cove		Upland Slope		
	SB1	SB2	SB3	ST1	ST2	UC1	UC2	US1	US2	US3
Acru	10.9	9.8	9.2	14.9	3.2	9.0	14.5	22.6	6.2	19.3
Acsa	0.0	1.7	0.0	0.0	0.0	3.9	4.0	0.0	28.5	0.0
Beal	19.3	15.7	29.6	8.5	17.7	16.9	2.4	0.0	0.0	0.0
Carya	0.0	0.0	0.0	0.0	0.0	0.0	3.9	3.4	14.0	1.1
Lita	4.1	7.9	3.6	1.3	5.8	12.3	14.1	0.0	0.0	0.0
Maac	0.0	4.9	2.9	0.0	1.7	5.2	2.2	0.0	5.0	0.0
Nysy	4.7	4.0	4.7	6.3	2.4	3.3	1.7	1.2	0.0	0.0
Pipu	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	14.7
Pist	6.9	9.0	3.7	20.9	14.1	0.0	0.0	3.5	0.0	1.2
Quercus	6.2	0.0	2.8	9.0	3.3	6.9	23.2	63.3	35.9	61.5
Qual	6.2	0.0	0.0	5.7	0.0	0.0	1.7	50.2	6.5	2.3
Quco	0.0	0.0	0.0	0.0	0.0	0.0	0.0	3.7	0.0	3.8
Qupr	0.0	0.0	1.7	0.0	0.0	0.0	8.4	1.7	3.6	40.0
Quru	0.0	0.0	1.1	3.2	3.3	6.9	13.1	7.7	25.8	15.4
Tsca	47.9	40.9	40.3	37.8	50.4	33.1	27.7	4.6	0.0	0.0
Other	0.0	6.1	3.2	1.3	1.4	9.4	6.3	1.5	10.4	2.2
Richness	7	10	11	9	9	11	16	10	11	10
Density	570	600	267	561	748	300	310	323	396	408
Basal Area	55.3	56.5	36.1	67.6	59.1	37.6	42.1	31.2	33.9	25.6

Species designations: Acru=*Acer rubrum*, Acsa=*Acer saccharum*, Beal=*Betula alleghaniensis*, Carya=*Carya* spp., Litu=*Liriodendron tulipifera*, Maac=*Magnolia acuminata*, Nysy=*Nyssa sylvatica*, Pipu=*Pinus pungens*, Pist=*Pinus strobus*, Quercus=*Quercus* spp., Qual=*Quercus alba*, Quco=*Quercus coccinea*, Qupr=*Quercus prinus*, Quru=*Quercus rubra*, Tsca=*Tsuga canadensis*, Other=*Amelanchier* spp.+*Betula lenta*+*Cornus florida*+*Fagus grandifolia*+*Fraxinus americana*+*Fraxinus nigra*+*Ostrya virginiana*+*Pinus rigida*+*Populus grandidentata*+*Prunus serotina*+*Tilia americana*.

as seedlings on upland slopes, outdistancing second-ranked *Quercus* almost ten-fold. Although total tree seedlings were fairly numerous among groups, averaging from ca. 71,000-139,000 stems/ha, the majority were ephemeral germinants ≤10 cm in height. The conspicuous lack of larger seedlings continued through the sapling layer for all groups. Group sapling means ranged a mere 50 to 117 stems/ha, with only 6 species represented: *T. canadensis*, *B. alleghaniensis*, *Nyssa sylvatica* Marsh., *A. saccharum*, *Hamamelis virginiana* L. and *P. strobus*. No saplings were encountered in sampling plots within sites SB3, ST2, US2 and US3. Recently-dead *Cornus florida* L. saplings were abundant on site US2.

Rhododendron maximum L. and *Kalmia latifolia* L. were the principal shrubs in ASNA (Table 3). The former occurred mainly on wet to moist sites, specifically stream bottoms, terraces and the upland cove. *Rhododendron maximum* was particularly dense within site SB3, often forming impenetrable thickets. Scattered patches of *K. latifolia* and *Vaccinium* spp. were exclusive to upland slopes. Total herbaceous cover was low overall, ranging from 16 to 31%.

Tree Canopy Structure. The overstory (dominant, codominant and intermediate classes collectively) of stream bottom forests was quite diverse, with *T. canadensis*, *B. alleghaniensis*, *P. strobus*, *L. tulipifera* and *A. rubrum* commonly present (Fig. 2). *Tsuga canadensis* was uniformly distributed vertically within the overstory, and comprised the majority of the overtopped class. *Betula alleghaniensis* was primarily in the intermediate class, whereas *P. strobus* and *L. tulipifera* were largely confined to the largest canopy classes. *Tsuga canadensis* and *P. strobus* dominated the lower and upper canopy strata, respectively, of stream terrace forests. *Liriodendron tulipifera* and *Quercus* occurred almost exclusively in dominant and codominant positions. *Acer rubrum* was moderately important in all but the overtopped class. *Betula alleghaniensis* was most abundant in the intermediate class. Within the upland cove, *L. tulipifera* was largely relegated to the dominant class. *Quercus* was common in the overstory, but infrequent in the overtopped class. *Acer* and *T. canadensis* generally increased downward through the canopy profile, together comprising most of the overtopped class. *Betula alleghaniensis* again occurred mainly as an intermediate. *Quercus* almost exclusively comprised the dominant and codominant classes of upland slope forests, with progressive decreases in the remaining classes. In contrast, *Acer* increased in the lower strata, being common in the intermediate class and dominating the overtopped class. *Pinus* occurred primarily as an overstory tree.

Stand Structure, Age Distribution and Disturbance History.

Evidence of large-scale logging during the mid-1840s was apparent in every ASNA stand (Figures 3-6). This disturbance was particularly noticeable in stream bottom sites, where substantial increases in tree recruitment and radial growth co-occurred (Fig. 3). Among principal trees emerging from this disturbance, *P. strobus* and *L. tulipifera* grew fastest, followed by *Quercus*, and then *T. canadensis*, *B. alleghaniensis* and *A. rubrum* (Table 4). The variety of recruits differed sharply from the old-aged trees remaining from the previous stand (referred to hereafter as remnants), which consisted largely of *T. canadensis*. Thus, the catastrophic nature of the 1846 disturbance seems to contrast with the prevailing disturbance regime of the 17th and 18th centuries when remnant *T. canadensis* were established (note compositional differences between 1722 and 1846 recruits in SB1). Site SB3 contained the largest number of remnant trees, although many overstory trees were post-1846 disturbance recruits. Indeed, even in this stand, alteration was so acute by European disturbance that radial growth rates of remnant trees are just returning to their pre-1846 levels (ca. 0.5-0.6 mm/yr; data not shown). An additional post-settlement disturbance occurred on sites SB1 and SB2 around 1912.

Present-day forests on stream terraces resulted primarily from the disturbance events around 1846, including possible fire (Fig. 4). The lack of remnant trees within site ST2 indicates near-total destruction of the pre-existing stand; after which *P. strobus*, *L. tulipifera* and *Quercus* grew most rapidly, and came to dominate much of the overstory, whereas *A. rubrum*, *T. canadensis* and *B. alleghaniensis* emerged more slowly (Table 4). Although pre-disturbance composition of terraces cannot be accurately depicted, *T. canadensis* and *N. sylvatica* (latter not specified on age-diameter charts) were present as remnant trees. A disturbance around 1805 resulted in limited recruitment in ST2, although most of that

Table 3. Mean seedlings (#/ha±SE) of principal species/genera and mean totals for seedlings, saplings, shrub cover and herbaceous cover of four physiographic groups identified at Alan Seeger Natural Area, Huntingdon County, Pennsylvania.

	Stream Bottom	Stream Terrace	Upland Cove	Upland Slope
Seedlings				
Acru	14800±6368	6750±850	23300±2700	57267±16689
Acsa[1]	100±100	50±50	3450±250	433±384
Acpe	0±0	150±150	0±0	1800±1650
Betu	27700±8410	42150±5050	46400±22300	500±115
Fram	1300±781	1200±100	5400±4300	233±233
Litu[2]	2333±353	1950±1650	5000±600	267±120
Nysy	2567±664	1750±1450	550±450	767±517
Pist	233±186	250±250	100±100	767±498
Prse	267±267	150±150	250±50	900±802
Quercus	33±33	0±0	700±700	6100±4652
Tsca[3]	21367±12116	84550±5250	14150±2950	867±592
Other	600±400	400±400	1700±1300	5767±1768
Total	71300±27277	139350±3150	101000±21600	75667±18613
Saplings				
Principal sp.	mixed	Tsca	mixed	Pist
Total	50±29	50±50	100±0	117±117
Shrubs				
Principal sp.	Rhma	Rhma	Rhma	Kala
Total (%)	44±16	18±6	8±2	12±7
Herbaceous Tot.(%)	19±8	16±0	31±11	22±12

Significant differences at $P < 0.05$ among groups include: 1 Acsa seedlings between Upland Cove and all other groups.
2 Litu seedlings between Upland Cove and Upland Slope.
3 Tsca seedlings between Stream Terrace and all other groups.
Species designations: Acru=*Acer rubrum*, Acsa=*Acer saccharum*, Acpe=*Acer pensylvanicum*, Betu=*Betula* spp., Fram=*Fraxinus americana*, Kali=*Kalmia latifolia*, Litu=*Liriodendron tulipifera*, Nysy=*Nyssa sylvatica*, Pist=*Pinus strobus*, Prse=*Prunus serotina*, Quercus=*Quercus* spp., Rhma=*Rhododendron maximum*, Tsca=*Tsuga canadensis*, Other=*Amelanchier* spp.+*Carya* spp.+*Crataegus* spp.+*Fagus grandifolia*+*Hamamelis virginiana*+*Magnolia acuminata*+*Malus* spp.+*Ostrya virginiana*+*Pinus pungens*+*Populus tremuloides*+*Sassafras albidum*+*Tilia americana*.

Table 4. Mean diameter (cm at dbh±SE) and canopy position mode[1] of principal trees recruiting *en masse* (1845-1875) after the major mid-1840s disturbance for four physiographic groups at Alan Seeger Natural Area, Huntingdon County, Pennsylvania.

	Stream Bottom		Stream Terrace		Upland Cove		Upland Slope[2]	
	DBH	Canopy	DBH	Canopy	DBH	Canopy	DBH	Canopy
Acer	28±5[a]	Int	33±5[a]	Int	52±2[a]	Dom/Cod	—	—
Betula	32±3[a]	Int	27±3[a]	Int	—	—	—	—
Lirio	57±3[bc]	Dom	45±10[ab]	Dom/Cod	57±4[a]	Dom	—	—
Pinus	61±6[b]	Dom	59±4[b]	Dom	—	—	47±10[a]	Dom
Tsuga	35±3[ac]	Int/Over	31±2[a]	Over	33±10[a]	Over	—	—
Quercus Ery	—	—	—	—	45±5[a]	Int	51±4[a]	Cod
Q. Leuco	46±2[ab]	Cod	40±2[ab]	Cod	45±7[a]	Int	41±2[a]	Cod

Values in a column with the same letters are not significantly different at $P < 0.05$.
1 Tree diameters included in analysis were strongly correlated ($P<0.01$; $r=0.79$) with coded canopy position (4=dominant (dom), 3=codominant (cod), 2=intermediate (int), 1=overtopped (over)).
2 *Erythrobalanus* (Ery; *Q. coccinea* + *Q. rubra*) and *Leucobalanus* (Leuco; *Q. alba* + *Q. prinus*) mean diameters within this physiographic group were significantly different at $P < 0.06$.

cohort may have been removed by post-settlement cuttings.

Upland cove forests were also composed of trees mainly originating after the 1846 disturbance (Fig. 5). *Liriodendron tulipifera* and *Acer* grew most rapidly during post-disturbance conditions, followed by *Quercus*, then *T. canadensis* (Table 4). A variety of remnant trees

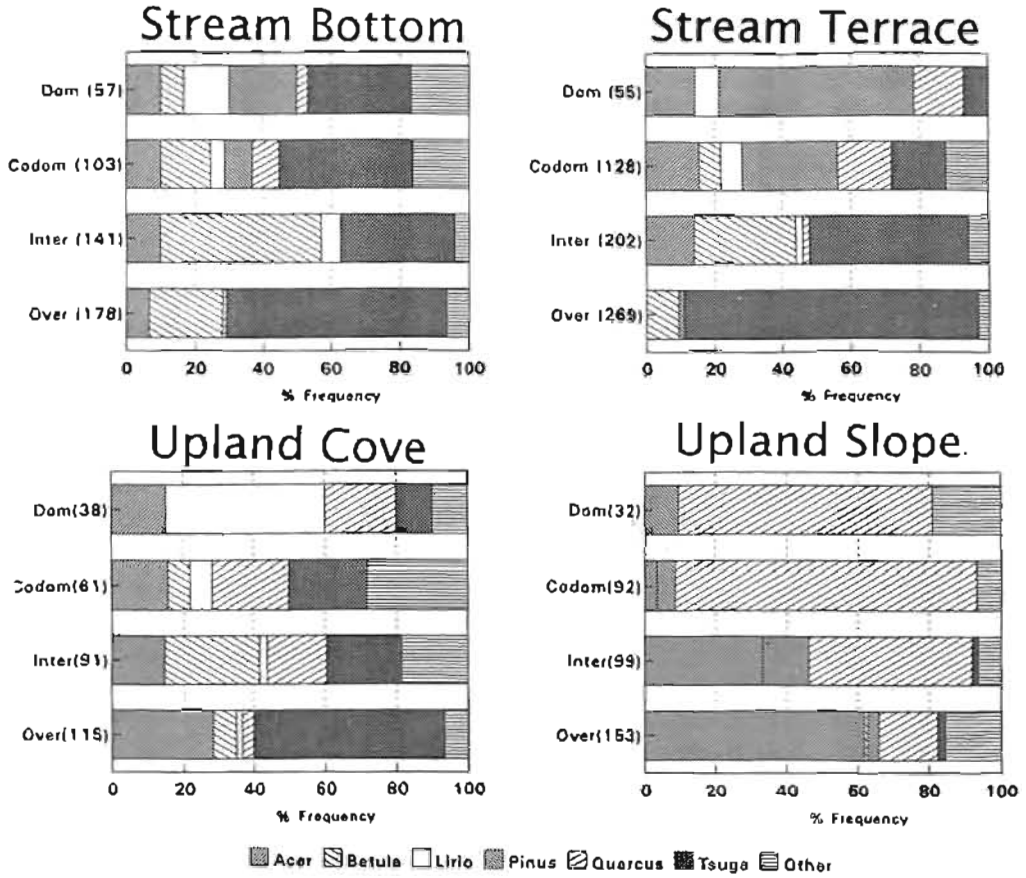

Fig. 2. Relative frequency of principal trees and tree density (#/ha in parentheses) by canopy class (dominant, codominant, intermediate, and overtopped) of four physiographic groups in Alan Seeger Natural Area, Huntingdon County, Pennsylvania.

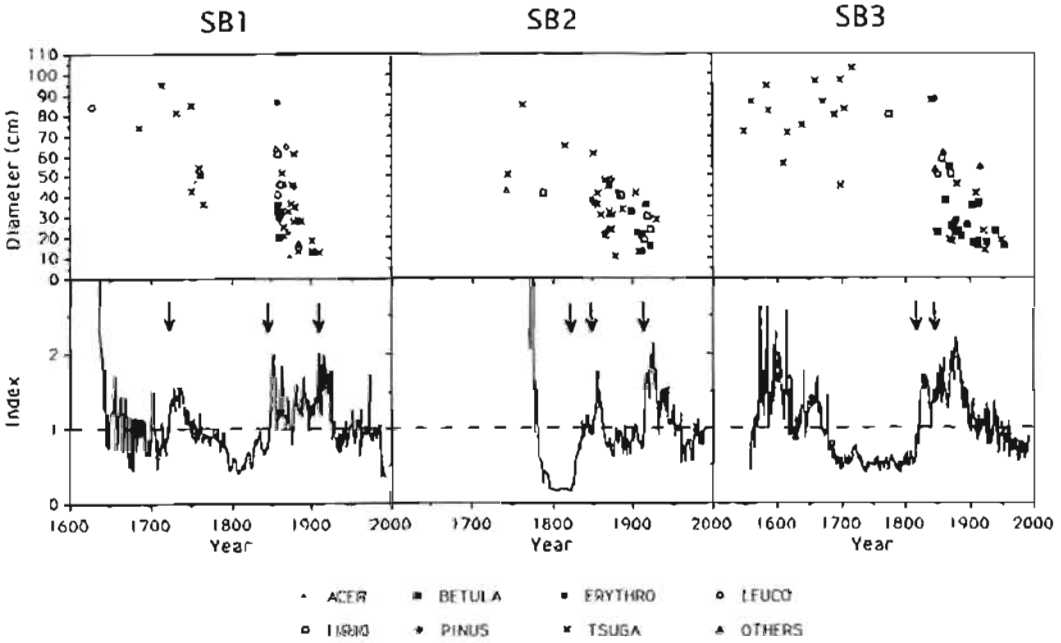

Fig. 3. Age-diameter and standardized tree-ring chronologies of 3 stream bottom (SB) sites sampled at Alan Seeger Natural Area, Huntingdon County, Pennsylvania. Ring-index pulses indicative of disturbance are designated by arrows. Erythro includes *Quercus rubra* and *Q. coccinea*; Leuco includes *Q. alba* and *Q. prinus*.

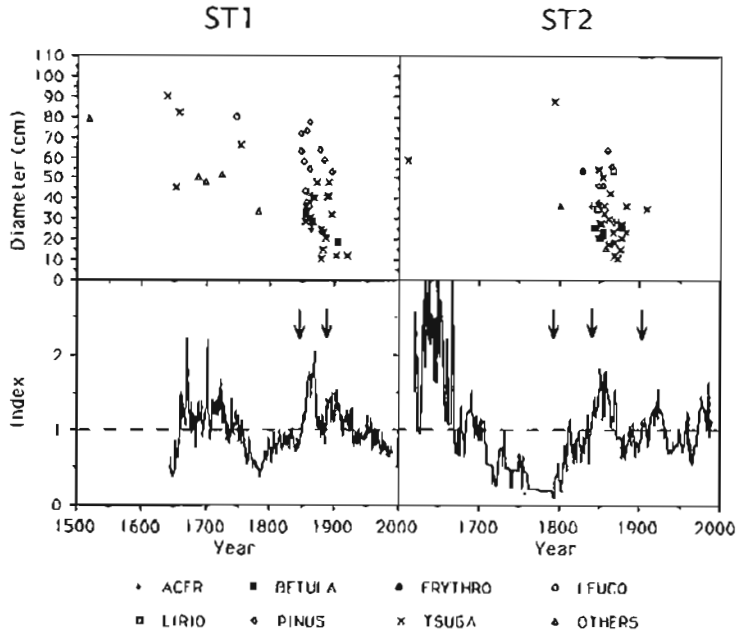

Fig. 4. Age-diameter and standardized tree-ring chronologies of 2 stream terrace (ST) sites sampled at Alan Seeger Natural Area, Huntingdon County, Pennsylvania. See Fig. 3 for comments.

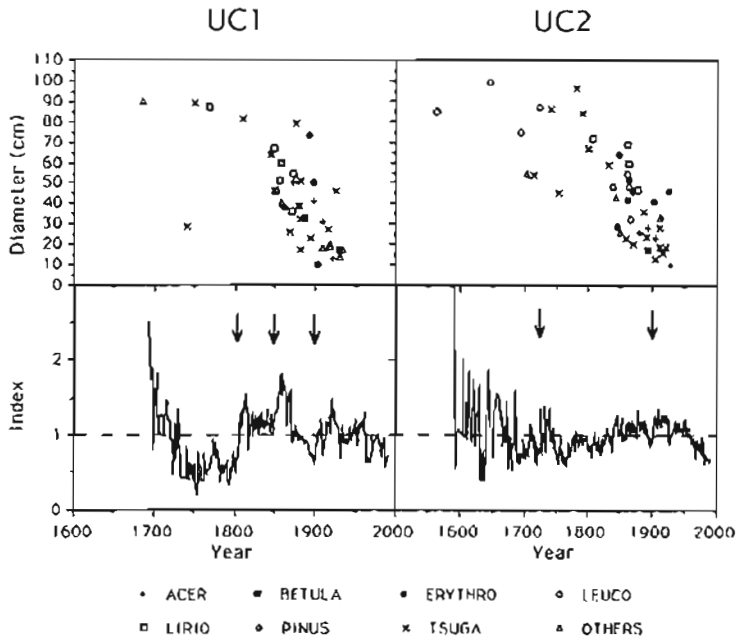

Fig. 5. Age-diameter and standardized tree-ring chronologies of 2 upland cove (UC) sites sampled at Alan Seeger Natural Area, Huntingdon County, Pennsylvania. See Fig. 3 for comments.

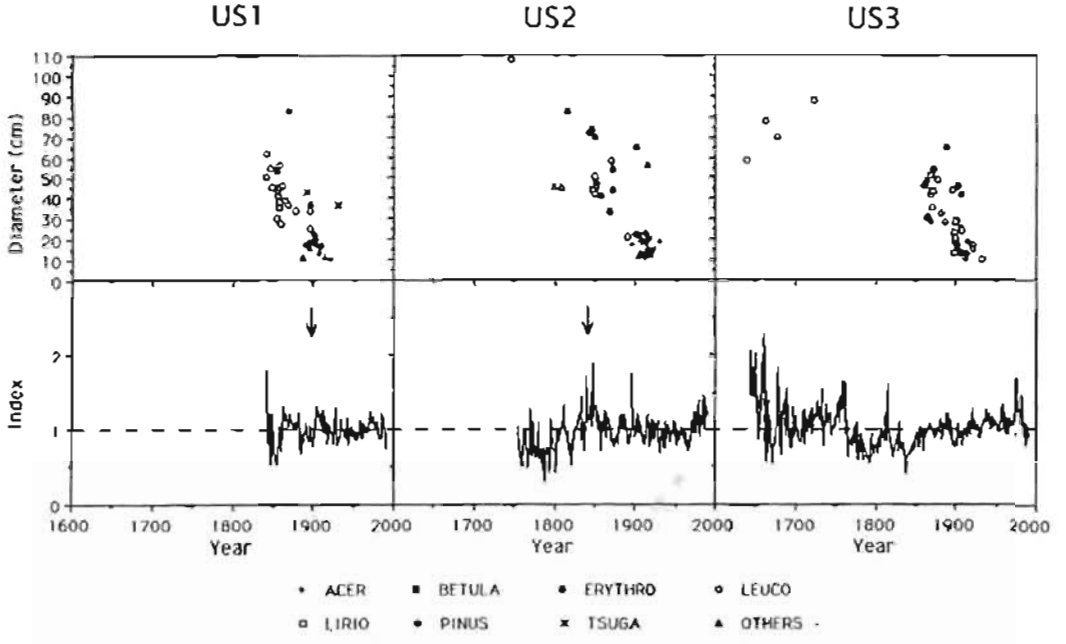

Fig. 6. Age-diameter and standardized tree-ring chronologies of 3 upland slope (US) sites sampled at Alan Seeger Natural Area, Huntingdon County, Pennsylvania. See Fig. 3 for comments.

were present, including *T. canadensis*, *Quercus*, and *L. tulipifera*. Presettlement disturbances based on tree-ring increases occurred during the 1730s (site UC2) and around 1805 (site UC1), although corresponding age-cohorts were not detected. A minor post-settlement disturbance in both stands around 1900 mainly stimulated previously established trees rather than producing a new cohort of tree recruitment.

Upland slope forests were nearly or completely denuded by the 1846 disturbance (Fig. 6). *Quercus* recruited vigorously after this disturbance, with members of the *Erythrobalanus* subgenus generally outpacing *Leucobalanus* (Table 4). A delayed tree response in US3 (exposed ridge) was presumably due to harsh post-disturbance conditions. Post-settlement fires probably contributed to this hiatus based on the abundance of surface charcoal, charred woody debris, and fire-scarred trees. A second disturbance around 1900 (evident mainly by age-cohort grouping) released shade-tolerate *Acer* on mesic sites (US1 and US2), whereas both *Quercus* and *Acer* recruited on the dry US3 site.

Chronologies based mainly of *Quercus* cores (UC2 and upland slope sites) displayed little tree-ring variation relative to those comprised of shade-tolerant *T. canadensis*. *Quercus*'s relative insensitively to canopy disturbance made their resultant tree-ring chronologies of limited use.

To better depict disturbance events during the presettlement era by recruitment fluxes, age data for all stands were combined and compared with ITRDB data (Fig. 7). Possible disturbance episodes spurring tree recruitment may have occurred immediately prior to the 1610s, 1640s, 1680s and 1740s. The last recruitment may be related to the 1730s disturbance detected in the UC2 chronology. Excessive tree-ring noise at the older portions of each stand chronology obscured further confirmations.

DISCUSSION

The presumption that ASNA forests have been relatively free of human disturbance following European settlement and, thus, representative of presettlement conditions was not supported by our data. Indeed, a large proportion of the current overstory was established after major logging in the mid-1840s. The structural composition of ASNA forests varied based on the magnitude of the initial anthropogenic disturbance in 1846 and occurrence and periodicity of subsequent perturbations. Discounting the old-aged remnants variously scattered throughout ASNA, stands had either an even-aged structure (stream terraces, SB1), uneven-aged structure comprised of 2 relatively distinct even-aged cohorts (upland slopes, SB2), or uneven-aged structure consisting of extended recruitment

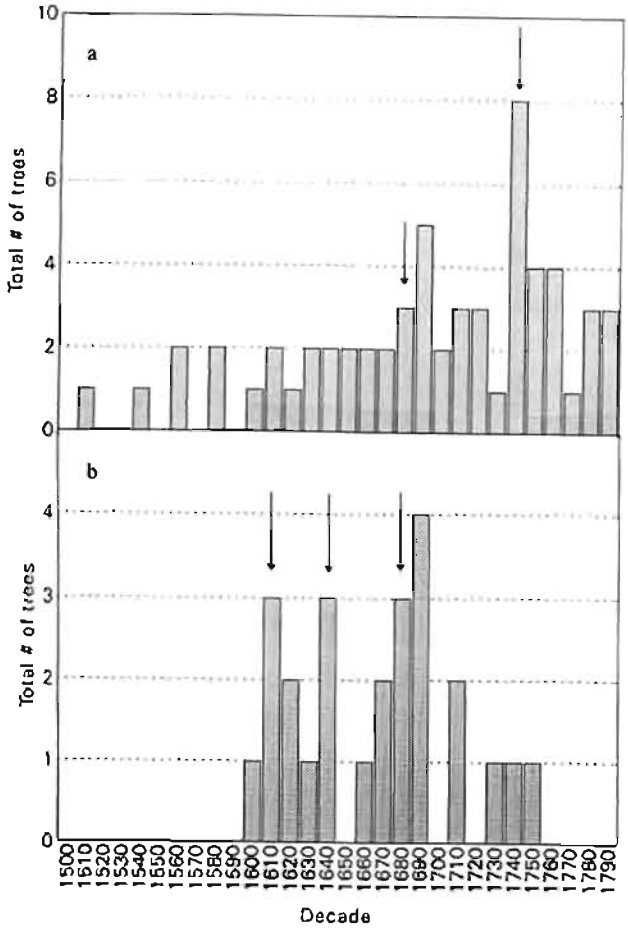

Fig. 7. Presettlement breast-height age distribution by decade of Alan Seeger Natural Area trees cored for this study (a) and for the International Tree-Ring Data Bank (b). Arrows indicate possible disturbances spurring tree recruitment.

periods (upland coves, SB3). In general, cutting was most severe along the periphery of ASNA and on upland slopes, and generally decreased towards its interior along Standing Stone Creek and its principal feeder streams. Upland slopes supporting *Quercus* forests were undoubtedly targeted for charcoal production for local iron furnaces (Thwaites 1985), hence explaining the severity of cutting disturbances on those sites. Even the core site (SB3) reputed as "virgin" showed substantial signs of anthropogenic modification during the mid-1840s, although it is not known whether this was due directly to logging or through the large-scale removal of surrounding forests. Regarding the latter, insular effects could have exacerbated tree mortality through increased susceptibility to blowdown, flooding events, fire (elevated fuel loading around periphery), and insolation- and wind-related desiccation (see Mladenoff et al. 1993).

Initial logging of presettlement forests in Pennsylvania led to substantial changes in forest composition (Hough and Forbes 1943, Goodlett 1954, Whitney 1990a, Nowacki and Abrams 1992), and these changes were often exacerbated by multiple harvests (see Parker and Swank (1982) for empirical evidence). In ASNA, the 1846 disturbance probably represents the first logging event due to area's relative remoteness within the rugged Seven Mountain region of central Pennsylvania. Tree recruitment originating from this disturbance displayed species differences regarding growth rate and form. *Liriodendron tulipifera* consistently outperformed other recruits on bottomlands and cove sites, typically occurring as large-sized dominants in current overstories. Rapid juvenile growth and longevity ensure *L. tulipifera*'s placement in developing forest canopies following disturbance and long-term overstory success (Buckner and McCracken 1978, Abrams and Downs 1990). *Pinus strobus* had similar growth patterns and canopy positioning, although it occurred mainly on low terraces along stream bottoms. Based on charcoal evidence, its establishment was probably linked to post-disturbance fires that burned down onto stream terraces from the surrounding uplands. Regarded as a pyrogenic species, *P. strobus* historically regenerated on sites where fires exposed mineral seedbeds and reduced competition from fire-intolerant species (Maissurow 1935, Little 1974, Ahlgren 1976).

Acer, B. alleghaniensis, and *T. canadensis* grew moderately slowly following the 1846 disturbance in stream bottoms, terraces and the upland cove. At present, *B. alleghaniensis* displays little canopy variance, typically forming small compact crowns in lower overstory positions. Whether *B. alleghaniensis* will successfully advance into higher and larger canopy classes over time or maintain its current canopy profile is unknown. Future recruitment may be limited due to its shorter life span relative to *L. tulipifera, P. strobus* and *T. canadensis*. Within upland slope forests, members of the *Erythrobalanus* subgenus of *Quercus* grew faster than *Leucobalanus* after disturbance (see Auclair and Cottam 1971). However, future succession favors the longer-lived *Leucobalanus* members. The lack of slower growing, shade-tolerant species in the post-1846 recruitment class on upland slopes is

in marked contrast to other physiographic groups.

All principal tree species on stream bottoms, terraces and the upland cove recruited immediately after disturbance(s) and stratified differently in the canopy according to their respective life histories. This pattern of succession corresponded to Egler's (1954) 'initial floristic composition' theory whereby most plants reestablish early after disturbance and community development unfolds from this initial flora. Upland slopes succession did not follow this scenario, probably because post-disturbance burns precluded the establishment of fire-sensitive *Acer* until much later (Nowacki and Abrams 1992). The degree by which forests of ASNA were altered by logging relative to presettlement conditions was difficult to assess fully. Indeed, a detailed reconstruction of presettlement forest composition based on the few surviving remnant trees was not possible without supporting witness tree data. There was a general correspondence between remnant species and those originating after initial logging; however, species diversity of the remnant population was usually more restricted. Extrapolating further on presettlement composition would be unwise because of preferential cutting practices and differences in species longevity. For instance, the predominance of *T. canadensis* and *N. sylvatica* as remnants on stream bottoms and terraces may be a mere artifact of both phenomena; that is, they represent species undesirable for harvest that happen to be long-lived.

Presettlement tree recruitment seemed to have a random pattern based on age distributions of individual stands, although the lack of data points greatly inhibited detection of similar-aged cohorts (see Figs 3-6). Moreover, age-cohorts may have been eliminated entirely or largely reduced by past harvesting, thus preventing their detection today. Combining age data from all stands and using ITRDB age data provided additional clarity regarding the presettlement disturbance regime. These data revealed pulses of tree recruitment during the presettlement era, indicative of periodic, low-intensity exogenous disturbance (ca. every 30 to 60 yrs). These recurrent perturbations may reflect a number of presettlement events causing tree mortality, including fire (especially on uplands), insect-attacks, disease outbreaks, or wind and ice storms (see Foster 1988). Unfortunately, corroboration of these disturbances via chronologies were limited due to excessive tree-ring noise during most of the presettlement era.

Although logging fundamentally altered the overstory composition and structure of ASNA forests, other human-induced disturbances have affected the area. Introduced diseases such as chestnut blight (*Endothia parasitica*) and dogwood anthracnose (*Discula destructiva* Redlin) have essentially eliminated *Castanea dentata* [Marsh.] Borkh. and *C. florida*, respectively, from area forests. The former species was undoubtedly a common associate with *Quercus* on upland sites in the region (Nowacki and Abrams 1992). On upland slopes, chestnut blight may have fostered *Quercus* dominance while decreasing overstory diversity (cf. Korstian and Stickel 1927, Stephenson 1986). Deer overbrowsing is currently deterring tree regeneration throughout ASNA, as in other parts of the eastern U.S. (Hosley and Ziebarth 1935, Hough 1965, Anderson and Loucks 1979). Its impact is reflected by the lack of tree saplings and large seedlings and a distinct browse line ca. 2 m above the forest floor. Based on the lower ages of highly palatable trees (*Acer*, *Tsuga*), heavy deer browsing is a relatively recent phenomenon at ASNA, possibly beginning in the 1950s. Although deer browsing is a contributing factor, resource monopolization by a dense, pole-sized layer of *T. canadensis* is probably the main inhibitor of tree regeneration on stream terraces (cf. Oliver 1981, Whitney 1990b). Thickets of *R. maximum* play a similar role within the core area of ASNA (SB3), largely preventing tree regeneration via resource monopolization (Phillips and Murdy 1985, Plocher and Carvell 1987). These large, impenetrable thickets are probably of recent occurrence, perhaps a result of past overstory disturbance and cessation of fire this century (McGee and Smith 1967). Where present, *R. maximum* benefits greatly from overstory disturbance, forming even-aged thickets via rapid vegetative spread (Phillips and Murdy 1985, Plocher and Carvell 1987). Future replacement of canopy trees in SB3 may be sharply curtailed if this situation continues, further spurring *R. maximum* spread and dominance of the understory.

Barring catastrophic disturbance, successional change is apparent for all groups based on compositional differences within tree canopies (see Fig. 2). Increases of *T. canadensis* (and possibly *B. alleghaniensis*) on

stream bottoms and stream terraces will likely offset future declines in overstory *L. tulipifera*, *P. strobus* and *Quercus*, although these changes will be gradual due to the long life spans of the latter species. Similar changes seem reasonable for upland coves, with *T. canadensis, B. alleghaniensis* and *Acer* increasing and *L. tulipifera* and *Quercus* decreasing. On upland slopes, *Acer* representation (principally *A. rubrum*) will likely advance at the expense of *Erythrobalanus* initially and *Leucobalanus* later (Nowacki and Abrams 1992). Any increases of overstory *Quercus* mortality (e.g., gypsy moth defoliation) will only accelerate this successional trend (Gansner et al. 1983, Gottschalk et al. 1989, Abrams and Nowacki 1992). For all forest groups, the successional changes expressed above may eventually be supplanted by atypical trends if current overbrowsing and/or intense shrub competition remain unchecked. Inadequate tree regeneration and recruitment may lead to more open canopies, with less palatable species increasing in representation. This phenomenon may already be occurring on site US1, where *P. strobus* regeneration is solely recruiting.

Whether the forest stands of ASNA can be characterized as old growth depends largely on perspective. If the absence of direct human disturbance is used as a sole criterion, then these forests would not qualify. However, if limited human disturbance is acceptable, certain ASNA stands having a substantial number of old-aged trees may be viewed in this context; although their functionality as old growth are probably greatly impaired due to the area's small size, insulation, and lack of corridors to other old-growth systems (see Mladenoff et al. 1993). Regardless of designation, ASNA forests harbor some of the oldest trees in central Pennsylvania and, therefore, represent a significant repository of information regarding past ecological conditions and disturbance events.

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Section 3: Management of Social Values

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Wilderness is made up of three components: a natural land base, human recreational experiences, and management practices. Wilderness management is faced with the multiple challenges of preserving the physical resources while not reducing or allowing visitors to reduce the quality of the wilderness experience.

Congress made clear its mandate in the 1964 Wilderness Act that, in addition to protecting areas in their natural condition, wilderness was to be "...administered for the use and enjoyment of the American people in such a manner as will leave them unimpaired for future use and enjoyment as wilderness and so as to provide protection of these areas, the preservation of their wilderness character, and for the gathering and dissemination of information regarding their use and enjoyment as wilderness..." (Wilderness Act, 1964).

It is this public use that gives rise to the societal values of wilderness. Several different types of values or benefits have been recognized as arising from wilderness experiences. They can be generally classified as either emotional, spiritual, physical, therapeutic, or status values. Wilderness is described in the 1964 act as possessing "outstanding opportunities for solitude..." From solitude come the spiritual, emotional and inspirational values of human wilderness experiences. The Christian Hymn, "How Great Thou Art," epitomizes the role that wilderness can play in spiritual experiences with the verse, "When through the woods and forest glades I wander and hear the birds sing sweetly in the trees, When I look down from lofty mountain grandeur and hear the brook and feel the gentle breeze; Then sings my soul,..." (Boberg, 1955).

Wilderness certainly has a recreational value as it challenges the physical being. "Primitive and unconfined" recreation is to many the chance for temporary liberation from modern stresses and an opportunity return to the values and experiences of ancestors. Wilderness has incredible capacity to stimulate both the body and the mind.

The therapeutic qualities of wilderness experiences are often identified with exchanging one set of stresses for the challenge of a more basic set. Many programs such as National Outdoor Leadership School, Outward Bound, and American Wilderness Leadership place emphasis on the therapeutic role of wilderness as it leads to growth and development of the individual psyche.

Status or increased self esteem is the fourth human societal value of wilderness. From wilderness experiences come opportunities for increased confidence, self-esteem and leadership. For disadvantaged groups the challenge of wilderness can be especially character and confidence building. By temporarily removing these individuals from their community environment, drug dependency, delinquency and other social problems can be addressed and the wilderness challenge can inspire individuals to set new personal goals.

The papers in this section address the management of the social values mentioned above. Aldo Leopold defined wilderness as such: "Wilderness areas are first of all a series of sanctuaries for the primitive arts of wilderness travel" (Leopold, 1949). Leopold's emphasis was on the recreational aspect of wilderness and specifically addressed canoeing and the use of trails for packing.

Four papers in this section are concerned with the management of trails and campsites in wilderness and natural areas. Mortensen examined visitor use impacts within the Knobstone Trail Corridor in Southern Indiana. The impacts were significantly reduced from 1985-1996 as horses and ORV's were removed from the trail. Marion and Liung surveyed designated campsites at Great Smoky Mountains National Park and ground management problems including campsite proliferation,

expansion and site damage, lack of solitude, tree damage and illegal camping. Burde, Conway and Ervin conducted a survey of backcountry trail managers to ascertain the trail standards used by their agency. He found that most had standards for new trail construction but nothing for maintaining existing trails. Silbergh compared trail management in Ontario, Canada with Scotland. The greatest differences were the issues relating to trespass, private property and access which is much more limited in Ontario than Scotland.

Four papers were concerned with the characteristics of the visitor experience. Clonts, Malone and Acharya studied the role of solitude in wilderness experiences. Borrie and Roggenbuck used the Experience Sampling Methods to more accurately gain information about the experiences of canoeists at Juniper Prairie Wilderness in Florida. Tarrant and Shafer compared the preferred experiences of wilderness visitors in Comanche Peaks Wilderness in Colorado and the Cohutta Wilderness in Tennessee. They discovered several significantly different experience preferences between the two areas. Russell, Henlee and Hall studied the impact of a guided wilderness experience on urban youth from the Atlanta Job Corps Center.

Three papers were concerned with information and education for wilderness visitors. Queen, Freimund and Peel examined the use of electronic media and the Worldwide Web as a means of dispersing wilderness information to visitors. As popularity of the Web grows it has potential to become the premier medium for information transfer. McDonald and Cordell reviewed three adult education theories and their applicability to wilderness. They felt that adult learning theory had received too little attention in the development of wilderness information and education programs. Managers must do a better job of matching the information to the medium and presenting it in a manner that is appropriate for the audience for which it is intended. Geoff Mann presented paper on improving communications between the various groups concerned with wilderness preservation in order to reduce conflicts. His premise was that improved communications should lead to better possible futures than now exist.

Most of the problems and opportunities in wilderness management and preservation are dictated by human social values. How effectively these values are managed will largely determine the future of wilderness and natural areas. While the consensus is that wilderness should be managed in a biocentric manner we must always remain aware that funding for management is an anthropocentric function of governments.

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Backcountry Trails Standards in Eastern Wilderness and Natural Areas

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Abstract: A survey of backcountry trail managers in the midsouth region revealed trail standards used to construct new trails provide guidance on trail tread width, slope, and brushing width and height. However, for existing trails, standards are either lacking or vaguely worded. There is little guidance as to trail tread depth, surfaces with significant rocks and roots, and exceptionally muddy sites. Further research is needed to identify uniquely what constitutes a trail problem, and what level of such impacts are acceptable to trail users and management.
Keywords: trails, backcountry, Limits of Acceptable Change, standards

In 1916, Congress enacted the National Park Act, creating the National Park Service and charging it with the mission of preserving natural areas for future generations, while allowing the public to use parks for pleasure (Ise 1961). This dichotomous mission has been adopted by park agencies worldwide and has even been adopted as the framework for wilderness management in the United States. Wherever it is applied, management faces a dilemma—how to preserve natural ecosystems while allowing for public use. This dilemma can be especially difficult in wilderness ecosystems.

To respond to this dilemma, resource managers have long sought to find proper use levels that would allow natural ecosystems to maintain their long term viability. Keeping use at or below this level, or carrying capacity, could lead to the maintenance or restoration of social and ecological conditions, given some set of management objectives (Stankey and McCool 1984). The comprehensive model is best described in Shelby and Heberlein (1986).

The direct application of carrying capacity to wilderness has had little success. Given the variability in wilderness ecosystems, and the variability of experiences sought by wilderness users, no single quantifiable estimate of wilderness carrying capacity has been derived. Some management strategies have been proposed, applied under the assumption that carrying capacity was thought to have been exceeded. Cole et al. (1987) suggest use be reduced, modified by space, time or user expectations, or sites hardened to resist user impacts. These tactics are of value only after the fact, well after physical or social problems are quite apparent.

Limits of Acceptable Change

If no specific level of use can be identified that maintains a sustainable wilderness ecosystem, perhaps an alternative means could be derived. In 1985, such a means was proposed by Stankey et al. entitled "Limits of Acceptable Change (LAC)." LAC is based on the premise that all levels of human use cause some amount of change. Having objectives defining the appropriate type of experience for an area allows management to determine how much change is allowable, within the constraint of meeting management objectives. The amount of change can, therefore, be identified that is acceptable and appropriate (Stankey et al. 1985).

The LAC process is comprised of nine steps. They are:

- identify area concerns and issues
- define and describe opportunity classes
- select indicators of social and resource conditions
- inventory resource and social conditions

•specify standards for resource and social conditions

•identify alternative opportunity class allocations

•identify management actions for each alternative

•implement actions and monitor conditions

In the decade since its inception, LAC has found favor with managers worldwide. It has become an integral part of land management planning, and has been extensively applied to wilderness in the United States and elsewhere. It is seen as a useful management technique that can help in ecosystem preservation and creating meaningful wilderness experiences.

Any management system is only as good as the inputs used to support it. Perhaps the most crucial decision step in LAC is step number 5, setting standards for resource and social conditions. For some aspects of backcountry management, standards are supported in part by sound research findings. For example, standards for backcountry campsites are based on a series of studies, mostly in the West, that help define the appropriate standards for campsites. Conversely, research supporting the setting of standards for backcountry trails is lacking. The result has frequently been a LAC system for trails with highly subjective standards that may have little value to field personnel making decisions about trail construction and maintenance.

The management plan for the Paria Canyon-Vermillion Cliffs Wilderness in Arizona and Utah illustrates this point. Paria Canyon-Vermillion Cliffs, managed by the Bureau of Land Management, was established in 1984. Access allows hikers to follow the Paria River from Highway 89 near Page, Arizona to the Paria's confluence with the Colorado River at Lee's Ferry, Arizona. According to the Draft Management Plan for the area, trails standards, determined in the LAC process, are as follows (USDI Bureau of Land Mgt. 1986):

> No more than one worn path to or through the area. Inventory by visual survey. Map and record location and condition of newly worn paths annually.

How useful is a statement such as this to a field manager? In the LAC process, will these standards identify the existence of a problem? Do these standards suggest where maintenance staff and funding should be allocated? In the case of Paria Canyon-Vermilion Cliffs, how would one define if a trail were "worn"? How would one know if a trail were worn and, if so, what would one do about it?

Previous Research

Backcountry management standards have evolved over the past two decades, many predating LAC. The evolutionary path went from problem definition, measurement of impact, definition of impact parameters, monitoring, and finally, analysis of standards. This process can be seen in backcountry campsite management. Brown (1977), for example, called for the evaluation of specific situations based on management objectives. Meanwhile, management strategies such as visitor dispersal, visitor containment, and site closure were developed and used to respond to campsite impacts (Cole 1981, Cole 1982, Washburn and Cole 1983, Marion and Merriam 1985, Cole 1986).

Appropriate parameters and inventory methods were developed for campsites (Frissell 1978, Cole 1983a). Methodologies have since been refined as seen in Marion (1991). Cole (1992) proposed a standard campsite model that included the following parameters: amount of use, vegetation fragility, vegetative density, and spatial concentration of impact.

Universally accepted campsite standards are not yet available, but researchers are seeking a scientific basis for them. Shelby and Schindler (1992) assessed how several user groups and managers viewed bare soil and fire rings at backcountry campsites. The several user groups were fairly consistent in their "limit of acceptable impact." Analysis of group standards may allow management to apply a range of standards in a given area.

Trail impact analysis has followed a similar path. Numerous studies have assessed trail impacts on vegetation and soils (Dale and Weaver 1974, Bratton et al. 1979, Leonard et al. 1985, Burde and Renfro 1986). Cole (1983b) tested a system of assessing and monitoring trails in the Selway-Bitterroot Wilderness. Bare trail width, total trail width, and trail depth were the primary parameters. Other impacts considered were multiple trails, roots, rocks, and mud. Helgath (1975) had earlier proposed the "cross sectional area loss" value as a means of measuring trail erosion.

Do Backcountry Trail Standards Exist for Eastern Wilderness and Natural Areas?

When wilderness managers and planners

proceed with the LAC process, how do they establish standards for backcountry conditions? Must the planning process establish unique standards for each individual plan, or do standards exist within agency policies to serve as guidelines? To answer these and other questions about standards, a survey of all backcountry managers was conducted in the midsouth region which included southern Illinois and Indiana, most of Kentucky, Tennessee, Arkansas, and Missouri, as well as western North Carolina. All managers of both federal and state areas that contained at least 10 miles of backcountry trail for hiker and/or horse use were personally interviewed. Federal agencies included the National Park Service, Forest Service, Fish and Wildlife Service, and Tennessee Valley Authority. State parks and forests in the states noted above were also included. A total of 75 managers were interviewed, separated into two groups based on primary users: hiker/backpacker and horse rider/hiker.

Each manager was asked to describe the standards they use. Handbooks, guidelines, and manuals containing the standards were reviewed and the contents compiled. Compilation of standards for hiker/backpacker trails is found in Table 1; horse rider/hiker trail standards are found in Table 2.

Trail tread standards for foot trails ranged from 12 to 72 inches wide; most ranged between 18 and 36 inches. Brush widths ran from 24 to 48 inches; brush height was typically 7 to 9 feet. For horse/hiker trails, trail tread standards ranged from 18 to 120 inches. Brush widths ranged from 3 feet to 10 feet, typically 6 to 8 feet; brush height ranged from 8 to 10 feet.

In both tables, several agencies had no standards whatsoever. Trail standards for Arkansas State Parks do not exist. Instead, their manual describes standards as "a matter of judgement and discretion" (Arkansas Trails System: Maintenance Manual). Illinois and Kentucky State Parks also lack standards as does the US Fish and Wildlife Service and TVA's Land Between the Lakes. No agency had any standard for maximum trail tread depth. Only Missouri State Park policy mentioned depth, requiring that managers "fill ruts".

Several other factors commonly found in impacted trails were not mentioned at all. These include muddy trails and braided or multiple trails. The presence of roots and rocks was mentioned but without standards. Tennessee State Parks stated that conspicuous roots should be removed from hiker/backpacker trails (Trail Construction Manual, Tennessee Department of Conservation). The Forest Service Handbook for Trails Management states that high roots should be removed from hiker/backpacker trails, but embedded roots and rocks should be left on hiker/horse rider trails. No specific definitions for any of these were included.

Two-thirds of managers noted that the management objectives they used were related to trail construction, while one-fifth had no management objectives at all. Only 2 percent noted maintenance as a management objective; the remainder mentioned safety as primary management objective. Construction standards give guidance for brushing width and depth, slope, and trail tread width, but essentially nothing about trail tread depth, multiple trails, and mud holes. Further, many trails were built before slope standards were established, and therefore, today, may have excessive slopes.

For the field manager responsible for trails, how useful are the above standards? Trail management primarily involves maintaining trail tread, removing obstacles such as fallen trees and rocks, and repairing damage from physical factors like water or from human impact. Given the lack of maintenance standards, how does such a manager know when a problem exists? Further, if the trail in question exhibits multiple maintenance problems, which factor or factors should determine where scarce funding and staff time should be allocated?

Suppose one were going to apply LAC to a wilderness area in the East, what standards should be adopted for trails as mandated in step 5 of the LAC process? Literally all wilderness areas in the east had existing trails at the time of designation. Many trails pre-date wilderness designation by several decades. Therefore, construction standards will be of little use—planners need to know what standards are appropriate for trails that may already be severely impacted. As noted above, existing trails likely will have multiple maintenance problems, several of which are not covered by a standard. When is a muddy tread or an exceptionally rocky tread a maintenance problem, and are they a more serious problem than tread width and depth?

Conclusion

If existing standards provide insufficient input for resource allocation and planning

processes like LAC, what must be done? The survey reported above reinforces what Cole (1983b) had stated earlier, namely, that it is important to define precisely what is to be considered a problem both in frequency and severity. There should be written standards stating unacceptable conditions. Shelby and Harris (1986) came to a similar conclusion relating to backcountry campsites. They noted such standards can be based on user perspectives, but such perspectives are a function of the values of the respondents.

Standards, especially as they describe achieving an appropriate condition for existing trails, are needed. The current focus in resource management to more effectively seek out users' views and to be responsive to their wishes, suggests the user perspective on trail quality should be pursued. Which trail parameters are important to users? How much deterioration in such parameters are acceptable to users? Is there variation within user groups? Are there differences between user groups? Do the views of managers differ from those of users?

Further research is also necessary to determine how widely a specific standard may be applicable. Must standards be applied more locally or can they be regional or even national in scope? Are they a function of social or natural conditions or are they more a function of user desires? Great strides have been made in better applying techniques like LAC to wilderness and elsewhere. But even more improvements are necessary. As funding and staff to rehabilitate highly impacted trails becomes more scarce, managers need guidance as to how to optimally use these resources.

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Table 1. Standards for Hiker/Backpacker Trails

AGENCY		Tread Min	Width Max	Max Depth	Max Slope	Brush Min	Width Max	Brush Min	Height Max	Other
Fish/Wild. Ser.										
Forest Service	Easy	18"	24"		20% in 100'	43"	43"	8'	8'	*
	Moderate	12"	18"		30% in 300'	36"	48"	8'	8'	*
	Difficult	12"	12"		30% in 500'	36"	36"	8'	8'	*
Park Service		18"			10%	48"	48"	8'	8'	
TVA										
Arkansas SP										
Illinois SF		40"	72"		10%	24"	Both Sides	7'	9'	
Illinois SP										
Indiana SP		18"	36"		10%	24"	Both Sides	7'	9'	
Kentucky SP										
Missouri SP		18"	36"	Fill Ruts	10%	24"	42"	7'	9'	
Tennessee SP		18"	18"		15%	36"	36"	7'	7'	**

*Remove high roots
** Remove conspicuous roots

Table 2. Standards for Hiker/horse Rider Trails

AGENCY		Tread Min	Width Max	Max Depth	Max Slope	Brush Min	Width Max	Brush Min	Height Max	Other
Fish/Wild. Ser.										
Forest Service	Easy	24"	24"		15% in 200'	6'	8'	10'	10'	*
	Moderate	24"	18"		25% in 300'	6'	6'	8'	8'	*
	Difficult	18"	18"		30% in 500'	3'	4'	8'	8'	*
Park Service		24"				8'	8'	10'	10'	
TVA										
Arkansas SP		18"	30"		10%	5'			10'	
Illinois SF		65"	120"		10%	24"	Both Sides	10'	10'	
Illinois SP										
Indiana SP										
Kentucky SP										
Missouri SP		36"	72"		10%	6'	10'	8'	10'	
Tennessee SP										

* Leave embedded roots and rocks

Trails: Managing Visitor Impacts

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Abstract: Walking trails have a long history, and in recent years have become a significant tool in conservation, education, recreation and tourism strategies world-wide, and have demonstrated concomitant economic, social and environmental impacts. Trails which are well planned, constructed, maintained and interpreted can prove to be a positive tool in managing visitor flows. By encouraging domestic users and tourists to follow a designated route, their enjoyment can be enhanced and sensitive ecological and historical areas can be shielded from heavy impacts. Trails can also be used for environmental education purposes, and well designed trail literature helps people to reflect on aspects of both natural and cultural inheritance. They also provide a means by which people can be attracted to visit areas off the beaten track and provide income to revitalise flagging areas. Finally, walking is both a physically and socially healthy activity, an activity in which all can participate and through which all can learn about others, young and old, rich and poor alike. On the other hand, trails which are badly planned, constructed, maintained or interpreted can cause terrible ecological degradation, disappointment and even injury to users. This paper will seek to compare practice in Southern Ontario with that in Scotland.

Keywords: Trails, countryside recreation, Canada, Scotland

BACKGROUND

Comparability of Scotland and Canada

Trails are of course, part of a wider environment, and in any discussion of wilderness, Scotland and North America share characteristics which make comparison viable. In the physical geography sense, both have heavily urbanised (and often depressed) areas, mixed with tracts of sparsely populated and even desolate land. The social and historical links are also significant, and Gibson (1993) has noted that, "clan names and kinspeople," are, "scattered throughout the world". The Scottish Diaspora of the Eighteenth and Nineteenth Centuries (Kay, 1995; MacPherson, 1995) has ensured especially strong ties with the New World, including Australia, Canada, New Zealand and the United States.

It would, of course, be senseless to talk of wilderness, Scotland and North America without reference to John Muir, born in 1838 in Dunbar on the East Coast of Scotland, which is a small town 25 miles to the East of Edinburgh. Muir's family left the town where the Firth of Forth joins the North Sea when he was an adolescent, emigrating to the United States where he was to make his mark in later life. His achievements, including the establishment of Yosemite National Park in 1890 and of the Sierra Club in 1892, have ensured that his name has gone down in history as the father of the (inter) National Parks movement. Muir is rightly revered in the US, where monuments to his memory include the John Muir Wilderness Area in California. Muir is also honoured in Scotland though, through The John Muir Trust and the John Muir Country Park. Founded in 1983, the Trust has as its Patron HRH The Prince of Wales and its stated objectives are:

- the guardianship of wild places, while respecting the needs and aspirations of those living in such areas;
- stimulation of the general awareness of the value of wild places;
- the management of the wild places and the development of appropriate management policies;
- the encouragement of volunteers to participate in conservation work related to wild places.

The John Muir Country Park was founded

in 1976 and includes the eight miles of coastline along which he walked as a boy and wrote about in *The Story of My Boyhood* (originally published 1913, reprinted 1992). The Park is a haven for nature and landscape conservation and for the recreational use of that landscape. For example, the vast majority of the Park is designated as an Area of Great Landscape Value and two areas of it are designated as Sites of Special Scientific Interest (one primarily biological Site, one primarily geological). It is, however, also a place which people are encouraged to use, with areas for beach barbecues and camping, the *John Muir Country Park Clifftop Trail* (East Lothian District Council, 1990) and a network of bridle paths. Thus, the sea and land which Muir loved as a child is being cared for in a sustainable manner 150 years since he left it.

Despite the John Muir link and the common feature of sparsely populated tracts of land, there are of course also differences between Scotland and North America. These are far from insignificant and are related to the issues of parks and wilderness. First, there are no National Parks in Scotland, despite the fact that these exist in England and Wales. Although there are protective designations such as Country Parks and Regional Parks in existence, the managers of these areas do not enjoy the same degree of control over land-use planning etc. as their counterparts in National Parks. The absence of National Parks in Scotland is a contentious matter, and there is no clear agreement on whether they are desirable, even amongst those who promote countryside recreation and conservation. This situation is related in a rather complicated, and perhaps tenuous, way (demands of space prohibit explanation) to the other great difference between Scotland and North America, that of 'Wilderness'.

It would be futile for the author, a Scot, to attempt to tell the story of wilderness in the US or Canada, so he shall not. Suffice to say, there is rather a lot of it, particularly in Canada. When one considers that the United States has Federal legislation in place (the 1964 Wilderness Act, 16 USC Sec. 1131-1133) under which about 600 Wilderness Areas have been formally designated, it is apparent that the extent to which wilderness exists in Europe is minimal in comparison e.g. there are no parallel designations in Scotland. In regard to Canada, the differences with Europe become even more poignant, e.g. in European terms, Norway is very sparsely populated with 12 persons per square kilometre. By comparison, Canada as a whole, has three people per square kilometre. Prince Edward Island, the most densely populated Canadian Province has nine people per square kilometre and the Northwest Territories have only 0.017 people per square kilometre, i.e. 700 times less densely populated than Norway, nearly 4,000 times less densely populated than Scotland and a staggering 14,000 times less densely populated than the U.K. Thus, whilst the Scottish Highlands are often referred to as 'Europe's last wilderness', the European and North American conceptions of wilderness are not really founded on anything like the same expanse of land, degree of population sparsity etc. Moreover, whilst much of rural Scotland may appear to be a barren and often hostile wilderness, it was not always thus.

The wild appearance of the land is in fact better regarded as a cultural landscape, the result of centuries of human activity, than as true wilderness. This once populated landscape is captured in Braveheart's images of small settlements scattered through remote Glens, which is an image representative of the era of William Wallace and even the era of Rob Roy (although this would have been changing towards the end of Rob Roy's lifetime).

In contrast to these bygone times, much of rural Scotland is now a treeless expanse of heather moor and peat bog (the latter being an especially sterile and unstable habitat, studied by ecologists precisely because of its lack of biological diversity). Dr. Jim Hunter (1995) has noted that whilst, "The more casual tourist, even the visiting environmentalist, might be content to treat the Highlands as 'Europe's last wilderness'", the truth of the matter is that the Highlands have, "been stripped of their original vegetation every bit as comprehensively as New Mexico." Indeed, since the time of the Romans the land has steadily been de-forested and over farmed, with the final factor which influenced the way that the landscape appears today being the Clearances. A Nineteenth Century account of this activity is provided by Marx (1976), writing about the Duchess of Sutherland,

> This person, who had been well instructed in economics, resolved, when she succeeded to the headship of the clan, to undertake a radical economic cure, and to turn the whole county of

> Sutherland, the population of which had already been reduced by similar processes, into a sheep walk. Between 1814 and 1820 these 15,000 inhabitants, about 3,000 families were systematically hunted and rooted out.....It was in this manner that this fine lady appropriated 794,000 acres of land which had previously belonged to the clan from time immemorial. She assigned to the expelled inhabitants some 6,000 acres on the sea-shore—2 acres per family. The 6,000 acres had until this time lain waste, and brought in no income to their owners. The Duchess, in the nobility of her heart, actually went so far as to let those waste lands at an average rent of 2s. 6d. per acre for the clansmen, who for centuries had shed their blood for her family. She divided the whole of the land stolen of the clan into twenty-nine sheep farms.....Finally, however, part of the sheep-walks were turned into deer preserves.

The end result of these Clearances is the sterile yet hauntingly beautiful environment which greets the visitor today. In summary, it is a quote from the Canadian author Hugh MacLennan (1960) which is as good an explanation as any of the differences between the meaning of wilderness in Scotland and the meaning of wilderness in North America,

> Such sweeps of emptiness I never saw in Canada before I went to the Mackenzie River.....But this Highland emptiness, only a few hundred miles above the massed population of England, is a far different thing from the emptiness of our own North West Territories. Above the sixtieth parallel in Canada you feel that nobody but God has ever been there before you, but in a deserted Highland glen you feel that everyone who ever mattered is dead and gone.

TRAIL RESEARCH: THE STORY SO FAR

Trails have attracted little academic attention, particularly in regard to the Scottish experience, and to remedy this situation, a study was initiated in 1993 by The Robert Gordon University with the following objectives:

1. to review existing literature and formulate a robust definition of trails;
2. to construct a taxonomy of trails to ease classification and analysis;
3. to review the pros and cons associated with the development of trails in Scotland;
4. to formulate a methodology for the planning, development and monitoring of trails;
5. to identify policy issues for trails in Scotland, having regard to lessons from overseas.

The first phase of work included a review of the small body of academic literature which exists and the collection and cataloguing of trail literature from around the world. This led to the establishment of The Robert Gordon University Trail Archive, a collection which now contains about 800 references.

The second phase focused on gathering information from officials of the tourism authorities, the development and nature conservation agencies, local government and the Forestry Commission. After further work, the findings were published in 1994 as *A Strategy for Theme Trails*.

The third phase of work consisted of forging collaborative links with academics and practitioners overseas. This led to the award of a Fellowship from the Sir Winston Churchill Memorial Trust to research trail related achievements in France, Germany, Denmark, Sweden and Norway, and a Carnegie Trust Travel Award to do the same in Ontario; (the Carnegie Trust for the Universities of Scotland was established in 1901 by Andrew Carnegie, the steel magnate and philanthropist, and its grants support personal research projects likely to benefit the universities of Scotland).

DEFINING TRAILS

The starting point for any discussion of trails, is to seek a meaningful definition. Attempts to define the subject range from Brian Goodey's1975 brief statement that a trail is "a published guide to a specific mapped route," to the more elaborate and somewhat 'tongue in cheek' attempt by Henry and Young (1993),

> An integrated, environmentally sensitive, sustainable, relevant interpretation of a theme, in an area, through the sympathetic development of facilities and marketing, generating economic and social benefit whilst satisfying consumer demand, local need, and environmental considerations.

In the work undertaken at The Robert Gordon University however, the following definition has been developed,

> A trail is a route for walking, cycling, riding, driving or other form of transport that draws on the natural or cultural heritage of an area to provide an educational experience that will enhance visitor enjoyment. It is marked on the ground or on maps, and interpretive literature is normally available to guide the visitor, i.e.

Based on this definition, criteria for further classification and sub-classification of trails may become:

- SCALE of initiative, i.e. national trails, regional trails, local or site trails;
- MODE OF TRANSPORT, i.e. trails designed as multi-use or to be followed by car, bicycle, horseback, foot or public transport;
- MEANS OF GUIDING USERS, i.e. signposting, printed literature or guides (e.g. countryside rangers).

LONG DISTANCE WALKING TRAILS

Bearing in mind the above definitions, the specific focus of research work undertaken in Ontario in 1995, was on long-distance walking trails, i.e. facilities which are regional or national in scale and which are designated for either multiple use or for walkers only. The two main trails in Ontario which fit this description are the brand new Waterfront Trail along the Northern shores of Lake Ontario, and the well established Bruce Trail following the Niagara Escarpment. Both of these trails provide recreation and conservation opportunities in Southern Ontario, a precious environmental resource which is under pressure from urban expansion and from the demand for recreational use of the countryside emanating out of the urban populations of Toronto, Hamilton and Kitchener/Waterloo.

The Bruce and Waterfront Trails have a number of features in common with all such long-distance walking routes. As noted earlier, there are economic, social and environmental considerations related to the planning, development and management of walking trails:

Economic—Both in Canada and the UK, trails feature in public and private investment programmes, and now command a reasonably high level of resource allocation, as well as generating economic benefits through trail user expenditure. Trails provide opportunities for enhancing an area's tourism profile and provide a means by which people can be attracted to visit areas off the beaten track and provide income to revitalise flagging areas.

Social—Walking is both a physically and socially healthy activity, an activity in which all can participate and through which all can learn about others, young and old, rich and poor alike. Indeed, much more emphasis is now being placed on the health benefits of walking as can be seen from recent promotional initiatives in the UK funded by the health education authorities and the British Heart Foundation and from the example of Health Canada's 'Active Living' programme.

Additionally, the sense of safety for users is one of the greatest assets which all trails have to offer. Those who feel confident to go their own way in the countryside with map and compass are free to do so, but huge sections of the urbanised population of North America and Europe do not feel so confident. Following a trail gives the walker the security of knowing the path will be of a certain standard, knowing whether or not facilities are available and where, not getting lost, not being challenged by hostile landowners etc. For instance, research by System Three Scotland(1991) has shown that 53% of people walking in the countryside are not sure where they are allowed to go, 54% are scared of getting lost, and 58% are scared of being confronted by angry landowners. It is therefore contended that trail initiatives are essential in encouraging many people to use the countryside for recreation.

Environmental—Trails can be utilised as tools for visitor management. By encouraging domestic users and tourists to follow a designated route, their enjoyment can be enhanced and sensitive ecological and historical areas can be shielded from heavy impacts. Trails can also be used for environmental education purposes, and well designed trail literature helps people to reflect on aspects of both natural and cultural inheritance.

THE BRUCE AND WATERFRONT TRAILS: HISTORY

Waterfront Trail

The Waterfront Regeneration Trust is based in Toronto and was established in 1992 to facilitate a large scale regeneration exercise along the Greater Toronto sections of Lake Ontario's Northern shore (The Royal Commission on the Future of the Toronto Waterfront, 1992). From the very outset the Royal Commission was committed to investigating the potential which trails had to offer in terms of helping the regeneration process, and envisioned the future Greater Toronto Area as being a place where,

> A network of greenways should connect the natural habitats and human communities of the waterfront, valley systems, tablelands, the

Niagara Escarpment, and the Oak Ridges Moraine. As much as possible, greenways should connect and incorporate existing public lands, to form a 'linked-nodal' pattern throughout the bioregion. Continuous pedestrian and bicycle trails should be developed in these greenways to provide recreational and commuting opportunities.

Whilst it may seem strange for a regeneration project to focus its activities so strongly on trails, the author would suggest that the reason for this focus on the Waterfront Trail is due to a realisation on the part of the Royal Commission and the Regeneration Trust that: a lot of the trail was already in existence one way or another, thus to link up the existing segments would be a relatively quick way of making a major achievement in the regeneration programme; the trail could potentially create a good deal of public interest and thereby raise the profile of the regeneration programme as a whole; the trail would be a regeneration outcome aimed primarily at the citizenry and would probably help to dispel the relatively common and somewhat negative perception of regeneration programmes as a means by which the commercial sector is subsidised at the taxpayer's expense.

The Waterfront Trail has now been fully open for just over a year, and overall has been a very successful initiative, relatively problem free given its sheer length (325 km/200 miles) and the number of partners involved in its planning and construction. The role of the Waterfront Regeneration Trust has been central to the initiative's success, and as an organisation which is still relatively new, the Trust has earned a lot of respect for the Waterfront Trail programme, particularly in regard to encouraging and managing the involvement of local communities.

Bruce Trail

The Bruce Trail, which is managed mainly through the voluntary efforts of the Bruce Trail Association, is the premier walking route in the Province of Ontario. It is some 775 km (about 500 miles) in length and runs South from Tobermory (at the Northern end of the Bruce Peninsula which separates Georgian Bay from Lake Huron) to Queenston on the Niagara River. The Trail follows the Niagara Escarpment (an unique landscape feature consisting of a rocky ridge estimated to be some 440 million years old).

The idea for the Bruce Trail had first been put forward in 1959 by Raymond Lowes of the Hamilton Naturalists' Club, who had been inspired by the example of the Appalachian Trail. The Bruce Trail Association was formally incorporated in 1963. It must be noted that the idea of building such a trail was considered radical in Ontario thirty years ago. Nothing like it had been tried before, there were no traditional rights-of-way, there was no enabling legislation, and there was no prior example of entering into access agreements with landowners on such a scale (at that time only about 20% of the land over which the Bruce Trail passes was in public ownership, compared to 43% now). The Trail was completed in 1967, and at this point in time, the Provincial Government started to investigate various means by which it could further its involvement in the protection of this precious natural resource, leading eventually to the creation of the Niagara Escarpment Commission, the final arbiter in the Niagara Escarpment's planning system (presiding over local, regional and county layers of planning control and over all public and private landowners) which strives to maintain the integrity of the Escarpment which is designated as a World Biosphere Reserve under UNESCO's Man and the Biosphere programme (Niagara Escarpment Commission, 1995).

THE BRUCE AND WATERFRONT TRAILS: IMPACT

Benefits of the Waterfront Trail

Social Impacts

Community Involvement—before any new section of the Waterfront Trail was constructed in a given locality, it had to be proven that the community had been involved in the appropriate decision-making processes. Furthermore, the Regeneration Trust views it as preferable if the community is also involved in the implementation phase of projects which it has sponsored and runs a volunteer programme to further encourage this. Ideas for the construction of sections of the Trail were then solicited by the Trust from a wide range of interested parties (municipalities, conservation authorities, voluntary bodies and the general public). Invitations to submit ideas were circulated, complete with guidance on the criteria which would be used to judge proposals received. This system of inviting ideas for potential construction projects was very

successful, and most of the proposals received went ahead with 50% of each project's funding coming from the Provincial Government, and 50% (including contributions in kind) coming from local sources, which again were (in the main) municipalities, conservation authorities, and voluntary bodies.

Training for the Unemployed—CA$7 million of training has been provided for unemployed people since the Provincial Government introduced a large and diverse employment training programme known as 'Jobs Ontario'. The Waterfront Regeneration Trust managed to secure these training monies, which allowed a dramatic expansion in scale of the trail building programme.

Environmental Impact

Planning—The Trail was planned with the utmost concern for its environmental impact, with the dominant philosophy being that not a single metre of trail should be built without undertaking an extensive resource audit first. To encourage compliance with this planning method, and therefore improve the degree of consistency in the final product (i.e. the Waterfront Trail), the Trust compiled a planning manual for multi-use trails, to be used as a reference point by the municipal partners. In his 1994 paper *Developing a Greenway Master Plan*, Darcy Baker explains this planning philosophy, that any trail must be planned on the basis of good information, rigorously collected through an auditing process which focuses on physical identity (e.g. bridges), a social inventory (community issues), a heritage inventory, and an environmental inventory. In this paper he proposes that of the four parts of the audit process, the compilation of the environmental inventory requires special attention:

> This inventory is the most important. It will guide and direct the greenway development by identifying sensitive areas where development should be restricted, areas where rehabilitation will be beneficial and finally, areas the public will want to explore.

Subsequent to the Trail's construction, its environmental integrity will hopefully be maintained to a high level and there have been recent additions to the planning manual of a set of guidelines for signposting the Trail and, most recently, a maintenance guide.

Regeneration—Obviously, as part of a huge urban regeneration project, the Waterfront Trail and associated projects have made a vast difference to the amenity of the Waterfront in the Greater Toronto Area. It would however, be extremely difficult to assess how much of that amenity results from the Trail alone, and how much results from it's associated regeneration projects.

Success—Trail use has been much more intensive than expected. Although it is a hard surface, multi-use facility for most of its length, boardwalks have had to be erected parallel to the hard surface along some sections, due to congestion and conflict between cyclists and walkers. This should however, be viewed positively in environmental terms as the users are people who have either changed their travel to work pattern away from car use or who have changed their recreational habits. That is, they now seek their recreational opportunities close to where they live, again decreasing car use and easing pressure on the countryside.

Economic Impact

Again, being situated mostly in an urban or peri-urban setting, it is difficult to assess economic impacts associated with the Trail separate from those associated with the rest of the redevelopment. However, it is likely that the significant numbers of people using the facility, as evidenced by the need to construct boardwalks etc. mentioned above, are spending money in the Trail's vicinity.

Benefits of the Bruce Trail

Social Impact

A Popular Day Out - The Bruce Trail, which passes 500 miles through Southern Ontario, is within one hour's drive of about seven million people. It therefore offers an excellent recreational and educational experience in the countryside to a huge number of urban dwellers, adding to their physical welfare and quality of life. Indeed, about 1.3 million people a year use the Bruce Trail, encouraging about 50,000 overnight stays. From this it can be noted that the vast majority of users are in fact people who are on a day out from the City. This view of the Bruce Trail as an important resource for an urban population is confirmed by the fact that of the nine local clubs which make up the Bruce Trail Association, the Toronto one accounts for some 40% of overall membership, even though Toronto or its suburbs are well to the East of the Trail.

Volunteering—this activity, described by

the UK Government as having "a vital role to play in the life of the community" and "significant social value" (Secretary of State for Scotland, 1994), is the backbone of the Bruce Trail Association. With six permanent staff and between 15,000 and 20,000 members (it is difficult to gauge the exact figure because of family and group memberships), the management of the Bruce Trail relies almost totally on volunteering.

Environmental Impact

Ecology— The Trail plays an essential role in encouraging many people to discover the Niagara Escarpment with minimal ecological impact. Indeed, it has a positive impact through active countryside management. The Bruce Trail Association believes that the conservation of the Niagara Escarpment is absolutely incompatible with highly intensive exploitation of the environment through operations like quarrying. However, there are of course also contradictions between conservation and less exploitative uses of the environment. Whilst recreation is a good example of an activity that is less destructive than extractive industries, such as mining or logging, it can also be at odds with conservation efforts when it becomes too intensive. The Escarpment is by no means unharmed by leisure pursuits, and there can be heavy pressure on the environment in and around the multitude of parks etc. on the Escarpment which the Trail helps to spread. Activities like ski-ing, camping and water sports are also problematic. The Bruce Trail itself however, is seen as a facility which poses no particular threat to the precious World Biosphere Reserve of the Niagara Escarpment.

Education—Although, as noted above, pressures can be great in and around areas designated as parks etc., it ought to be recognised that these are of course a valuable environmental education resource. It is one of the most admirable aspects of the Bruce Trail, that it links over 100 of these environmental education resources (publicly owned parks, forests, nature reserves etc.).

Economic Impact

As expressed earlier, the Bruce Trail attracts over 1.3 million visitors a year, who, it is estimated, contribute in excess of CA$30 million to the local economy, per annum. This can be very positive for the local population and can provide new business opportunities. In relation to the figure of 50,000 overnight stays reported, it is interesting to note that there has been a huge increase in the prevalence of Bed & Breakfast provision along the Trail's length in the last decade. In 1986 there were four such establishments, and by 1995 this number had increased tenfold to about forty. There is however, no evidence as to why this increase has come about, but it is suspected that it is a combined effect of increasing long-distance use of the Trail and changing accommodation tastes.

COMPARISON WITH UK/CONCLUSIONS

What then, are the characteristics of the trails, countryside recreation and conservation game in Ontario which strike a European visitor as salient? It is suggested that one characteristic is particularly striking, namely, the issues relating to private property, trespass and access.

The sanctity of private land ownership in Ontario and the extremely serious view which seems to be taken of trespass is somewhat strange to the European spectator. In Norway, Germany and Sweden it is the freedom of access to land which is sacred, not its limitation, and this freedom is enshrined respectively in the Allemannsretten (a legislated right of access), the Betretungsrecht (also a legislated right) and the Allemansrätten (a Common Law provision). The situation as regards the so-called 'freedom to roam' in Scotland is somewhat different, but briefly is thus: it is unlawful to trespass, but in the vast majority of cases there is no meaningful sanction which can easily be imposed by the Courts. This therefore amounts to a *de facto* 'freedom to roam', which is tolerated by most landowners as long as no damage is incurred to their property.

Even where a European country has a less permissive system of access to the countryside in general (e.g. England), this is often compensated for, to a certain extent, by the existence of ancient rights-of-way networks. Considering the English example, these rights-of-way allow public access to given routes over private land, and in total the network in England extends for about 200,000 km / 125,000 miles (Peter Scott, 1994). Even in comparison with the United States, Ontario lacks the legislative ability to create trails [National Trails System Act (as amended) 16 USC Sec. 1244], which has been so successful in, the creation of facilities such as Tennessee's Natchez Trace National Scenic Trail and the Overmountain Victory National Historical Trail.

Given the lack of either a 'freedom to roam', a historical right-of-way network or legislation in Ontario, this makes the accomplishments of the Bruce Trail Association (and other groups managing long-distance trails purely through voluntary access agreements) all the more remarkable. It is a truly admirable feat to (in the case of the Bruce Trail) have come to a series of voluntary access arrangements covering a distance of 775 km (500 miles). In Scotland, local authorities can enter into 'public path agreements' with landowners, which allow payments to be made to landowners in exchange for access. A variety of schemes exist in England which allow public authorities to offer financial inducements to private landowners in return for permitting public access. In the US, the Symms National Recreational Trails Act of 1991 ensured that there are monies available for the provision and maintenance of recreational trails, held in a national recreational trail fund. With organisations like the Bruce Trail Association unable to offer an equivalent 'lure of the loonie', that so much can be achieved through talks and handshakes, and perhaps more importantly, that such agreements can be made to last, is a ringing endorsement of the quality of trail management in place.

In conclusion, Ontarians can be proud of the evidently committed efforts of the many staff and volunteers in the public, quasi-public and voluntary sectors without whom there would be no trails.

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Campsite Survey Implications for Managing Designated Campsites at Great Smoky Mountains National Park

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Abstract: Backcountry campsites and shelters in Great Smoky Mountains National Park were surveyed in 1993 as part of a new impact monitoring program. A total of 395 campsites and shelters were located and assessed, including 309 legal campsites located at 84 designated campgrounds, 68 illegal campsites, and 18 shelters. Primary campsite management problems identified by the survey include: (1) campsite proliferation, (2) campsite expansion and excessive size, (3) excessive vegetation loss and soil exposure, (4) lack of visitor solitude at campsites, (5) excessive tree damage, and (6) illegal camping. A number of potential management options are recommended to address the identified campsite management problems. Many problems are linked to the ability of visitors to determine the location and number of individual campsites within each designated campground. Our principal recommendation is that managers apply site-selection criteria to existing and potential new campsite locations to identify and designate campsites that will resist and constrain the areal extent of impacts and enhance visitor solitude. Educational solutions are also offered.
Keywords: campsite impact, campsite management, campsite monitoring, Great Smoky Mountains National Park

Park and wilderness managers must maintain a balance between resource protection and recreation provision mandates. Though a central purpose for the creation and management of protected areas, visitation has the potential to degrade both natural resources (Hammitt and Cole 1987, Kuss and others 1990) and the experiences of visitors (Lucas 1979, Shelby and Shindler 1990). This is particularly true along trails and at overnight campsites and day-use recreation sites, where visitation and its effects are concentrated.

Historically, protected area managers have often relied upon their subjective impressions of campsite and trail conditions as a basis for management decision making. However, increasing participation in wildland recreation continues to challenge managers responsible for minimizing the environmental and social impacts associated with such visitation. More objective and scientifically defensible visitor impact assessment and monitoring programs are needed to help develop and support effective management actions (Marion 1995). Additionally, research from the discipline of recreation ecology is yielding new knowledge that can assist managers in reducing resource impacts associated with wildland recreation (Cole 1987, Cole and others 1987, Leung and Marion 1996).

This paper describes selected results from the development and application of a backcountry campsite monitoring program for Great Smoky Mountains National Park. The goal of this work was to obtain reliable yet cost-effective measurements of managerially relevant campsite condition indicators for all backcountry campsites and shelters. Our focus in this paper is on presenting and discussing implications and recommendations derived from the first monitoring cycle.

STUDY AREA

Great Smoky Mountains National Park (GSMNP) was established in 1934 and has grown in size to include 514,885 acres along the boundary of Tennessee and North Carolina. This National Park Service (NPS) unit includes

69 miles of the Appalachian Trail and is distinguished by its 1978 designation as an International Biosphere Reserve. Approximately 425,000 acres, 83% of the park's acreage, are recommended for wilderness designation. Under NPS management policies, such lands must be managed as wilderness.

The southern Appalachian Mountains, including exceptionally diverse flora and fauna, comprise the park's primary public attraction. Elevations range from 840 feet to 6,643 feet. Twenty peaks rise above 6,000 feet in elevation and the topography is steep; only 10 percent of the park's lands have slopes of less than 10 degrees. Major plant communities include cove hardwoods, hemlock, mixed oak, northern hardwood, pine and oak, beech, and spruce-fir, with some of the most extensive virgin forests in the eastern United States.

GSMNP reported 9.28 million recreation visits in 1993 making it one of the most heavily visited parks in the National Park system (NPS 1993). While many of these visitors remain close to their cars, a considerable number also engage in day hiking and overnight camping activities. Backcountry overnight stays reported by the park for 1993 were just over 96,459, sixth highest within the National Park system (NPS 1993).

Prior to 1972, backcountry camping was largely unregulated, specifying only distance restrictions from park roads, Clingman's Dome Tower, and water resources. Beginning in 1972, camping was rationed along the Appalachian Trail and several other trails to reduce crowding and impacts at popular camping areas. A backcountry use pamphlet listed 43 suggested camping areas and 18 backcountry shelters. In 1973, a designated site camping policy was implemented, including 79 backcountry camping areas. Use of shelters was restricted to their bunk capacity. A cross-country hiking policy was established in 1974, permitting camping at non-designated sites. Horseback camping was restricted to 23 of the backcountry camping areas, with occupancy restricted to available hitchrack space. Backcountry visitation peaked in 1976 (115,300 overnight stays), prompting a campsite impact survey by Bratton and others (1978). Their study documented resource conditions at 20 shelters, 93 camping areas, and 289 illegal campsites.

In 1993, the year our survey was conducted, camping was permitted at 84 designated backcountry camping areas (hereafter referred to as campgrounds) and 18 shelters. Overnight visitors must obtain a self-registered camping permit. Reservations for specific campgrounds must also be obtained if their anticipated itinerary includes one of the 15 rationed campgrounds or 18 shelters. Maximum party size is eight and visitors may stay only one consecutive night at shelters and up to three consecutive nights at campgrounds. Campfires are permitted only at designated campgrounds and shelters.

Horseback riders are restricted to park trails specifically designated for horse use and to 51 of the 84 designated campgrounds or to 13 of the 18 shelters (64 areas total). Hitchracks are provided at many of the campgrounds and shelters where camping with horses is permitted.

RESEARCH METHODS

This project's research objectives called for developing a standardized assessment system to monitor resource conditions on backcountry campsites. Three types of comparisons are possible. Resource impacts caused by camping are inferred by comparing onsite and offsite (control) conditions. Trends in campsite conditions are documented by comparing campsite impacts assessed during two or more monitoring cycles. Additionally, various groupings of campsites (e.g. rationed vs. unrationed) can be compared to evaluate the influence of additional environmental, use-related, or managerial factors. Procedures applied during this study employed all three forms of comparison to infer the extent of change caused by camping.

Monitoring Procedures

Monitoring procedures employed during this study emphasize a multi-indicator measurement-based approach but add descriptive condition class assessments and photographs (see Marion and Leung 1997). For campsites with exposed soil, all three approaches were applied, requiring a field crew of two persons approximately 15 minutes to complete. For less disturbed campsites, an abbreviated set of procedures was applied. A comprehensive campsite monitoring manual was developed, including detailed descriptions of all campsite assessment methods and materials employed during the survey (Marion and Leung 1997).

The survey's objective was to conduct a

census of all discernible backcountry campsites. A census was viewed as necessary to accurately characterize the distribution of campsites and aggregate change for each campsite condition indicator (e.g. the total area of disturbance affected by camping). Such comprehensive data would also be needed to support implementation of standards-based management frameworks. Such data are essential for developing realistic standards for various opportunity classes and for identifying the number and location of campsites that exceed those standards.

Field work, including one week of staff training, was conducted from June 1 to August 15, 1993. During this same time, period field staff also surveyed the condition of 72 park trails (328 miles) as part of a separate study (Marion 1994).

Campsites were defined as areas of obvious vegetative or organic litter disturbance that in the judgment of field staff were caused by camping activities. Furthermore, disturbance had to be of such extent to produce a discernible boundary between disturbed and undisturbed areas. All indicator conditions were assessed only within the established boundary of a campsite, although procedures allowed for additional assessments within obvious "satellite" use areas. Fixing the area of interest within campsite boundaries is necessary to increase the precision of assessments.

Campsites were located using a variety of information and approaches. Designated campsites were located through thorough searches of the areas around each backcountry campground. Illegal campsites were located by consulting park staff most familiar with the backcountry and by following every recognizable side path during thorough ground-based searches.

Campsite indicators were selected following a review of recreation ecology literature, discussions with park staff, and consideration or published criteria guiding the selection of monitoring indicators (Cole 1989, Marion 1991, Merigliano 1990). For soil, the percentage of exposed soil was assessed according to a six-category cover-class scale. The number of trees with moderate to severe root exposure was counted within delineated campsite boundaries as an indication of soil compaction and erosion. For vegetation, the percentage of ground covered by vegetation on-site and off-site was estimated using the six-category cover class scale. The number and degree of damaged trees and number of tree stumps was also assessed. Aesthetic and behavioral indicators included the number of trails extending from a campsite, distance to formal park trail, number of fire rings or scars, and the presence of litter or improperly disposed human waste.

Data Analysis

Data were entered into dBASE IV and exported into SPSSPC+ for statistical analyses. Data were error-checked and new variables were calculated. For example, vegetation loss (ft^2) was calculated by subtracting the midpoint of the off-site vegetation cover class estimate from the midpoint of the on-site estimate and multiplying by the campsite area to obtain an estimate of the area over which vegetation cover has been removed on campsites (Marion and Leung 1997. A full range of descriptive and relational statistical analyses were performed. Both mean and median values are reported. The mean is not always the best measure of central tendency, due to the effect of outlier data and distributions which are highly skewed. In these instances the median provides a better estimate of central tendency and is emphasized in the following discussions.

RESULTS

Survey staff located and assessed 395 individual campsites and shelters. Sixty-eight campsites were judged to be illegal. Half of these campsites are located near designated campgrounds and field staff encountered some difficulties in differentiating between legal and illegal campsites. Survey staff assessed 237 legal campsites at the park's 67 unrationed backcountry campgrounds (3.5 sites/campground) and 72 campsites at the 15 rationed campgrounds (4.8 sites/campground). All 18 of the rationed shelter sites were also evaluated. The number of individual campsites per designated campground ranges from 1 to 12 with a mean of 3.8, excluding shelters, all of which were assessed as single sites. Of the 82 designated campgrounds, 9 have only 1 campsite, 18 have 2 campsites, 20 have 3 campsites, 10 have 4 campsites, 9 have 5 campsites, and 16 have 6 or more campsites.

The majority of illegal campsites (54, 79%) are within 100 feet of formal trails, nearly 60% are within 25 feet of park trails (Table 1). Similarly, more than half of the legal campsites and shelters (188, 58%) are within 100 feet of formal park trails. Only 71 legal campsites and

Table 1. Results for selected indicators for campsites and shelters by legal and rationing status.

Indicator[1]		Illegal Campsites (N=68)	Legal Unrationed Campsites (N=237)	Legal Rationed Campsites (N=72)	Legal Rationed Shelters (N=18)
Distance to Trail (ft)	≤25	40	69	20	8
	26-100	14	67	22	2
	101-200	9	45	18	5
	≥201	5	56	12	3
	Mean	56	136	102	105
	Median	20	70	76	29
No. Sites Visible (#)	0	54	46	8	15
	1	12	82	19	3
	2	2	54	15	0
	≥3	0	54	30	0
	Mean	0.2	1.6	2.5	0.2
Campsite Size (ft^2)	Mean	515	1311	2530	3218
	Median	382	876	1740	2895
	Sum	35,052	310,761	182,143	57,920
Vegetation Loss (ft^2)	Mean	273	814	1208	1522
	Median	159	521	653	1431
	Sum	8201	129,435	72,478	24,353
Exposed Soil (ft^2)	Mean	266	812	1489	1398
	Median	182	470	856	1361
	Sum	7970	129,064	89,352	22,365
Damaged Trees (#)	Mean	0.7	2.9	5.6	2.1
	Median	0	1	2	0
	Sum	45	690	401	37
Trees w/Root Exposure (#)	Mean	0.6	1.2	2.0	0.7
	Median	0	0	1	0
	Sum	18	186	120	11
Stumps (#)	Mean	0.7	1.9	3.4	0.9
	Median	0	1	2	0
	Sum	47	460	247	17

[1]N is the number of campsites for all indicators except vegetation loss, exposed soil, and trees with root exposure, which were assessed only on campsite with exposed soil (see Methods section). N values for these indicators are 30, 160, 60, and 18.

shelters (21%) are located more than 200 feet from park trails, thus four-fifths of the park's designated campgrounds and shelters are likely to be visible from the park's formal trail system.

The number of other campsites in the area that are visible from each campsite, a measure of campsite intervisiblitiy, was assessed to evaluate the potential for solitude while camping. The potential for solitude at illegal campsites is substantially higher than for legal campsites: no other sites are visible from 54 (79%) of illegal campsites, compared to 69 (21%) of all legal campsites (Table 1). Within designated campgrounds, individual campsites often occur in dense clusters. For example, three or more other campsites are visible from 54 (23%) of the legal unrationed campsites and from 30 (42%) of the legal rationed campsites (Table 1). Twelve of the rationed campsites have five or more other sites visible. The close proximity of campsites and trails diminishes solitude for both hikers and campers. Current campsite locations do not reflect Wilderness Act mandates that specify solitude as a principal element of wilderness recreation.

Campsite Conditions

Campsite condition comparisons across legal

and rationing status are presented in Table 1 for selected impact indicators. Results indicate substantial differences in campsite conditions exist between these various campsite stratifications.

Illegal campsites are generally quite small in size (median size = 382 ft^2) with limited vegetation loss or exposed soil (Table 1). The sum of campsite area for all illegal sites, referred to as aggregate impact, totals 35,052 ft^2 or 0.8 acres (Table 1). The extent of tree damage and root exposure on these sites is low. Legal unrationed campsites are larger in size (median size = 876 ft^2) and account for the largest aggregate impact of any category (310,761 ft^2) (Table 1). For remaining indicators all measures of change are more than double the values for illegal campsites. Legal rationed campsites (median = 1740 ft^2) are approximately twice the size of the unrationed sites (Table 1). The area of vegetation loss and exposed soil are also substantially larger and the number of damaged trees and stumps (median = 2/site for both indicators) are the highest for any category.

Shelters have the largest areal measures of change, with a median size of 2985 ft^2, vegetation loss of 1431 ft^2, and exposed soil of 1361 ft^2 (Table 1). Median values for the remaining indicators indicate limited impacts, more similar to conditions on illegal campsites than those on designated campground sites.

Two campsite condition indicators, campsite area and damaged trees, exhibit extensive change and warrant additional attention. As a group, legal campsites and shelters range in size from 36 to 23,948 ft^2 with a median size of 1,039. Approximately one-quarter of the campsites are less than 501 ft^2 in size (80, 24%), and about one-half are less than 1001 ft^2 in size. However, 62 campsites (19%) are between 2000 and 4000 ft^2 and 30 campsites (9%) are larger than 4000 ft^2, an area of approximately 63x63 feet.

For legal campsites and shelters that have trees within their boundaries (N=245), approximately 63% of the trees on the typical site are damaged (as indicated by median values). More importantly, all campsite trees are damaged on 69 (28%) of the campsites. The number of damaged trees ranges from 0 to 53 with a median of 2 (mean = 3.5). Twenty percent of the campsites have 6 or more damaged trees, 10% have 9 or more, and 8 campsites have 20 or more damaged trees. For all legal campsites, a total of 1,128 of the 1,943 trees assessed (58%) were evaluated as damaged. In off-site areas of legal campsites, surveyors found an additional 1,249 damaged trees.

Aggregate measures of impact have more ecological significance than median or mean values for various stratifications of campsites. Managers must balance their goal of providing for appropriate recreational visitation with that of resource protection. Thus, an important objective is to limit the total area of disturbance or exposed soil, or the total number of damaged trees. The legal unrationed campsites account for the greatest area of disturbance, including over half (53%) of the total area of disturbance associated with all campsites and shelters (585,876 ft^2, 13.5 acres). The large number of sites in this category (N=237) is the primary factor explaining this finding (Table 1). Legal rationed campsites, primarily due to their larger sizes, also contribute substantially to the total area of disturbance (182,143 ft^2, 31%). Findings and contributing factors for the remaining variables mirror those of campsite size (Table 1).

DISCUSSION

This survey identified a number of problems associated with backcountry campsites in Great Smoky Mountains National Park, including: (1) campsite proliferation, (2) campsite expansion and excessive size, (3) excessive vegetation loss and soil exposure, (4) lack of visitor solitude at campsites, (5) excessive tree damage, and (6) illegal camping. Recreation ecology research findings support the park's current policy of restricting most campers to designated campsites. These studies document a curvilinear relationship between overnight visitation and most forms of campsite impact (Cole 1987, Marion and Merriam 1985, Marion and Cole 1996). Conditions change rapidly with initial campsite use but the rate of change diminishes with increasing use. An important implication of this relationship is that aggregate impact is most effectively minimized by concentrating visitation on a limited number of campsites—the principal objective of a designated site camping policy.

At GSMNP managers have additionally sought to control camping impacts by rationing visitation at the most popular and highly impacted campgrounds. Data from this survey suggest that this action is highly effective at

shelters where use is restricted to their bunk capacities. The large tent camping areas situated around shelters that the earlier survey by Bratton and others (1978) document have largely recovered. Park permit data indicate that the shelters accommodated 37% of the overnight backcountry visitation in 1993 (excluding drive-in horse camps), yet our survey found that shelters account for only 10% of the total area of disturbance. The effectiveness of rationing at shelters is explained by the elimination of tent camping areas and the extreme spatial concentration of activities caused by the shelters.

Rationing at campgrounds is a far less effective management action. The curvilinear use/impact relationship implies that dramatic reductions in visitation would be needed in order to achieve any substantive reductions in campsite impacts. In contrast to shelters, rationing at campgrounds does not completely eliminate any tenting areas because visitors, though their numbers are reduced, retain the ability to camp in any location they choose. Even low to moderate levels of visitation are sufficient to prevent substantial recovery on previously heavily impacted campsites (Cole and Ranz 1983). In 1993, rationed campgrounds accommodated 17% of the overnight backcountry visitation, yet our survey found that rationed campgrounds account for 31% of the total area of disturbance. Finally, rationing does little to address solitude issues as it does not increase the spatial distribution of campsites relative to trails and each other.

It is pertinent to conduct a brief problem analysis before considering alternative management options for reducing campsite impacts. Many of the campsite management problems and their principal contributing factors are interrelated. For example, the locations of individual campsites are selected by visitors; even campground designations were historically assigned to pre-existing visitor-selected campsites. Problems with campsite proliferation and expansion, groundcover degradation, and lack of solitude are all directly related to this contributing factor. Survey results indicate that visitors can and often do choose campsite locations that are fragile, rather than resistant; close to, rather than apart from, other campsites, park trails, and streams, and in areas with great expansion potential rather than in areas where topography limits campsite expansion and proliferation. Additionally, park literature in 1993 did not convey any information addressing these issues; thus, visitors may have been unaware of the impacts of their activities, park management's concern, or appropriate minimum impact camping practices.

Potential Management Options

Managers must develop a thorough understanding of the nature, extent, and contributing causes of campsite degradation problems before defining the range of potential management solutions. Marion and Leung (1997) provide a more comprehensive review of these topics, which are greatly abbreviated in this paper. The most effective management strategies and actions are those that address the underlying causes of degradation problems. For example, a program to assist natural recovery on illegal campsites will be ineffective if the causes of illegal site use are not resolved. In addition to the likely effectiveness of alternative management options, participants in the decision process must also consider the costs of implementation to both managers and visitors, and secondary or side effects (Cole and others 1987). Both initial and recurring costs in funding and personnel needed to implement the action must be considered. Given that wilderness visitation is to be "primitive and unconfined", managers must consider the effects of their actions on visitor freedom, obtrusiveness, when and where the visitor is affected, the number of visitors affected, and the importance of activities that are affected (Cole and others 1987, Hendee and others 1990).

We offer some potential or preliminary management options for the consideration of park staff and others involved in managing backcountry recreation at GSMNP. Research findings from recreation ecology and the results from our survey support the general strategy of visitor containment to minimize camping impacts, as implemented by the designated site camping policy at GSMNP. The cross-country camping zones, which could be expanded to include more of the most remote and rarely visited park areas, could be effectively managed under a camping dispersal strategy. Visitors would be encouraged to select resistant pristine locations for camping and to rigorously apply the *Leave No Trace* camping practices that are most appropriate to this form of camping (NOLS 1994).

A principle advantage of the campsite designation strategy is the ability to direct camping to areas that resist and spatially

(a)

(b)

Fig. 1. Flat topography offers no constraint to the expansion of this 2,560 ft^2 campsite (a) in the Upper Ripskin backcountry campground. In contrast, the sloping topography within which the Medicine Branch Bluff campground is located, limits site proliferation and the expansion of this 767 ft^2 campsite (b).

constrain camping impacts. This can be accomplished by applying site selection criteria that rate such attributes as vegetation resistance to trampling, erosion potential due to slopes or soil texture, topography or other features that restrict campsite expansion and proliferation (Fig. 1), and proximity to sensitive areas such as stream banks or cultural sites. Social attributes can also be incorporated to protect and ensure the opportunity for solitude by establishing visibility or distance criteria for locating campsites. Preliminary bio-physical and social criteria are offered by Marion and Leung (1997) some of which were applied to campsites as part of the 1993 survey.

Application of the criteria to existing and potential new campsite locations can yield information useful to the selection of campsites that can be individually designated (as opposed to campground designations). Campsites could be designated by firmly anchoring camping posts, firegrates, or camping symbol signs. Such physical features will naturally concentrate future visitation to their immediate vicinity; alternately, visitors could be required to camp within a specified distance of the selected feature. Both theoretical (Cole 1992) and empirical (Marion 1995) research supports the merits of such features in achieving substantial reductions in the total area of disturbance through the spatial concentration of camping activities. As previously noted, managers must weigh the advantages of these proposed actions with their management and visitor costs.

If individual campsites are designated, each campground would have an inherent capacity equivalent to the number of campsites. Visitors would have to be made aware of this to allow time to locate an available campsite in popular areas. Park staff should seek to match the number and distribution of campsites to current visitor travel preferences. Most problems related to insufficient campground capacity can be resolved by adding campsites or additional campgrounds. Those that cannot are, in our opinion, best addressed through a system of entry point quotas rather than campsite rationing. Under entry point quotas, visitors retain greater freedom to travel and alter their schedules while in the backcountry. Refer to Marion and Leung (1997) for further discussion on this topic.

Educational and campsite maintenance programs can also play important roles in reducing campsite degradation. A comprehensive pamphlet titled "Leaving No Trace in Great Smoky Mountains National Park" was developed in 1995 and is now widely distributed to backcountry visitors (NOLS 1995, Marion and Brame 1996). Tree damage can best be addressed by encouraging visitors to use stoves and avoid building fires. Small Leave No Trace campfires should be built with dead and down wood that can be broken by hand. Axes and saws are unnecessary and should be prohibited. Efforts are also being made to enhance the personal communication of this information and its integration in other park literature. Finally, backcountry maintenance efforts could be expanded to deter site expansion on designated campsites (Marion and Sober 1987) and to speed the recovery of closed and illegal campsites (Cole and Schreiner 1981).

Illegal camping is substantially reduced from the late 1970's when Bratton's survey revealed 289 illegal campsites (Bratton and others 1978). Survey staff conducted careful and exhaustive searches for illegal campsites at substantial distances from formal trails so we believe this finding accurately reflects the status of illegal camping. Further reduction of illegal camping will require an improved understanding of underlying causes. Are illegal campers unaware of the park's camping regulations? Does illegal camping occur only when there is crowding, conflict, or insufficient space at non-rationed campgrounds? Are illegal campers aware of the regulations but feel that their chances of being caught or fined are small? Additional information is needed for these questions before effective management options can be discussed.

CONCLUSIONS

Visitor impact monitoring programs offer protected area managers an objective tool for documenting trends in resource conditions as affected by recreational activities. Monitoring data describe the nature and extent of resource changes and can be analyzed to reveal the influence of use-related, environmental, and managerial factors. As demonstrated in this paper, monitoring data permit the quantitative documentation of site-specific conditions, providing a permanent and impartial record of changing resource conditions. Our analysis and interpretation revealed a number of campsite management problems, to which we applied recreation ecology and wildland recreation management knowledge to offer some potential management options. These findings provide

GSMNP managers with an improved understanding of backcountry campsite conditions and how additional actions might substantially improve both resource and social conditions. We recommend further evaluation of these and other alternatives by park managers to consider management and visitor costs, and to incorporate the advice of experienced backcountry staff and representatives of the public and organized interests.

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Wilderness Policy and Argumentation: Toward Better Possible Futures

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Abstract: The conversation among wilderness advocates today has become specialized to such a degree that particular experiences and knowledge are prerequisites to participation. In this paper I describe what I term to be the three poles of the "discourse of wilderness," and critique each in terms of its public accessibility. Arguing that advocates' various representations of wilderness must be both publicly justifiable and open to argument, I point to the possibility of increasing the diversity and political influence of those concerned with wilderness protection and management. To do this, I refer to the literature of rhetoric, contemporary planning and policy analysis, and philosophy in search of modes of wilderness justification in terms of the futures that it offers, and its ties to what we can see as the kind of world in which we wish to live.
Keywords: Wilderness, discourse, argument, public participation

For those interested in wilderness preservation, there is perhaps one common element to all possible assessments of the success of wilderness policy and protection up to the present.[1] Regardless of whether or not one sees efforts up to this time as a complete failure, as ineffectual good intentions, or as successful and having great future potential, all seem to agree that we are not there yet. However, this does not mean necessarily that there are too many people in the wilderness, or that existing wilderness is not adequately managed or protected. In fact, I can expand upon this claim—somewhat ironically—by stating that wilderness needs more people—a greater diversity of human voices and communication. It is how we humans talk about wilderness, the words we use and the associations we make, that dictates our management of wildlands. We are the operative variable. A recognition of this is counter to the prevailing biocentric wisdom in many ways, for it is founded upon the fact that if we are to preserve a wilderness humans perceive as of value, the appeal to that sensitivity is essentially an appeal to an individual's humanity. The biocentric argument for an ethical relationship between humanity and wilderness is still an appeal to ethics—phenomena particular to humans, as far as we know.

Acknowledging this essential anthropocentrism, this paper has two interrelated goals. First, I want to argue that contemporary discussions of wilderness—especially within the environmental and wilderness preservation movements—exclude the majority of a population whose participation could not only contribute a great deal to the environmental critique of land management policies, but whose numbers could effectively increase the political weight of the environmental movement itself. Secondly, and more generally, I would like to propose that wilderness-oriented policy makers and managers could more effectively accomplish their goals not by focusing their efforts, but by enlarging the circles in which they operate. I want to show that wilderness management is as much, or more, a social as a scientific responsibility, and that the concerns of wilderness managers must necessarily expand to recognize this breadth. What follows, therefore, involves two steps: 1.a critique of contemporary wilderness discourse, particularly as it exists within the environmental movement, and 2.a sketch of an alternative argumentative approach that has the potential to overcome the obstacles to success that we now face.

DISCOURSE, ARGUMENT, AND THE PUBLIC

To make these points, it is first necessary to briefly describe what is meant by discourse,

argument, and public in the context of this discussion. Discourse is essentially the on-going communicative interaction of participants about something. The idea of this sort of interactive field of communication and its potential as both a subject of study and a social force has received a great deal of attention from social theorists of all stripes in the last thirty years. Recently, it has been the focus of the work of philosophers like Richard Rorty (1991) and Jürgen Habermas (1984), but it has a lengthy intellectual history (arguably anything from one hundred to two thousand years). Without going into unnecessary detail, the basic premise of this method of analysis, regardless of the countless individual conclusions, is: language, as the medium of communication, can actually determine the character and structure of human relationships. Because of its capacity to reflect underlying patterns of power distribution, implicit normative judgments, and so forth, it effectively regulates access to the conversations that make up the "reality" of what a society is "about." Recognizing the power that the structure of discourse reflects, it is possible both to analyze the language in any discourse to illuminate its hidden hierarchies and biases, and to respond to these conditions to counter the injustices or obstacles to participation that exist (O'Hara, 1996). This language-based critique offers a useful avenue for critique of the conversation concerning North American wilderness.

Argument is closely related to discourse and conversation and has also received a great deal of attention in the social sciences recently. As Majone (1989:10) defines it, argument is "the link that connects data and information with...conclusions;" it is, in the words of Fischer and Forester (1993:4), systematically ambiguous, referring "both to an analytic content ("the logic of the argument") and to a practical performance ("the argument fell on deaf ears")." In other words, arguments are the way we make sense of our perspectives, the logic we use to tie our understandings to the world as we experience it, and the expression of these perspectives. As such, they are "a complex blend of factual statements and subjective evaluations" (Majone, 1989:10). An argument is simply an input into the conversation about something, and that conversation can be understood as the set of competing arguments concerning the topic of interest. Inevitably, then, the definitions and structures of the concepts discussed become not only essential to the capacity of the conversation to reach some sort of consensus or mutual understanding, but points of contention in themselves. Disparate "points of view" are basically competing attempts to define critical terms, and are generally advocated by what Maarten Hajer calls a "discourse coalition:" "a group of actors who share a social construct" (1993:45). Thus, the importance of definitional issues to the argumentative process has enormous implications for any public discourse. Most significant is the fact that since arguments are basically subjective expressions of interpretive experiences—expressions based upon definitions that are widely shared or particular to a coalition—then access to a public discourse will be dependent upon an individual or group's capacity to either accept a shared meaning, or adequately compete with their own.

It would be quite easy to accept the colloquial definition of "public"—anything to which in principle all citizens have equal access—in this paper, but I would like to offer an alternative that expands the term to allow for a consideration of conversation both between or within discourse coalitions. I therefore adopt a definition of public from Nancy Fraser's discussion of Habermas (1992:124):

> [H]however limited a public might be in its empirical manifestation at any given time, its members understand themselves as part of a wider public.

On these terms, there are many diverse publics, a fact not only important to this discussion, but humbling to all advocates who claim to be speaking for the wider population. This definition will permit an examination of discourse both within the wilderness preservation and environmental movements and in the wider citizenry. With this in mind, the idea of public policy can also be seen in broader perspective—one that reflects the fact that the policy-making process does not only occur within legislatures. Indeed, anyone familiar with contemporary North American politics would be hard-pressed to deny the reality of intra- and extra-governmental interest group influences.

Taking account of the above definition of "public," in fact, one can see that the process of public policy formulation depends as much if not more upon the policy-oriented arguments and conversations within specific discourse coalitions as it does on those that take place in the halls of elected representatives. "Public

policy" in this sense is as much what the Sierra Club chooses to advocate as what the province of Ontario puts on parchment, for the Sierra Club is a "public" in and of itself. The fact that Ontario could be seen to "have the final say" is representative only of the fact that they become involved in the final stages. Public policy and policy arguments have been formulated, defined and refined many times along the way. As Frank Fischer and John Forester (1993:1) put it:

> If [policy] analysts' ways of representing policy and planning issues must make assumptions about causality and responsibility, about legitimacy and authority, and about interests, needs, values, preferences, and obligations, then the language of policy and planning analyses not only depicts but also constructs the issues at hand.

This is true for all publics and public representatives, from wilderness advocates' groups to the Ontario Ministry of Natural Resources.

CONTEMPORARY WILDERNESS DISCOURSE

Although it need not be limited to this audience, this paper is aimed primarily at those who would identify themselves as participants in the contemporary "discourse of wilderness." In focusing upon this group (of which I consider myself a member), I hope to show that the manner in which participants in this discourse talk about wilderness, the social constructs and language with which we frame our conversation, excludes a wider public that we not only claim to represent, but whose support we desperately need if we are to achieve even the mildest of the wilderness preservation and management goals we have set for North America. This is founded upon the belief that, at a minimum, most North Americans want and expect access to wild nature (defined sociologically, ecologically, or otherwise), even if this is not explicitly articulated by our present political climate and debate. In short, I believe that more people truly care about wilderness management and preservation than wilderness advocates generally assume; these citizens are simply not asked the right questions, or made to feel welcome in the conversation. This becomes evident through a reflection on the poles of the wilderness debate within the environmental community, and the ambiguity, complexity, and alienation that face any new participant in the discourse of wilderness.

The Three Poles of the Discourse of Wilderness

There are new wildernesses in North America, but they are not defined topographically. In juxtaposition, and often over against the "spiritual" wilderness of John Muir and Gary Snyder, we now have ecological and philosophical wildernesses. Ecological wilderness includes phenomena like biodiversity, landscape-level dynamics, stress and disturbances; the relationship with wild nature that became the essential to preservationists in the late nineteenth and first seventy years of the twentieth centuries. What Max Oelschlager has called a "wilderness theology" (1992:289), has been joined by a scientific explanation of human dependence on wildlands. This development has in turn been followed by a philosophical wilderness that is discussed in terms of intrinsic and instrumental values, of moral monism and ecocentrism. Deep ecologists have called on Spinoza (Devall and Sessions, 1985:237), environmental pragmatists have pointed to William James (Fuller, 1992), and Martin Heidegger's name has become almost common in some treatments of environmental ethics (for example, Gare, 1995).

Each of these perspectives are the realm of specific conversations, the discourse of specialists. This is not harmful in itself; indeed, there will probably always be—and need to be—complex, analytical considerations about virtually everything on Earth and beyond it. Yet these perspectives are also the main components—the three main "poles"—of the contemporary discourse of wilderness. As such, they compete for prominence in the environmental debate, structure the fora of and access to this debate as it relates to wilderness, and define the terms and arguments through which interested publics can converse. These perspectives, therefore, interact internally through those concerned about wilderness specifically, and externally in society-at-large and the environmental movement as a whole. Each "pole" thus needs to be briefly examined in terms of its language, assumptions, and context, as they frame the contemporary policy-level conversation about wilderness.

Spiritual Wilderness

Although the idea of a spiritual/religious attachment to the wild is most often associated with the transcendentalists Emerson and Thoreau and their successors like Muir and John

Burroughs (Nash, 1982:127), it would be unreasonable to describe the pantheism of these men as dead and gone.[2] Wild country, which had for Muir "a mystical ability to inspire and refresh" (Nash, 1982:128), has not lost this effect on participants in the discourse of wilderness. Perhaps most influential of today's "spiritualists" is philosopher and theologian Max Oelschlager, author of such seminal works as The Idea of Wilderness (1991) and Caring for Creation (1995).

Oelschlager's work constructs a "postmodern wilderness," one which requires us to see ourselves and wilderness as the product of a "cosmic synergism" (Oelschlager, 1991:321)—and is written in beautiful, poetic language that is undeniably appealing, provided one has a very large vocabulary. While not inferring that he intended *The Idea of Wilderness* as a popular treatise on wilderness issues and history, there can be little doubt that Oelschlager's work is difficult conceptually, largely inaccessible in terminology, and assumes not only some very particular prior knowledge, but no little sympathy for what might be loosely termed a "new-age" outlook. Although one may argue that Muir's claim that "all life structures—animals and ouzels, meadows and groves, and all the silver stars—are words of God, and they flow smooth and ripe from his lips" (cited in Oelschlager, 1992:286-7) may have been appealing to a nineteenth century culture still very much familiar with religious reference, one would be hard-pressed to describe the following passage, from the very same essay by Oelschlager (1991:302), as reflective of contemporary attitudes:

> The mind forgets intellectual conventions: Nature as lifeless matter in mechanical-motion, History as the stage upon which human life is set, and the mores of culture. Go into the wilderness. Stand on the rock of granitic truth. Hear the Ur syllables, of Mother Earth: the wind! the moving water! the sighing boughs!

Let me re-emphasize the fact that the point is neither to argue that Oelschlager, Gary Snyder, and other contemporary "spiritualists" contribute nothing to the discourse of wilderness, nor is it that their efforts are futile because the general citizenry of North America is too "stupid" or "uninterested" for their work to do any good. Indeed, they contribute immensely. The point, rather, is that they do not reach very many people.[3] The reasons for this are precisely those previously discussed: the language is abstruse; the concepts are difficult, very abstract and often require significant background knowledge. Furthermore, the experiences upon which these revelations are based are simply completely alien to many people, myself included. Asking or expecting an individual whose personal experience of the wilderness may not reach the transcendent heights described is like asking an agnostic to give a sermon. He or she will most likely feel as if they have nothing to contribute. What is there to offer those who obviously see so much more; people who get so much out of the "commune with nature?"

Furthermore, despite the fact that the above examples are drawn from academic literature, the point is often no less true for "popular" works about wilderness. Rick Bass, for example, in The Lost Grizzlies, writes:

> Beth kneels by the shrine [a collection of things gathered in the mountains] and lists the names of the flowers bundled there. Her naming them seems to drop her into a dreamy state. I realize she is no linger talking to me, nor even to herself, but to the flowers and to the mountain. (1995:194)

This is said without sarcasm—a description of the type of quasi-religious experience that is, perhaps sadly, foreign to many (I would venture most) people. In fact, the group with whom it is perhaps easiest to identify is "the rush of starry-eyed backpackers" that Bass tells us is "the last thing" he and his colleagues want in the mountains (1995:169). Indeed, there are many examples of this spiritualism-cum-worship in contemporary nature writing.[4]

The fact that the spiritual wilderness is such a powerful influence on the discourse of wilderness, then, does not necessarily benefit wilderness, if one can see it as benefiting from wider appreciation, expanded preservation, and sound ecological management. The fact that an individual cannot confidently participate in this aspect of the conversation unless he or she feels some sort of metaphysical tie to the wild often results in that forum of the discussion—and its participants—being written off as "impractical," "elitist," and/or "misanthropic" (e.g., Brick, 1995:64). These charges, deserved or not, can strongly affect the capacity of a conversation to be inclusive and participatory.

Ecological Wilderness

By ecological wilderness I mean the wildlands with which most managers and policy-makers are most familiar today. Concerns for landscape processes, biodiversity, ecosystem management and the like have become commonplace in almost all discussions of wilderness. The relatively new discipline of conservation biology is focused upon the attempt to understand these relationships and their impact upon the planet's species. The framework and terminology of the ecological wilderness is arguably the dominant paradigm in the discourse of wilderness today. Its adherents are ascendant, in both the scientific and political communities, and its structure has allowed some measure of success where the environmental movement has often faltered in the past: the realm of "hard" science. Researchers like Reed Noss, Michael Soulé, and Edward O. Wilson have gained the attention of the environmental community because they have, in many ways, "proven" what wilderness preservationists have always "known:" life on Earth is interconnected; humanity probably needs other species to survive; there is still a great deal humans do not know; many species play complex roles we have never imagined. From the perspective of citizens who feel that what little wilderness remains must stay wilderness, and be managed accordingly, these "discoveries" are tantamount to scientific affirmation of environmentalism.

Although, like any technical discipline, ecology demands the use of some complex concepts, many of which require extensive knowledge of other complexities, unlike most other technical disciplines, its terminology has leaked out of the academic departments into the hands of non-experts. This has occurred for political, not commercial reasons (unlike, say, the case of computer science). I have personally welcomed the flood of data to back up my arguments. Although I am not an ecologist, I have a fairly well-developed understanding of ecology, and thus the facts that edge: interior ratio is significant, and metapopulation dynamics affect mammalian distribution throughout the landscape have supplied me with strong empirical ammunition. Thousands of other wilderness activists have also appropriated the new information. We hurl it at legislators. We explain it to bureaucrats. We elicit it from scientists. Mostly, though, we simply affirm it when our colleagues repeat it to us. Among wilderness advocates, we have introduced new language to the discourse of wilderness; we have increased the knowledge necessary to participate in the conversation. What one needs to know to find a seat at the table is shaped by this and must be expressed in a particular way. In short, it is virtually impossible to speak of the ecological wilderness if one is unable to play the dominant—in this case, quasi-scientific—language game, even if one already shares the perspective of the other participants in many ways.

This last point is the crux of this paper, and is particularly true of the new scientism that has taken hold of the wilderness preservation movement (Grumbine, 1995). It is reasonable to expect that if the key term in political interaction is "justification," then the exponential increase in supporting scientific evidence necessarily means that wilderness advocates turn increasingly to science. What it also necessitates, though, is a discursive transformation and translocation away from colloquial North American conversation—the way that most people talk, and the words that most people use—what the philosopher Michael Walzer calls "real talk" (1991). This problem must be addressed by those performing the transition, those already participating in the discourse of wilderness. It is very difficult for people to support the idea of wilderness if it is made implicitly obvious that they do not or cannot understand wilderness.

This is not to say that the ecological wilderness is of no use, or that it has made a negative contribution to the environmental movement. In fact, it has arguably had the greatest impact upon wilderness preservation of any recent discursive development. Yet it has undeniably affected the way people discuss wilderness and other environmental concerns, and made this discussion more complicated and inaccessible, at least at any politically effective level. If, as I have claimed above, there are indeed many "silent" people who support the idea of wilderness and wilderness protection, and their input would be incredibly valuable from both a social (diversity) and political (pure numbers) perspective, then wilderness must either be brought to them, or they brought to it. Scientific rhetoric is one, but definitely not the ideal, manner in which to do this. Instead, we must find a way to look for sound, politically effective, and "real life" methods of justification and discussion. These must exist not in place of, or over and above, but along side and interconnected with the extant poles of the

discourse of wilderness.

Philosophical Wilderness

The field of environmental ethics has grown quickly in recent years. There is a host of well-written anthologies on the subject, an increasingly diverse and heated debate concerning many conceptual differences, and a group of intellectuals like Eugene Hargove, J. Baird Callicott and Holmes Rolston who have gained respect not just in the environmental community, but throughout the discipline of philosophy. In addition to ethics, though, environmental writing that addresses other traditional philosophical questions is becoming important. Agency and selfhood are being discussed in light of human-animal relationships (Dennett, 1995), for example, and there is a new school of thought entitled "environmental pragmatism," after the philosophy espoused by Charles Pierce, William James, and others (Light and Katz, 1996). The increasing recognition of the significance of the human-nature relationship that has coloured late twentieth-century western society has indeed elicited a theoretical response.

Because it would be impractical to address all of these new ideas here, this discussion will focus on the defining terms of the dominant discourse of the philosophical wilderness. These terms are derived from the ongoing debate amongst environmental ethicists about intrinsic and instrumental natural values. While most of the input in this debate has used the term "nature" to refer to the world exclusive of humanity and its accoutrements, it is essentially a conversation about the rights and purposes of the wild, and is thus about wilderness and what it means to humanity and other species.

The debate is founded upon differing opinions as to nature's "value"—by which is meant for whom it exists, how it is or can be understood, and what "rights" it may be said to possess. Those who claim that nature has intrinsic value believe that it has a value above and beyond that assigned to it by humanity, whether that value is spiritual, economic, recreational or otherwise. Supporters of this view are generally called "nonanthropocentrists." Opposing them are the "anthropocentrists," who believe that all natural "value" is constructed and assigned by humans. Although this may seem like a fairly simple distinction, and one that has fairly clear outcomes, it is in fact quite complex, and becomes more so everyday.

For example, if asked about the implications of this debate for the "rights" of wildlife and wilderness, one's first reaction might be to say: "Well, it's pretty clear that anthropocentrists don't think that wildlife and wilderness have any rights in the human sense, and nonanthropocentrists think that they do." This is a reasonable response, but not correct; like all philosophical differences, there are fine but important distinctions both within and between the camps. Anthropocentrists, for example, can represent what many wilderness activists would describe as the dominant western view: wilderness has no "rights," it exists solely for human use. Others, although equally anthropocentric, believe that wilderness and wildlife have many rights—perhaps as many as humans—but that it is inevitable that humans assign them. This latter group is as pro-wilderness as those who call themselves biocentric, but do not believe one can be truly biocentric, as we are all inescapably human. There are many similar distinctions made in the nonanthropocentric school, and many possible shades in between.

I offer this brief overview to underscore the fact that these concepts have entered, and are a part of, the contemporary conversation about wilderness. Indeed, within the wilderness activist's tool kit, the "intrinsic value" argument has become a commonplace. It is used in different forms, for instance, in a collection of works as diverse in approach as Noss and Cooperrider's management blueprint *Saving Nature's Legacy* (1994:22), David Rains Wallace's polemic *The Klamath Knot* (1983), and Edward Abbey's acerbic *Down the River* (1982:28). From a philosophical perspective, the idea of intrinsic or inherent value has become crucial to the wilderness preservation movement, both internally and as a wider political statement.

The problem lies in the fact that, even though it is perhaps the simplest and most quickly explained of the elements of discourse in the philosophical wilderness, it is still difficult, vague, alienating. Worse, it easily can be seen as pedantic and uninteresting. This is not a fact to be taken lightly. While wilderness appreciation and enjoyment are intellectual and physical exercises, wilderness protection and management are political exercises and they take place within a context of wider public interest. If the environmental community believes that

wilderness deserves recognition at a political level, and that this will be good for humanity, then we must find a way to express these ideas to the greater public, to involve them in our conversations and receive their feedback. If the concepts, structure, terminology and context of that discourse do not include, allow for, or elicit that participation, then wilderness advocates are shooting themselves in the proverbial foot. If wilderness does contribute to our human lives, as I and many others believe it does, then it must be possible to discuss it in terms that make sense to people, that speak to them of their real lives.

ARGUMENT AND BETTER POSSIBLE FUTURES

Richard Rorty asks that we see "the gap between truth and justification" as "simply the gap between the actual good and the possible better" (1991:21), and it in this light that I would like to offer an alternative, or at least additional, framework for the discourse of wilderness. Although those of us who already participate in this conversation may see clearly the role of the various "sub-discourses" that exist, and believe whole-heartedly in the objective truth of their postulates, "objective" is of little pragmatic importance in the greater public forum. Following Rorty, we can see that if the "truth" to which we adhere—that wilderness is valuable and important to all life on Earth—is to become a part of the public policy, then it must obtain two essential and related qualities: it must be justifiable, and, therefore, it must be arguable.

The elements of the discourse of wilderness must be arguable for one crucial reason: if they are not arguable, if they cannot be called into question, if they cannot be participatory, then they cannot be public. Argument is the main ingredient in conversation, and it is the practical application of a language that structures our thoughts, imaginations, and policies. By not actively ensuring the "arguability" of positions—by not opening the discourse to others—wilderness advocates keep wilderness from the public, and therefore from public concern. Indeed, it is the inclusion of disparate communities that constitutes the public solidarity the environmental community so desperately needs. If the recognition of collective responsibility is the goal of all social movements—as surely it is—then it is critical that we help form a community to which it is possible to feel collectively responsible. An essential element of that community must be a conversation to which all have access. As Rorty remarks, "[o]one cannot be irresponsible toward a community of which one does not think of oneself as a member" (1991:197).

Once we acknowledge the necessity of "arguability," we can see the need for justification—the use of argument to solidify intersubjective agreement. Because of the quasi-participatory nature of North American society, the public justifiability of a position is the key element in its incorporation into our daily lives. Advocates of wilderness preservation have long recognized this, and have continually tried to justify wilderness concerns to the greater citizenship. This has resulted in some significant gains for preservation and management, notably the United States' Wilderness Act of 1964, and the generally increasing awareness of environmental issues since the late 1960's. In the wake of a growing number of highly politicized and confrontational events, though, wilderness protection has come to be associated with job loss, lack of economic "growth," and the whims of an affluent class not directly affected by these phenomena. The immediacy that fomented the Wilderness Act has been followed by a decline in the public justifiability of wilderness protection. Careful, and not always unwarranted attacks by other groups have illuminated the real and imagined drawbacks of wildland preservation. The lack of an effective response to this—other than the appeal to a steadily weakening U.S. Endangered Species Act—is the result of the inaccessibility of the discourse of wilderness. Given no access to a conversational forum with those who are involved in wilderness issues, these more general concerns are inevitably kept outside the circle of wilderness advocates, and are exacerbated by the fact that the justifications heard from that circle are not offered in a language or through the experience of the greater public. If wilderness concerns are to become a force in the public debate over policy, and have the force of numbers and a publicly discursive rationality, then the focus must turn to justification.

The final question this paper must address, then, is what element can we introduce or reintroduce to the discourse of wilderness that could allow for increased accessibility to the conversation? My suggestion is the future. This is not an entirely new idea, as intergenerational concerns and long-term sustainability are staples of environmental discussions. What I mean by

future here, though, is closer to social scientists' "desired future conditions" (DFCs) (Maguire, 1995); we, as wilderness advocates, policy-makers, and managers, need to go to the public and ask them if the future they would like to see—for themselves, for their children—has wilderness in it. When you look ahead at the things that you would like to be on the planet, whether you can enjoy them or not, are wilderness and wildlife some of those things? I firmly believe that the greater number will say "yes." Recent research in Canada indicates that there are common elements to conceptions of wilderness at both extremes of the resource extraction/wilderness preservation debate (Mann, 1996). Wilderness, in other words, is something to which most of us can relate, despite the fact that we might relate in different ways. It is this communality which we who are concerned for wilderness must emphasize, for it is "we" that must grow, both in numbers and in diversity. If this can be done, then we will have taken the first step toward an inclusive conversation.

It is in this sense—the sense of our human possible futures—that I claim that wilderness managers and policy-makers have as much a social as an environmental responsibility. Interestingly, though, the social element most commonly emphasized is that of recreation. What I advocate here, though, goes beyond recreation, beyond contingent valuation, and beyond intergenerational option value. These are essential concerns, but they are still components of a discourse that welcomes almost exclusively those who already belong. Self-identification is valuable only in that it is a recognition of a point of view already held. To move beyond this, to open the conversation, and thus the community of wilderness, we must refocus on what unites us all: the language we may all speak, and the future we all share. In the words of Donald Davidson (1984:196-7), although this cannot ensure consensus, by "enlarging the basis of shared...language" we at least "make meaningful disagreement possible."

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Footnotes

1. The term "wilderness" in this paper refers to wildlands in general, not specifically to lands legislatively designated under the United States Wilderness Act (although these are subsumed by the more general term). The reasons for this are the facts that wilderness issues are not limited to Wilderness Areas, and that in Canada, the word "wilderness" has no special legal meaning.
2. Max Oelschlager, in "Wilderness, Civilization, and Language" (1992) argues very persuasively that Thoreau was not a transcendentalist in the conventional sense, and that the usual emphasis upon his intellectual debt to Emerson is greatly exaggerated (see pages 274-283).
3. Interestingly, Oelschlager has made many of these same criticisms of "ecophilosophy" in general. (Bruner and Oelschlager, "Rhetoric, Environmentalism, and Environmental Ethics." Environmental Ethics. 16(4): 377-396 (1994).) In a criticism related to the one being made here, he and Bruner point to the need for a greater emphasis upon rhetoric if the environmental movement is to realize its political potential.
4. A topic perhaps more worrying, but for which there is not space here, is the unfortunate dualism that is apparent in the speech of many of today's wilderness activists: Although more people must be actively supportive of wilderness and wilderness preservation, only those privileged with a "true" appreciation of its magnificence are welcome in the wilderness

Describing the Wilderness Experience at Juniper Prairie Wilderness Using Experience Sampling Methods

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Abstract: Wilderness managers continue to pursue a goal of providing quality experience opportunities within the lands they manage. However, the question of what dictates a quality experience begs a greater understanding of the visitor experience in wilderness. The Experience Sampling Method (ESM) is suggested as a means to gaining information about the experience as it unfolds. This study applies the ESM to the study of visitor experiences at Juniper Prairie Wilderness in northern Florida. The ESM is used to allow immediate visitor feedback on positive and negative aspects of the visit, as well the dominant focus of attention at particular times and places in the visit. Experiences in high-use conditions are compared with those during low-use conditions. Thus, managers have access to a valuable description of the wilderness as it is experienced by the visitors.
Keywords: wilderness experience, outdoor recreation, Experience Sampling Method

The Wilderness Act of 1964 (P.L. 88-577) established the National Wilderness Preservation System partly for the purpose of "recreational, scenic, scientific, educational, conservation and historical use." It lays out some of the character of that use, giving guidelines for the types of experiences that could be expected, such as "outstanding opportunities for solitude or a primitive and unconfined type of recreation." Wilderness managers work to provide outstanding opportunities for quality wilderness experiences. In doing so, they seek description of the dimensions and qualities of the wilderness experience that visitors are attaining. However, as Watson and Roggenbuck (in press) point out, in many cases very little about the wilderness experience is measured beyond crowding influences. The wilderness experience is determined by, and indicative of, far more than the numbers of people encountered or the level of privacy achieved. It could be conceived of as a complex transaction between people and their internal states, the activity they are undertaking, and the social and natural environment in which they find themselves.

However, much of the recreational research that looks at the wilderness experience views it as a static product of the visit to the wilderness area. Visitors are typically asked to recall their time on-site, up to four or more weeks after their visit. In doing so, some aspects of the events, the experiences, and the locations may be blurred into one summarized recollection. Not only could the accuracy of such recall be questioned (Borrie and Roggenbuck, 1995), but concern could also be expressed at the loss of rich and informative detail. In understanding the wilderness experience as it unfolds, greater effort should be directed to the dynamics and processes of the experience. While Schreyer, Knopf and Williams (1985) called for a re-conceptualization of recreation resource research towards an understanding of the process of recreation behavior, little empirical work has examined the process of recreation experiences. The passage of time is an important variable in shaping the process of experience. However, the time dimension of the lived wilderness experience has received little attention, and has not been measured in the American wilderness context.

Part of the reason for failing to examine the wilderness experience as it is lived is the predominance in wilderness research and management of a deterministic model of

recreation, which often reports the size of, focuses upon, and attempts to measure predictable and desired outcomes or benefits (Patterson, Williams and Scherl, 1994). In contrast, one might view the wilderness experience at a particular moment of time, as a state that can be reported to researchers. This would allow a closer look at the wilderness experience as it unfolds across time. But, this would require different research approaches than have typically been applied in wilderness. A new methodology called the Experience Sampling Method (ESM) appears to have potential for studying the lived experiences in wilderness, but problems also exist. The ESM has not been fully tested in wilderness.

The purpose of this study, therefore, was to examine the usefulness of the Experience Sampling Method for helping to identify the defining qualities of the wilderness experience. Visitors were asked to provide description of the most positive and negative aspects of their wilderness experience. Further, the degree of focus on five modes of wilderness experience is considered (a focus on self, a focus on others, a focus on the environment, a focus on task, and a focus on emotions and feelings). In doing so, a direct description of the wilderness experience is achieved, providing valuable feedback for the wilderness mangers. Understanding the lived experience in wilderness can help managers in their selection of indicators and standards for experience and resource conditions.

METHODS

The Experience Sampling Method

This study applies the Experience Sampling Method (ESM), a relatively new methodology utilized by leisure researchers (Samdahl, 1992, Unger and Kernan, 1983, Graef, Csikszentmihalyi, and Gianinno, 1983). The ESM was developed to investigate moment-by-moment experiences of persons in normal settings (Csikszentmihalyi, Larson and Prescott, 1977, Csikszentmihalyi and Larson, 1987, Csikszentmihalyi and Csikszentmihalyi, 1988). It consists of asking individuals to carry electronic beepers that signal pre-programmed random points of time at which subjects report or rate their immediate experiences by filling out a brief questionnaire. Unlike post-hoc questionnaires and reflective journal entries, the answering of the ESM form is designed not to become an experience in itself. By using random scheduling, the participant has less of an opportunity to anticipate and prepare for the self-report. Little cognitive effort or verbal skill is required to adequately tap and report the immediate conscious experience. The ESM is, therefore, ideally suited to the verbal report of states (feelings, opinions, and events) without the accuracy difficulties typically associated with such self-report (Borrie, 1995; Borrie and Roggenbuck, 1995).

Application of the ESM at Juniper Prairie Wilderness

The study entailed sampling among day visitors to the Juniper Prairie Wilderness on the Ocala National Forest, Florida. Visitor use of the Juniper Prairie Wilderness is almost completely centered on Juniper Creek. This creek originates from the springs within the developed Juniper Springs Recreation Area, soon entering the wilderness area, flowing for the first two and half miles, narrow and winding through subtropical forest. After that it broadens out, continuing slowly for another five miles through alternating open prairie wetlands and enclosed forest. It leaves the wilderness area just before passing under Highway 19 (where most canoeists take out) one mile before flowing into Lake George. The stream is slow paced, without any rapids or portages. However, many novices find the narrow, tight bends and numerous overhanging tree trunks and branches quite a challenge.

A separate parking lot, unloading area and trail leading to the put-in are provided at the start of the creek. This is within the Juniper Springs Recreation Area, which also has a restroom, changing facilities, and kiosk facilities. A concessionaire at Juniper Springs Recreation Area rents and shuttles canoes under a special use permit. All canoeists must obtain a wilderness use permit, thus limiting the number of canoes and kayaks. Bulletin boards at the put-in indicate that the average trip takes between four and four and a half hours, including stops. A dock and rest stop has been developed close to the midway point, but other than the dock, no facilities are provided. A ban on disposable containers (soda cans, etc.) is in place, but enforcement has proved problematic.

Sampling of visitors to the Juniper Prairie Wilderness was carried out during the month of July, 1994. On each of 19 sample days, canoeists were approached to participate in the survey. Over these days, 191 groups were interviewed (an estimated total of 500 groups

paddled Juniper Run on the sample days) and completed an initial on-site contact form consisting of basic socio-economic questions as well as recreation specialization questions concerning canoeing and wilderness experience. Seventy three percent then agreed to participate in the ESM study and answer a series of questionnaires during their visit to the wilderness.

In approaching visitors seeking their participation in the research, it was recognized that the respondents' task had to be realistically presented, but in a manner that would not discourage those who might be willing to participate. Because it was not possible to sample all visitors on a particular sample day (due to the logistics of distribution and retrieval of a limited number of beepers), efforts were taken to encourage those who agreed to carry the packet of beeper and questionnaires to faithfully carry out the recording task. For this reason visitors were approached in a relatively casual and friendly manner at a time and place which would not unduly intrude on their preparations to launch their canoes. At the Juniper put-in there was a clear period of time when some members of the group were casually loading their boats, while others in the group were off returning the canoe cart. Those remaining with the boats were, therefore, more likely to be approached. This may be a cause of lack of representativeness in our sample, as it seemed that dominant members of the group would take responsibility for returning the cart. However, this is balanced by two factors noted during the debriefing of study participants: in some cases the questionnaire was discussed and filled out in conjunction with other group members, and in other cases, primary responsibility for completing the questions was given to other members of the group.

The respondent for each group carried a packet of research materials that was sufficiently waterproof that the packet could sit in the bottom of the canoe easily accessible and the beeper easily heard. Each packet contained a sufficient number of 8 1/2 x 11 inch questionnaires printed on waterproof paper, two pencils, a plastic backing board on which to write, and the beeper device inside its own plastic bag. The entire package was small in size (6 x 10 inches), brightly colored and individually numbered for identification. At Juniper, where the average float through the wilderness is about four and a half hours long, the beepers were scheduled to signal randomly within one and a half hour blocks. That is, on average each participant would be beeped every one and a half hours, or three times in a four and a half hour visit. This frequency was chosen so that every respondent would be beeped at least twice, and that groups that took an extra long time to make the journey would not be disturbed more than four times. Feedback from these day visitors who were beeped four times was that this became disruptive and burdensome.

Upon hearing the beep, respondents were instructed to turn off the alarm, pull over to a stable location and complete a questionnaire asking them about their thoughts, feelings and experiences at the time the beeper sounded. The survey form took between 2 and 5 minutes to complete, and aimed to be a 'snap shot' of the moment in time just before the beeper went off. Participants found the task interesting and rewarding and were willing to share their experiences in this way.

Finally, participants were told that a technician would meet them at the end of the trip to hear about their experiences, collect their questionnaires and the equipment, thus allowing a debriefing process where a few more of the research objectives could be explained, any misunderstandings or questions cleared up, and feedback on the research process gained. It is possible that compliance rates were higher because of the knowledge that someone would be making the effort to greet them and ask about their experiences and reactions.

Questionnaire Items

Each time respondents were beeped, they answered both closed-ended questions, permitting quick response, and open-ended questions, allowing their own interpretation of events. The first block of closed-ended questions involved asking visitors how much they were focusing on each of five domains: on "their own thoughts" (a focus on self), on "other people around you" (a focus on people), on "your feelings and thoughts" (a focus on emotion), on "the natural environment around you" (a focus on environment), and on "the task you were carrying out" (a focus on task). These five domains were developed from the work of Ittelson (1978), an environmental psychologist who discussed the nature of environmental experience, as well as the work of leisure scientists such as Scherl (1990), Tinsley and Tinsley (1986), and Samdahl (1988), and are

further described in Borrie (1995). For each of these five items, respondents were asked to answer on a zero to nine scale, with 0 indicating that they were focusing on that domain "not at all", between 1 and 3 showing "somewhat" of a focus on that domain, 4 through 6 being "quite a bit" of a focus, and 7 to 9 having "very much" of a focus on that aspect.

The next section of the questionnaire entailed open-ended questions for the visitor to describe particular aspects of their wilderness experience since the last time they had been beeped (or since the start of the trip if it was the first time answering the questionnaire). In particular, respondents were asked to "list three things about the trip (of the natural environment, the people, facilities, management activities, rules and regulations, etc.) that you LIKE the most" and to "tell us what you DISLIKED the most since the last time you were beeped." In this way, visitors could provide this feedback while it was still fresh in their memories. Respondents were also asked to list what activities they were doing at the time they were beeped, and the environmental features around them that they noticed most.

RESULTS

Sampling

It should be noted that the sample at Juniper Run was more of a convenience sample than representative of all the visitors down the Run. Initial analysis suggests that those who refused to participate were more likely to have less canoeing experience, to be paddling with friends rather than family, and to be male. Of the 140 groups who agreed to carry beepers, 137 completed at least one questionnaire (2 failed to complete a questionnaire on the river, 1 set was lost). Table 1 shows the breakdown of visitors by the number of questionnaires completed. Overall, we collected a database of 280 completed questionnaires at Juniper Prairie, from a total of 137 visitors.

The following characteristics describe the 140 people who agreed to participate in the Juniper Prairie study:

- Average age—38 years old
- Average group size—4.3 people
- 49% had paddled Juniper Run before
- 85% had rental canoes in their group
- 59% of visitors who took beepers were women (53% of visitors approached were women).

Table 1. Number of questionnaires completed by visitors at Juniper Prairie Wilderness

No. questionnaires completed/ respondent	No. visitors
4	7
only 3	30
only 2	62
only 1	38
Total	137

Questionnaire items

Table 2 summarizes the responses to the first five items asking about focus of attention ("how much were you focusing on ..."). Focus on the environment received the highest average response, followed by a focus on task. Answers to the open-ended questions, where respondents could give up to three things that they 'liked' and up to three things that they 'disliked' about the trip, are shown in Tables 3 and 4, respectively.

Table 2. Responses of Juniper Prairie wilderness visitors to focus of attention items

Focus of attention	Mean (0-9 scale)	Std. Dev.
Focus on environment	6.5	2.4
Focus on task	5.3	3.1
Focus on people	3.8	2.6
Focus on emotion	3.0	2.6
Focus on self	2.8	2.6

Because of a management concern over crowding levels, the answers to both the open-ended and the closed-ended questions have been broken down by high-use versus low-use periods. Of the 19 sample days, 7 were on weekends or public holidays and both private and rental canoe use was significantly greater than on weekdays. As a result, 42% of the respondents (117 visitors) were during the high-use period. Table 5 shows the difference in mean response for the closed-ended questions on focus of attention between high and low-use periods. It can be seen that the focus on other people is significantly greater during high-use periods (rising from a mean of 3.4 to a mean of 4.4) and that focus on task also rises (from a

Table 3. List of things that visitors to Juniper Prairie wilderness liked the most

Category of response	No. resp.	% respond
Environment—general	65	60.7
Wildlife	47	43.9
Fellowship with group	37	34.6
Relaxing/Peaceful	35	32.7
Quietness	34	31.8
Naturalness	21	19.6
Pleasant staff	20	18.7
Not too crowded	19	17.8
Little trash/ cleanliness	17	15.9
Coolness/Shade	16	15.0
Flora	12	11.2
Clear water	9	8.4
Clean restrooms	8	7.5
Halfway point	7	6.5
Exercise	6	5.6
Challenge/Excitement	6	5.6
Variety of trip	5	4.7
Weather	5	4.7
End of the trip	4	3.7
No motor boats rule	4	3.7
Swimming	4	3.7
Closeness to god	3	2.8
Just drifting	3	2.8
Smoothness of water	3	2.8
Planned trip	3	2.8
Not too many bugs	2	1.9
Canoe carts	2	1.9
Rental canoes	2	1.9
Closeness to trees	2	1.9
Easy trip	2	1.9
Others tipping over	2	1.9
No swimming rule	2	1.9
Shallow water	2	1.9
Signs blend in	2	1.9
Trees across stream	2	1.9
Valid cases 107		

Other likes mentioned (only one response) Children paddling, Familiarity of area, Fishing, Launching area,. River opens up, No cans rule, Spring and boils,. Teaching, Twists and turns.

Table 4. List of things that visitors to Juniper Prairie wilderness disliked the most

Category of response	No. response	% response
Bugs / Mosquitoes	34	32.4
Low hanging branches	31	29.5
Litter / trash	29	27.6
Noise of other groups	27	25.7
Jets overhead	18	17.1
Heat	17	16.2
Too many people	12	11.4
Spiders / Webs	11	10.5
Weather / T'storms	10	9.5
Getting stuck	9	8.6
Having to paddle	8	7.6
Filling out survey	8	7.6
Tipping over	7	6.7
Children fussing	6	5.7
No bathrooms	6	5.7
Halfway pt. in disrepair	5	4.8
Smells	5	4.8
Tannins in water	5	4.8
No cans rule	4	3.8
No emergency help	4	3.8
Little or no wildlife	4	3.8
Beeper going off	4	3.8
Noise from canoes	3	2.9
Alligators	3	2.9
Low water	2	1.9
Long trip	2	1.9
No wading rule	2	1.9
Take out point	2	1.9
Damage to environment	2	1.9
End of trip	2	1.9
Valid cases 105		

Other dislikes mentioned (only one response) :Airboats, Alcohol on the run, Appearance of others, Expense of rental, Halfway pt. crowded, Plants overgrown, Long walk to put-in, Not enough parking, No interpretation, No mile markers, The unknown, Wildlife feeding, Begging raccoons, Cliff was ruined.

mean of 5.0 during low-use times to a mean of 5.5).

A similar comparison between high-use and low-use periods for the categories of response to the open-ended questions on visitor likes and dislikes is shown in Tables 6 and 7. A greater percentage of respondents reported positive experiences with wildlife in low-use periods (48%) than in high-use periods (39%). In high-use periods more visitors seem to have problems with the low hanging branches (36% of respondents versus 25% during low-use periods), perhaps indicating greater pressures from other groups to keep moving at a brisk pace. Likewise, litter was a greater concern in high-use periods (33% of visitors reporting dissatisfaction during high-use conditions compared with 24% during low-use times). Marginally more people disliked the noise from other groups on high-use days (27% compared

Table 5. Comparison of mean focus of attention items between high-use and low-use periods

Focus of attention	Low use (0-9 scale)	High use (0-9 scale)	t-value	p-value
Focus on environment	6.5	6.5	.24	.81
Focus on task	5.5	5.0	1.46	.15
Focus on people	3.4	4.4	-3.19	.01
Focus on emotion	2.8	3.3	-1.36	.18
Focus on self	2.7	3.0	-.88	.38

Table 6. Comparison of likes between high-use and low-use periods

Category of response	Number of responses	Percent
High use conditions		
Environment	29	65.9
Wildlife	17	38.6
Relaxing / Peaceful	14	31.8
Fellowship with group	13	29.5
Quietness	13	29.5
Coolness / Shade	10	22.7
Low use conditions		
Environment	36	57.1
Wildlife	30	47.6
Fellowship with group	24	38.1
Quietness	21	33.3
Peaceful / Relaxing	21	33.3
Pleasant staff	14	22.2
Naturalness	13	20.6
Not too crowded	12	19.0

Table 7. Comparison of dislikes between high-use and low-use periods

Category of response	Number of responses	Percent
High use conditions		
Low hanging branches	15	35.7
Litter / trash	14	33.3
Noise of other groups	12	28.6
Bugs / Mosquitoes	10	23.8
Too many people	8	19.0
Low use conditions		
Bugs / Mosquitoes	24	38.1
Jets overhead	18	28.6
Low hanging branches	16	25.4
Litter / trash	15	23.8
Noise of other groups	15	23.8
Heat	14	22.2
Spiders / Webs	9	14.3
Having to paddle	8	12.7

to 24% on low-use days), although these levels are still comparatively low.

DISCUSSION

Generally, the Experience Sampling Method proved to be an effective way to collect visitor data at the Juniper Prairie Wilderness. Respondents were happy to participate, faithfully completing a number of questionnaires and thereby providing a record of their experience throughout the wilderness. As a result, a very direct and immediate picture of 'inside' the wilderness experience has been achieved without the reconstruction and biases associated with recall at a later date. For example, visitors have been able to record their likes and dislikes while those likes and dislikes are still current in their memory. They have also been allowed to inform us as to what was dominating their attention at particular times and places in the wilderness. This study demonstrated the willingness of respondents to score an item low if it was not relevant to them at that point in time. This is partly because the immediacy of report lowers the chances of deliberate bias on the part of the visitor, but also because the respondent does not feel as if that one judgment has to cover the whole experience (and thus also lowering the need for strategic responding).

This is one of the first longitudinal databases of the wilderness experience, with multiple observations for each respondent. If the subjects could be recruited to complete more questionnaires over a longer period of time (in larger wilderness areas, for example), then it might be possible to identify phases of the wilderness experience. However, given the current recruitment strategies, there would seem to be a limit to the degree of compliance that could be expected of wilderness visitors. Over longer periods of time, the problems of non-response bias and equipment failure would be greater.

The use of modifications of ESM, such as directed journals or disposable cameras, might

be recommended since these tasks are more likely to be considered part of the visitor's experience anyway. For example, rather than using a small alarm to randomly signal when to complete a form, the respondent could be given a camera with instructions to take four (for example) photographs each day, at least half an hour apart, and at that time and place complete a questionnaire. Not only is taking a photograph a more natural part of the visitor's experience, but it also provides motivation and reminder of the research task. (The film would be developed and prints returned as an incentive for participants.) Equipment such as cameras might more easily have a place in wilderness (thus lowering the ethical complaint of sending research technology into wilderness), and might also be applicable to a greater variety of wilderness areas (since the beeper may not be as easily stored and heard by backpackers in wilderness as it was by canoeists).

CONCLUSIONS

The Experience Sampling Method is successful at capturing an important aspect of the visitor experience in wilderness, that of the inside-the-wilderness experience. For managers, that glimpse into the visitor experience is achieved at far less cost and intrusion than frequent ranger patrols. As Watson and Roggenbuck (in press) explain, an understanding of the visitor experience can be a precursor to the development of indicators of wilderness conditions. The input of visitor opinion can guide the selection and evaluation of indicators in the LAC wilderness planning process (Roggenbuck, Williams and Watson, 1993). The ESM may offer an approach to measuring those indicators. It can also provide a wealth of information to help managers understand and evaluate the effect of their management actions on the quality of visitor experiences.

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Visitor Use Impacts Within the Knobstone Trail Corridor

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Abstract: All impacts of visitor use within the corridor of the 96 km (58 mile) Knobstone Hiking Trail in Southern Indiana were systematically evaluated in 1985. On an areal basis, camping impacts were not extensive though, when present, indicated diminution of the trail environment through increased soil compaction and exposure, changes in vegetative density and ground cover, root exposure and tree wounds, floristic dissimilarity, loss of duff, and site development. The most striking impact was pervasive damage (tread widening, entrenchment, soil exposure) by off-road vehicles. The 1996 overview study again found camping impacts though, as previously documented, when viewed on a spatial and areal basis, they were minimal. Off-road vehicle use was sharply curtailed. Tread entrenchment has worsened with time and widening continues to be a problem on some steep slopes. Strategies for coping with hiker impacts are discussed.
Keywords: Knobstone trail, visitor impacts

THE RESOURCE AND PROBLEM

Rising to the west, above the Scottsburg Lowland, lies the most prominent regional topographic feature in Indiana—the Knobstone Escarpment (Lindsey, 1966). This unique physiographic boundary representing the eastern part of the Norman Upland is an area of strong local relief characterized by narrow flat-topped ridges, steep slopes, deep V-shaped valleys, and since the early 1980's embodies the Knobstone Trail, one of the finest long-distance hiking trails in the Midwest. Beginning just north of the Ohio River, near New Albany where it attains heights of nearly 180 m (600 feet) above the valley floor, the trail follows this remarkable physical boundary to the northwest where it gradually decreases beneath thick glacial drift. This upland is underlain by relatively resistant siltstone, which is, in part, responsible for the magnificent relief. Additionally, it consists of interbedded shales in the Borden Group of early to middle Mississippian age. Knobstone Shale, which is a combination of weathered brown shale, sandstone, and siltstone, is common and gives the escarpment its name.

Climax vegetation is primarily mixed hardwood—Oak/Hickory on the east, south and west aspects with Beech/Maple on the north; (in the trail's northern portion Beech/Maple will climax on all but higher south slopes). Interestingly, many of the ridges contain Virginia Pine (*Pinus virginiana* Mill) which collectively is the most extensive area of natural coniferous growth in Indiana. Ground and understory flora are species normally associated with the previously mentioned climax associations, while wildlife is particularly abundant owing to past management practices which developed clearings and small woodland ponds on former ridge top farms. Essentially, the trail traverses 58 miles of the Clark State Forest, Elk Creek Public Fishing Area, and Jackson Washington State Forest—40,000 acres of rugged back country in three counties.

Trails of this length and relief are unique to the Midwest. Outside of the celebrated Appalachian Trail in the eastern United States, the "Knobstone" with its developed and undeveloped potential (40 additional miles) does not have an equal in this geographic region. Its development from inception to reality has been coordinated by the Division of Outdoor Recreation, Indiana Department of Natural Resources. A variety of institutional arrangements facilitated development, including a $200,000 interim loan from The Nature Conservancy, Indiana Chapter for purchase of a key tract, while the Indiana state legislature

appropriated funds.

The study purpose was to document campsite and other utilization impacts along the Knobstone Trail. Unlike many studies which focus on a small number of concentrated sites, this research attempted to understand both the areal extent and spatial distribution of impacts within the trail corridor. Reasons for doing such research are essentially two fold: first to document present physical conditions and second, if impacts deleteriously affect the land base system then present management strategies need to be reviewed in relation to the findings. An additional purpose is that such a systematic approach initiates a data base from which future studies can accurately determine change.

REVIEW OF RELATED LITERATURE

Investigating wildland in the late 60's, and publishing after five years of data collection in the Boundary Waters Canoe Area, Merriam and Smith (1974) found expansion of campsites the most striking result observed. Some experienced over 100 percent expansion, particularly those with open understory. Their water quality studies indicated coliform bacteria populations at campsites were significantly higher than at nearby control points. Also affected were phosphate concentration and turbidity levels. A similar study in the West by Lesko and Robson (1975) concluded that subalpine meadows retain their integrity better than forested areas because of thicker organic horizons (soil), deeper rooting mediums and a higher proportion of tramping-resistant species. This finding has been substantiated by Cole (1979, 81) and others (Liddle 1975). Cole has continued his work in this area, and in a recent study of the Oregon Eagle Gap Wilderness (1982), found that campsites at popular destinations had experienced significant loss of vegetation and tree damage while exposure of mineral soil and tree roots was less severe. However, 10% of the sites exceeded recently adopted management objectives for loss of ground cover. Marion and Merriam (1985), in a study on well-established campsites in the Boundary Waters wilderness area, discovered an 88% floristic dissimilarity average vis-a-vis camp and control sites. Clearly, many of our most unique natural areas are being subjected to impacts which severely lower their biotic and aesthetic qualities. User perception also corroborates scientific data. In the comprehensive review of renewable resource recreation by Cordell and Hendee (1982), reference is made to studies which indicate nearly half of the visitors who had previous trips to the same wilderness area in the West felt conditions had worsened as a result of litter, destruction of vegetation, fire rings, etc.

While an overview of wilderness and back-country research documents visitor impact at dispersed locations such as lakeshores, scenic ridges, and trail treads (Helgath 1975, Heberlein 1979), very limited, if any, work has been done on a more comprehensive trail corridor method as undertaken by this study. Indeed, a perusal of the literature, including a voluminous bibliography on recreation research published by the U.S. Forest Service (USDA 1983) does not document such an approach.

Finally, in a user study of the Cranberry back-country in West Virginia, Echelberger and Moeller (1977) found that the most liked characteristics of the wilderness setting were solitude and natural scenic beauty. Stankey (1972) comments on this point:

> Gradually reducing the rigorousness of guidelines for wilderness management will not only result in the eventual deterioration of the unique environmental qualities these areas possess, but will also result in the loss of a special kind of experience for which there is little substitute.

RESEARCH METHOD—1985

The following ranked parameters, based on quantitatively defined categories modified from the work of Parsons and MacLeod (1980) and Cole (1982), were studied at all areas of discernible impact within the trail corridor 30M (99 feet) including width during the summer of 1985:

1. Density of ground vegetation (compared to comparable undisturbed site-control)
2. Mineral soil exposure (compared to control)
3. Tree damage
4. Tree root exposure
5. Development
6. Cleanliness
7. Barren core area
8. Access trails
9. Soil compaction (using a soil pentrometer and compared to (control mineral soil immediately below litter and duff - measured in kg/cm^2 (mean values)

10. Duff depth (compared to control)

11. Relative cover (compared to control by percent)

Ranked parameters were examined by frequency, percent and a chi-square test. Parameters with mean values (soil compaction, duff depth and relative cover) were analyzed by the t-test for significant difference.

In addition to the parameters studied above, four permanent 1/10 acre (410m^2) plots were established to provide a data base to access long-term vegetative conditions.

No permanent plots fell within impacted areas. One permanent trail transect (on an approximate 40% slope) to measure previous soil loss and to monitor future soil movement and changes in trail width (after Leonard and Whitney, 1977) was established.

RESULTS AND DISCUSSION - 1985

Impact Sites—Ecological Effects

Twenty-one off-trail impact areas were found within the trail corridor (30m x 96 km). As seen from an areal and spatial perspective, this indicates a minimum level of corridor impact. However, the impact areas, all of which were campsites except one, show considerable problems with user-dependent parameters.

For example, 40% of the campsites had a barren core area greater than 15 m^2 with 30% having such a core area between 5-15 m^2. Impact research over the past decades has consistently shown that back-country visitors tend to utilize previously occupied sites (Cannon 1979, Cole 1982, Heberlein 1979), and the resulting biotic and aesthetic degradation becomes a problem for the resource manager who must implement management strategies to arrest or slow deterioration. This is particularly true with the Knobstone as it is a relatively new trail having opened in 1980 with completion of additional segments since that time.

Vegetation density and soil exposure which were related to a comparable control, further corroborate changes in and near the impact areas. Seventy-six percent of the sites showed more than 50% difference in density of ground vegetation while 57 percent indicated a similar difference in soil exposure. These findings support the work of Cole (1979) who found that over 53 percent of ground cover was lost in densely wooded sites. Both these parameters interact in a way that makes possible the introduction of exotic forbs such as; plantain (*Plantago major*), and dandelion (*Taraxacum officinale Weber*) respectively. A loss of floristic integrity and aesthetics results. In addition, the means (kg/cm^2) for impacted and control areas were 3.70 and .97 respectively, resulting in a highly significant difference ($P < .001$). Further, in 9 of 21 sites the resistance was beyond the instrument maximum of 4.5. Compaction can lead to a loss of pore space for air infiltration which is a limiting factor for proper root respiration. Additionally, needed water infiltration is reduced, while runoff and erosional rates increase. It is important to note also that such heavy compaction will severely reduce chances of new woody seedling development and enhance chances for the germination of exotic forbs as discussed previously.

Viewing tree damage and root exposure, seventy percent of the sites showed trees with broken branches, scars, or severed saplings, while 57 percent had root exposure on one to four trees. Marion and Merriam (1985) indicate that dying trees show a strong correlation with tree damage and root exposure and that such a strong correlation supports the hypothesis that tree damage is causally related to reduced tree vigor and perhaps also to increased mortality. While some reduced vigor was noted, no unusual mortality was observed, though subsequent monitoring will be an important future management concern, since the effects of most tree impacts are cumulative over time.

Corresponding with compaction, there was also a highly significant difference ($P < .001$) between duff on the impact site and a control. Again, this is important ecologically, since duff provides a portion of the incorporated soil organic material which acts as a mulch, absorbs raindrop impact and has been shown to reduce compaction as its content increases (Marion 1985). Finally, in a further indication of biotic change related to impact sites, all relative cover indices (graminoids, forbs, shrubs), except mosses and lichens, varied significantly ($P < .02$) from respective controls.

User Modification of Impact Sites

As is typical of previous wildland/ backcountry visitor studies, modification of sites has occurred. Fifty-five percent of the sites showed some development, primarily a fire ring, and in terms of cleanliness, 50 percent of

such areas had problems with litter.

Problems of development and cleanliness are indigenous to many back-country trails, and the Knobstone is not an exception. Such problems are discouraging to both resource managers and those visitors who try to minimize their impact. Information on low impact camping and its ethic is well presented on a trail map available to all users from the Department of Natural Resources central office and offices of the three state properties, but it is not enough to mitigate problems.

Impacts Other Than Campsites

Off-road vehicle use in 1985 was the most serious trail impact and was too widespread and pervasive to be assigned individual impact areas. Virtually the entire length had become accessible to ORV use, primarily motorcycles, though some three-wheeled use occurred as well. Fig. 3 indicates how severe the problem had become on a hillside. Here the trail tread has been widened to over 40 m (132 feet) in some places as ORV users are taking different routes to the top.

Although trailhead signs and trail literature clearly point out that both ORV's and horses are prohibited, historical use of the state forests, on which a majority of the trail resides, has been otherwise. Vehicles and horses have been and still are permitted on current and old logging roads. Additionally, the Knobstone intersects and in some instances (primarily ridge tops) utilizes old road segments, thus ORV's have easy access to the footpath. With these forest intersections coupled with the crossing of state and county roads, trail access points are numerous.

RESULTS AND DISCUSSION—1996

A reconnaissance study was conducted during the spring of 1996. The entire 96 km (58 miles) was not surveyed as initially, rather selected areas of previous impact were visited. The most striking change relative to trail/corridor impact was the sharp reduction of illegal off-road vehicle and horse use. This has been accomplished by the relatively simple, but effective management technique of leaving blowdown on the trail (Figures 1 & 2). Note that Fig. 2 shows an approximate 16-18 inch diameter log on the trail. Logs larger than this are generally removed as the management stipulation is to leave only those barriers which can be relatively easy to straddle.

Fig. 1. Log barrier on uphill slope

Fig. 2. Log barrier on sidehill slope, note white blaze (trail marker) in background

While there is still some illegal horse use, motorcycle and ATV activity has been effectively eliminated.

Several previous areas where trail widening and tread entrenchment were beginning were re-visited. One of the most serious areas of widening occurs on the south approach to Round Knob, one of the greatest scenic and

popular areas on the trail. On a clear day you can see Louisville, Kentucky some 64 km (40) miles distant. Here the trail (figure 3), previously widened to 40m (132 feet). Widening is considerably less in 1996 at 10m (33 feet) as shown in Fig. 4. Rill erosion has begun, which will only exacerbate over time, thus the need for developing an effective series of two to three cut and fill switchbacks with temporary signage (for the new route) to reach the top of Round Knob.

Fig. 3. 1985 Trail widening primarily due to off-road vehicle use.

Fig. 4. 1996 Trail widening at same area showing marked reduction in width, but loss of Chestnut oak (*Quercus prinus* L).

There are other areas where the trail also gains elevation too steeply with the concomitant erosion which should be treated in a similar manner.

The 1985 study found 20 camping impact areas which, as previously noted, on an areal basis was minimal considering corridor length. In the trail area that was revisited, the same de-facto permanent camping sites were being utilized. Figures 5 and 6 depict the summit of Round Knob. Both photos show a typical backcountry de-facto permanent site. There was no noticeable enlargement of the barren core area, though some loss of gramminoids and seedlings were evident as the total impact area has expanded slightly.

Fig. 5. Round Knob campsite. June 1985.

Fig. 6. Same campsite, April 1996. Minor change, although one small tree has been eliminated.

Tread entrenchment, while on a spatial/areal basis was not severe, is nevertheless increasing (Fig. 7). It primarily occurs on slopes > 20% where there is a straight run > 50 M (165 feet). The use of water bars when the trail was built does mitigate this problem in some areas, however the initial use of deadwood and sawn stakes in bar construction has rotted in 70-80% of installations. The present technique of using treated wood and rebar (Fig. 8) will be longer lasting though less aesthetic.

Fig. 7. Tread entrenchment of 0.7 M (2.3 ft) 1996.

Fig. 8. New style water bars which are also utilized where steps are placed.

CONCLUSION AND SUMMARY

The Knobstone trail, which traverses an area of extensive relief, is in an unprecedented recreational resource in the lower Midwest. A 1985 study of the trail identified and assessed visitor-induced impacts which have a potential for lowering biotic quality within the trail corridor. While the number of such impacts on a spatial (number/ km) and an areal basis were not high, individual site deteriorating conditions such as lower vegetation density, loss of ground cover, increased soil exposure, decreased duff depth, etc., point to a diminishing wilderness quality surrounding campsites. Pervasive intrusion of non-permitted off-road vehicles, with accompanying tread widening and entrenchment erosion, was documented.

The 1986 follow-up reconnaissance study found off-road vehicle and horse use sharply curtailed with a concomitant reduction in tread widening. Serious entrenchment exists in several spots and the need for more efficient utilization of water bars and use of switch-backs to replace straight runs on several steep slopes was noted. De facto, permanent campsites remain, but are not a serious problem as expansion and tree loss is minimal. Overnight use of the Knobstone is not heavy, which undoubtedly helps to keep loss of trees and expansion from increasing to the degree found in other studies (Cole and Marion, 1986). In this vein, one of the four 1985 randomly placed .10 acre (410 m^2) corridor plots was surveyed and the only discernible change was a broken top on a Virginia Pine resulting from a late winter (March 1996) extremely wet and heavy snow. This same storm also created significant areas of coniferous and hardwood blowdown which will result in the need for considerable trail clearing and unfortunately, has an effect on trail aesthetics in areas of heavy loss.

The Division of Outdoor Recreation, Indiana Department of Natural Resources developed and maintains the "Knobstone," a unique backcountry trail. With limited finances for maintenance (180 day crew), and some help from the Clark and Jackson Washington State Forests, the time is propitious for enhancing ties to the increasing Hoosier interest in backcountry recreation through the Indianapolis Hiking Club, Central Indiana Wilderness Club, and the Hoosier Hiking Council. To tap this human resource the Division has developed the "Knobstone Trailblazers" for volunteers to work on the trail under supervision. In addition, it is suggested that a modest registration station, like those utilized throughout the National Wilderness Preservation System, be installed at two trailheads on a trial basis. Dispensing low impact educational materials, maps and the registering of visitors has a proven history of being valuable to management goals relative to appropriate backcountry use.

As Marion and Merriam, (1985) presciently point out, "Managers will be continually challenged to find new ways to manage wilderness resources so that human induced changes remain substantially unnoticeable." Additionally, it remains essential that best management practices are devoted to this very valuable resource so trails can truly lead "...not merely north and south but upward to the body, mind, and soul of man." (Levers 1983).

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Enhancing the Potential for Wilderness Electronic Communication[1]

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Abstract: The Internet may be the most rapidly advancing technology affecting wilderness use, protection and management today. Thirty-five percent of American households and 50 percent of American teenagers have computers. These data help explain the exponential growth of computer literacy including internet applications. The Internet, as a tool that literally links people across the globe, impacts the way we think about communicating wilderness issues, values, and ethics. Our paper provides a review and critique of the state of Internet use related to wilderness and wilderness audiences. We discuss the relationship between wilderness and the cultural forces of mass communication, and present a taxonomy of the "user" audiences associated with the Internet. Lastly, we review current opportunities for wilderness communication as demonstrated by an on-line World Wide Web (WWW) application, and conclude with a discussion of future opportunities for wilderness Internet research, development, and application.
Keywords: internet, wilderness, electronic communication

The World Wide Web (WWW) is emerging as an important communication medium for wilderness, but its potential is unlikely to be realized for some time. Currently, the development of Web pages largely represents a process of turning existing analog data (e.g., brochures) into a digital form. But the simplicity of this analog to digital transformation may lead to less than optimum development and use of this exciting new medium in support of wilderness use, management, science, education and support by the environmental community. We propose a framework to guide the development and use of the web for wilderness, and the associated evolution of the wilderness "Cyber-Culture" that is taking shape.

COMMUNICATION AND THE CULTURES OF WILDERNESS

Wilderness is inextricably tied to culture. Cultural literacy can be described as the awareness of one's relationship to a culture that rises from the experiences of contributing to, taxing, testing, engaging in, and becoming proficient with a social system. This interaction is mediated by communication, and in the case of wilderness, mass communication has a pertinent role. As the norms of a culture (and its forms of communication) crystallize, individuals learn to depend on their relationships to information sources to connect themselves to the larger contexts of their culture. For example, a person who chooses to read the Wall Street Journal is likely to have an apriori awareness and agreement with the way certain issues will be addressed by that information source. Thus, in this example, a continuity has been developed with the readership and a familiar bridge for literacy has been maintained.

The ability to debate ideas within a broad American audience has been instrumental (and still is) for the development and galvanization of the wilderness ideal. In the Summer of 1890, John Muir and Robert Underwood Johnson teamed up to publicize a proposal for what would become Yosemite National Park. This publicity would occur in the nations leading monthly magazine, Century, of which Johnson was an associate editor (Nash, 1982). Within their plan, Muir, an already respected author, would articulate for the masses the wilderness values of Yosemite Valley while Johnson would write supportive editorials and lobby congress. They hoped to reach one million readers. This

early action illustrates their astute recognition of the value of mass communication in developing a wilderness constituency and culture.

Today, with the emergence of electronic communication venues, mass communication has become accessible to wider audiences of providers and users. In the near future, nearly any interest may be able to capitalize on the access to large, target audiences, that Muir and Johnson enjoyed in 1890. So it is important that we think today about our strategies for communicating over the web with the many cultures of wilderness that will be instrumental in the use, stewardship, advocacy and development of information through science and imparting that information through education.

The Emergence of Digital Communication

Digital communication will be an inescapable phenomenon during the next decade. Most of the music we listen to has already been digitally mastered and enhanced, and telephones will continue to be a source of digital communication. Among all of the sources of digital communication, however, none is more profound than the desk top computer.

Computers have experienced enormous proliferation in almost all professional settings and skill in their use is becoming a basic requirement for most careers. In his 1995 book, Being Digital, Nicholas Negroponte states in 1994, 65 percent of the computers sold worldwide were for home use, and thirty-five percent of American households and 50 percent of American teenagers had a personal computer!

While traditional discourse with mass communication may build dependable bridges, once we have selected a bridge we may see little advantage of choosing another. This could be termed monocultural literacy. The goal of multicultural literacy is to be able to step out of our traditional frame and view the largest context in which we exist. Thus, a wilderness visitor may be enlightened to consider wilderness from the perspective of other wilderness subcultures i.e. managers, scientists, educators, advocates, policy makers.

We are convinced that such multicultural literacy is not being pursued or achieved in the wilderness domain of the Internet. Sponsors of wilderness information on the internet generally put out promotional information -- their story -- or target one client group -- sometimes missing both. Thus, in the context of the Internet, numerous opportunities exist to rethink wilderness communication based on a multicultural approach and to target the several subcultures of wilderness interest.

FOCUSING ON INTERNET USERS

To many of us who access (or aspire to access) the information super highway, the technical details of developing, supporting, and distributing data and information via this technology are a mystery. As with computer technology in general, many of us tend to overemphasize the technical details of these systems at the expense of a focus on the users of the tools. This situation is exacerbated by the extremely rapid rate of change in computing and network technology. No sooner do we define the state-of-the-art than the state-of-the-art changes.

So we propose that there is a need to focus on users rather than on technology. Then, rather than reviewing "Who is doing what on the Net?," we propose a structure for inventorying and classifying user applications in communicating wilderness issues and ideas.

System Users Vs. End Users

Systems engineers refer to two types of users; system users and end users. System users are the persons who possess the myriad of technical skills needed to provide on-line or turn-key capability. These are the highly skilled and focused technicians who actually build the applications and databases necessary to meet program goals set by managers and administrators who are sponsoring the system. But most of us are not system users, we are end users. End users are the audiences to whom an application is directed. Normally, end users are not as highly trained technically as system users, but it is their information needs that the system developers are trying to meet. Ideally, a formal needs assessment survey would be conducted by system developers in order to identify a target audience of users. These target audiences would then be surveyed about their information needs, desires, and aspirations.

But in the case of the WWW, this classical approach to system design is rarely employed. Because of the global, unrestricted nature of the Web, it is simply not possible to identify all end users. System users may identify and target a core audience (such as wilderness visitors), but

the applications cannot, in all practicality, be restricted just to those types of users. Many of the people who access the system are performing ad hoc queries. They do not become "consumers" until after the Web tool is built and they discover the situation by "surfing the net" often on the topic of wilderness.

We can further distinguish between end users as being either data providers or information seekers with some being a combination of these. It is difficult for system providers to know who the users are, raising a range of questions such as, "What is my audience; what are they doing with the data, and is that how I intended it to be used?" Similarly, end users are asking, "Where do I find the information I desire; how does anyone know what I desire, and would they act on that understanding if they did?" So we propose that wilderness on the internet be more explicit about who the parties are that need to talk to each other. We suggest viewing the basic cultures of wilderness as visitors, managers, scientists, educators, environmental advocates and policy makers which constitute six logical classes of provider and end user audiences for wilderness information on the internet. Fig. 1 shows the dialog paths that might exist between these types of wilderness internet users. The case study presented below describes the types of wilderness data and information currently available to one of those classes of end users. Again, our intent is to provide a framework that we can use to assess the state of wilderness information providers and consumers.

REVIEWING A WEB APPLICATION TO WILDERNESS: ALPINE LAKES

In this section we present a review of the Alpine Lakes Wilderness home page on the WWW. Our review looks at many different aspects of this important source within the context of multi-cultural literacy between different types of providers and consumers. In critiquing the ALW application we try to explore opportunities to better understand the culture of cyber-communication and to uncover new opportunities to enhance the digital multicultural literacy of wilderness communication.

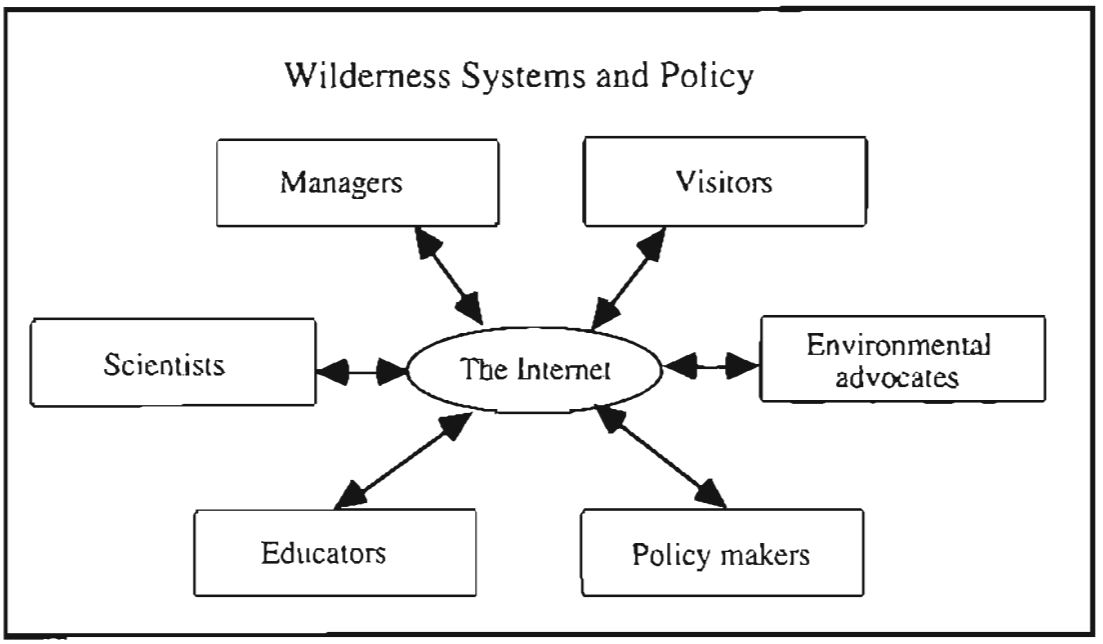

Fig. 1. Dialog Pathways between wilderness subcultures of visitors, managers, scientists, educators, environmental advocates and policy makers.

The ALW interface gives users 2 pathways for exploration; one alternative is to "click" on hotlinked items such as "Intro to the Alpine Lakes Wilderness," the other is to conduct further Netscape searches by clicking on "Net Search" or other buttons. In reviewing the application, we stepped through each of the pathways supported by system developers.

In the case of the ALW, our interpretation of the dialog paths supported shows that the vast majority of communication tends to be dominated by information flowing from the wilderness manager (provider) to wilderness user (visitors). The targeted visitors appear to be people who are most likely to physically visit the area as opposed to "virtual" or Web-based visitors. The end users are invited only to comment on the page. Thus, the potential two-way dialog between managers and visitors emphasizes conveying information from the manager to the potential physical visitor.

Interestingly, the target end user audience of the ALW homepage is not specified, but certain informational elements are targeted to audiences such as day users, overnight users, and horse packers. One might assume that the intended user is a visitor to ALW, but this begs two questions. One, what type of user? Someone who has visited before? Someone who has yet to visit and seeks new opportunities in the same geographic local? Or a net surfer who seeks only the virtual opportunity to visit ALW? Our review leads us to conclude that the first time visitor gains much, but more experienced Web site or real area visitors (who physically go to the area) find comparatively little specific information. The page is essentially an "electronic brochure." We wonder what opportunities exist to expand this dialog to other wilderness subcultures in an interactive format.

Topically, the ALW home page and related hotlinks cover a broad spectrum of social and ecological topics. The majority of information provided to the virtual visitor is management or regulatory in nature. This large emphasis on policy reinforces our interpretation that this monocultural dialog is one-way, from the manager to the visitor.

In technical terms we offer several observations. With the exception of indirect connections via hotlinks to other sites, access to other wilderness data is limited. There is not extensive use of graphics, nor is there a photo gallery or multi-media alternative available for the user. Access to maps is also limited, and the one available map was generalized and not convenient to the user who was browsing other pages of the application. In other words, when the text mentioned a "district," the user had to go to a separate page to get a map showing where the district was. Physical data, such as number of visitors, generally were unavailable. In spite of an emphasis on policies and regulations related to visitor use levels, there was no specific information for the visitor on where or when new regulations applied.

These observations are made with the recognition that building a Web page is a time-consuming and complex exercise and that decisions about what to put on first will depend on the objectives of the area managers. It is not our intent to belittle or labor an excellent resource for the wilderness community. The Alpine Lakes page presents an outstanding beginning, which is why we selected it as our example for discussing a larger dialog and future opportunities for targeting other wilderness subcultures.

DISCUSSION

As mentioned above, the ALW page makes extensive use of one path in the proposed multicultural dialog; from managers to potential onsite visitors. We propose that an expanded framework may also address the interests of other subcultures. For example, the scientific audience may be interested in publications reporting studies or scientific information about Alpine Lakes. Managers may be interested in the status of management plans, EIS's, visitor data or creative solutions to management problems. Environmental advocates may desire current information on proposed additions or pending legal activity and policy makers may desire access to staffing or budgeting numbers, presence of endangered species habitat or reactions to proposed legislation.

Another pathway used on the ALW page is a link to other Forest Service sites on the Internet. This link will take the visitor to the Web sites supported by National Forests, Forest Service science projects, Forest Service-related information and to other cooperators and associations. Our confusion with this link is related to "who" the Web developers were taking to these places. Since nearly all of the hotlinked sites were related more to the broader context of forest management than to wilderness, we could only assume that the audience for this link are those people that

access the ALW page because of a wilderness interest, but also wish to do some general surfing or browsing. For people who do not fit into this category, such as the wilderness-only user, this seems an inefficient use of time; something very common to use of the Web. It is possible that this linkage was designed for a manager-to-manager form of communication. Yet this seems unlikely in that the depth of information provided on most of these pages was at a general level that is already common understanding within the management domain.

The web provides the capability to move beyond one-way communication to an interactive mode. Thus, page developers should be asking themselves what they would like to know from the other subcultures and structure their pages to compile that information. On-line questionnaires are easily developed and compiled. The Web could become a venue to present and compile comments on issues ranging from visitor questions or desires to the soliciting comments on Environmental Assessments or Impact Statements.

Given the interactive capability of the internet, it is timely to ask what the appropriate uses of the web are. How far beyond information dissemination toward interpretation or an experiential mode should managers go? Should the Web replace physical wilderness experiences? Can it? For whom? These are questions in need of reconciliation as the development of Web pages continues. Certainly, there are varying degrees of interaction that can be built into Web pages, ranging from posing information in the form of questions to engaging end users in surveys, scenario building and execution, to using multimedia techniques to guide them through a virtual visit complete with video navigation and sounds. What do the visitors want? Are they even aware of what their options are?

CONCLUSION

A large cyber-culture of wilderness is likely to emerge over the next five years. This culture will include wilderness visitors, managers, scientists, educators, environmental advocates and policy makers as providers and consumers on the global network. It will be present to some degree wherever communication is used within the context of wilderness. With this transformation comes numerous opportunities and obligations to improve wilderness communication and demands on the quality of and extent of access to the wilderness dialog. People will become accustomed to and learn to expect immediate and thorough detail on a wide range of wilderness information.

In the midst of rapid change, our inclination may be to simply try and keep up by translating our existing analog data to a digital form. Under this agenda we would all have system people put our story (brochure) on the internet. We are hopeful, however, that this will not be the long term case and rather, that we will take advantage of this opportunity to learn together how to become connected and interact with the various wilderness subcultures. We should consider the World Wide Web as a way of thinking and conversing, rather than simply a form of mass communication. We must begin by trying to understand the specific and common needs of our audiences, our wilderness subcultures, so that we can successfully consider what information to provide, what questions to ask, and to whom we are addressing those questions.

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Footnotes

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Wilderness-Based Learning from an Adult Learning Perspective

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Abstract: Adult education theory is examined as a previously unapplied body of knowledge for application in wilderness management and education. Three adult education theories are reviewed and their applicability in wilderness is discussed. Additionally, profiles of wilderness users are compared with active adult learners and the implications of this comparison are presented. We conclude that adult learning theory has received too little attention in the development of wilderness management and education programs. Viewed through the eyes of an adult educator, one sees Wilderness as a learning resource where wilderness management options must be weighed carefully for possible affects on the learning outcome of Wilderness experiences.
Keywords: adult learning theory, wilderness education, wilderness experiences, wilderness management, education)

INTRODUCTION

Education is a often used to meet the goals of Wilderness management (Alaraudanjoki, 1994;Hansen, 1989; Krumpe, 1990; Oset, 1989; Ratz, 1989; Roggenbuck & Manfredo, 1990; Spray &Weingart, 1988). Such education typically is aimed at influencing user behavior or preserving Wilderness values. Wilderness-based education has also been concerned with human development programs, such as Outward Bound, and for therapy and rehabilitation purposes(Krumpe, 1990; McIntyre, Kiewa, & Sandell, 1994; Williams, Haggard, & Schreyer, 1988). Inaddition, the use of wilderness for human resource development and continuing professional education has been noted (Spray & Weingart, 1988). This literature has been mainly descriptive, providing a host of typologies of programs and program outcomes.

Although attention to wilderness-based learning has resulted in a better understanding of some of the educational opportunities and outcomes possible within a Wilderness environment, there has been no discussion of whether or how wilderness-based learning in general is different from learning in a non-wilderness setting. Does wilderness offer unique opportunities for learning? Does wilderness enhance learning? In light of these types of questions, we examine in this paper whether adult learning theory informs a better conceptualization and understanding of wilderness-based adult learning?

The purposes of this paper are to: 1) apply adult learning theory and principles to the wilderness education setting, 2) compare the profile of active adult learners with that of wilderness users, and 3) explore the potential that adult learning theory leads to a better understanding of wilderness-based adult learning. Three educational theories are reviewed and their possible application to wilderness education settings discussed. Although shortcomings are noted, these theories seem to offer some useful insights for educators and researchers by positing some explanations of the phenomenon of learning within a wilderness setting. wilderness educator sand learners provide some support for these theories by their activities and reported outcomes within the wilderness literature. The theories we review focus on different aspects of the learning setting. The first of these, situated cognition,

emphasizes the centrality of the learning environment.

SITUATED COGNITION

Within education, the theory of situated cognition offers insight into why wilderness settings may stimulate adult learning. According to situated cognition, setting (or situation) is not just important to adult learning, it is vital and basic to understanding adult learning (Wilson, 1993). Situated cognition assumes that learning is 1) a social (or interactive) activity, 2) structured by the availability of situationally provided tools, and 3) very much affected by interaction with the setting. Wilson (1993) observed that "to understand the central place of context in thinking and learning, we have to recognize that cognition is a social activity that incorporates the mind, the body, the activity, and the ingredients of the setting in a complex interactive and recursive manner" (p. 72). Further, situated cognition holds that learning and knowledge do not easily transfer across contexts, but instead are tied conceptually by the individual to the activity and setting in which the learning occurred. Without knowing the context or situation in which learning occurs, learning cannot be fully understood.

Situated Cognition theory seems to improve our insight into the nature of learning within wilderness settings. Wilderness settings are different from non-wilderness settings in that humans are merely visitors in these settings, thus the effects of human activity are minimized. It is the wild, undisturbed natural quality of wilderness areas that sets them apart from non-wilderness. According to situated cognition theory, interaction between the individual and the wilderness environment, engagement in wilderness activity, interaction with other individuals, and with their own physical and psychological status determine learning outcomes. For example, Williams, Haggard, and Schreyer (1989) suggested the personal, cultural, and biological symbolic significance of wilderness as a major factor in self-definition work. McIntyre, Kiewa, and Sandell(1995) pointed to "the environmental context [as] unfamiliar and somewhat frightening, complex, uncontrollable, stimulating and potentially enjoyable" (p. 179). They proposed that the wildness of wilderness is the "crucial attribute of the adventure experience," as it fosters awareness of human-nature interdependence and humility.

As effective as wilderness-based programs may be, however, sometimes the learning that occurs seems short-lived (Alaraudanjoki, 1995). Situated cognition theory may provide insight into why some individuals may forget many of the lessons they learned upon returning from a wilderness experience . If learning is largely context-dependent, it may be difficult for individuals to transfer lessons learned in and from wilderness, where nature dominates, to the fast-paced, crowded, and mechanized world of everyday life where human technology dominates.

ANDRAGOGY AND SELF-DIRECTED LEARNING

The concept of adults as self-directed learners was introduced into adult education by Tough(1967, 1971). Andragogy, a similar notion, was described by Knowles (1980). The basis of both andragogy and self-directed learning is the belief that as adults mature they become more self-directed in their learning. Autonomy and choice are key notions underlying these related theories.

In andragogy (here used to include self-directed learning) the needs of the learner take precedence over the needs of the teacher. In such learning, there is respect for "the individual's freedom from authority and control that might inhibit the natural tendencies of growth and development" (Pratt, 1993). Andragogy assumes individual agency to achieve fulfillment independently and through self-direction. Although there is a great deal of debate over the cultural and philosophical underpinnings of andragogy, the notion of self-directedness seems to have implications for learning within a wilderness setting. wilderness visits typically represent an opportunity for autonomy for the visitor, particularly from the perspective of living and surviving without the material and mechanized comforts of society. Andragogy suggests that adults seek more and more freedom from control of their learning as they mature. If this escalating quest for freedom in learning is even partially true, wilderness may provide an environment especially well suited to the exercise of cognitive freedom. places the burden and the opportunity for learning on the learner-visitor. In such situations, teachers are not as much teachers as they are guides or facilitators. In andragogy the emphasis is on individual and self-development.

It is clear that a model similar to andragogy

often guides wilderness human development programs, although probably unconsciously so. Krumpe (1990), for example, observed that wilderness-based programs "reflect belief in the value of wilderness...as a place to experience personal growth, renewal, and education" (p. 84). The lack of normal day-to-day contacts and distractions in most wilderness settings may enhance the ability of individuals to focus on self and self-directed learning. The theories of andragogy and self-directed learning may help researchers better understand how wilderness-based human development programs facilitate self-reflection and growth in adults.

CRITICAL REFLECTIVITY

Critical reflectivity is thought to be one of the central processes in transformational adult learning(Mezirow, 1995). Transformational learning is a qualitatively different kind of individual learning. According to Clark (1993), transformational learning "produces more far-reaching changes in the learners than does learning in general, and...these changes have a significant impact on the learner's subsequent experiences. In short, transformational learning shapes people; they are different after transformational learning, in ways they and others can recognize" (p. 47).

The theory of perspective transformation (Mezirow, 1991) is the most comprehensive theory of adult transformational learning thus far specified. According to perspective transformation theory, adults function within particular meaning structures, which are comprised of beliefs and psychocultural assumptions. Although these meaning structures organize experience, they also distort it to some extent. Awareness of distortions presents an opportunity for the individual to change that part of their meaning structure, or to transform their perspective. Perspective transformation is based on the belief that adults learn through critical reflection and critical self-reflection. Critical reflection is the central process by which underlying beliefs and assumptions are critically assessed and reorganized.

Adults are motivated to learn when they are faced with a problem that must be solved. They solve the problem, at least in part, through reflection---thinking about how past experiences, beliefs, and knowledge either support or contradict the circumstances presented by the problem. Adult educators have widely accepted critical reflectivity as a core process of adult learning. Critical reflectivity may be of particular importance to wilderness-based learning, and is often used as a technique in organized wilderness-based programs (McIntyre, Kiewa, & Sandell, 1995).

In normal day-to-day existence, individuals are inundated with responsibilities, and demands are put on their time to such an extent that many do not have (or feel they have) time to reflect on their underlying assumptions and premises. Wilderness is a setting that contrasts sharply with hectic everyday life by providing a place that invites, and may in fact demand, reflectivity. An individual can be free from the clock, the car, the kids, the job, the telephone, e-mail, and the media in wilderness and thus find that thinking and reflecting come easier. wilderness-based human development programs have often used critical reflectivity as a component of the wilderness experience. For example, many programs have built-in times for solo experience, meditation, and group discussion. These activities are meant to foster critical reflectivity, to reframe questions, and to examine old dilemmas in new ways. Discussion allows what Mezirow called "consensual validation". Consensual validation is made possible through rational discourse—talking things through with others, testing one's reflective thoughts, and exploring options for integrating a new perspective into one's lifestyle.

FORMAL, NONFORMAL, AND INFORMAL LEARNING

Three types of educational environments and related learning are recognized in adult education--formal, nonformal, and informal. Formal learning depends upon a structured educational program. Examples of structured programs include higher education, cooperative extension courses, and wilderness skills courses. Nonformal learning occurs within a context of less structure, such as in outdoor recreation settings. Nonformal learning is characterized by less obligation and more freedom of choice, but some form of intentional educational media is still involved. Examples include learning at visitor information facilities, from environmental organization literature, and from television documentaries. Informal learning occurs incidentally and without any intentional structure. Examples include everyday

life experiences, non-structured outdoor recreation participation, wilderness backpacking trips, and incidental exposure to cultural norms.

When most people think of learning or education, formal learning processes or institutions typically come to mind. For many years within adult education, formal learning captured almost all of the attention of both researchers and educators. Since the 1960s, however, more attention has been given to nonformal and informal learning within adult education. The work of Mezirow(1991), Tough (1967, 1971), and Knowles (1980) has helped to focus attention on educational settings outside of the formal context.

Unfortunately, adult education researchers have found it difficult to track the incidence of nonformal and informal adult learning. Similar in many respects to the task of estimating leisure participation, statistical estimates of participation in adult learning and education are believed to be incomplete, inaccurate, and low (Merriam & Caffarella, 1991). Just as almost all individuals have some leisure which they use in some manner, almost all adults learn whether they intend to or not. Like recreation activities, which can be observed, participation in formal education (and most forms of nonformal education) can be observed. However, just as leisure cannot be observed, neither can learning. Thus, the portrait of the typical adult learner, as she or he has sometimes been described in adult education, can be flawed.

Comparison of Characteristics of Participants in Formal Adult Education and Wilderness Users

The portrait of an adult learner is typically limited to those who participate in some form of structured educational program, more often than not, a formal program. While we recognize the limitations of this portrait, the profile of the typical formal adult learner can help to identify the type of persons who are most likely to be active in adult learning and education. This portrait might include adults who have taken a spelunking class, but it would not include self-taught spelunkers. As we discuss the characteristics of adult learners, this limitation must be kept in mind, particularly since nonformal and informal learning are more prevalent in wilderness than is formal learning.

The typical participant in formal adult education is white (91% in 1984), married with children, and has above average income (Courtney, 1992). Consistently, the characteristic found to be the most important predictor of participation in adult education is level of formal education already achieved. Participants typically have at least a high school diploma, and as education rises above the high school level, so does the probability of participation (Courtney, 1992). Adult education participants usually live in the suburbs, and a higher proportion of westerners participate in adult education than easterners. Although recent research is beginning to report an increase in the number of older American participants, most of the adult participants are under 40 years old. The remarkable thing about this profile is that it has changed little since first being described in the 1920s (Courtney, 1992). This profile of the typical adult education participant led Courtney to say, "While there is then a perception shared by both the public and those who provide and teach educational programs that opportunities for learning in adulthood are open to all, reflecting a true market economy, the reality appears to be otherwise" (p. 5).

The 1994-95 National Survey on Recreation and the Environment (NSRE) obtained interviews with a subsample of 1,661 Americans who were asked a set of questions about wilderness. Of this sample, 225, 13.5%, indicated they had taken a trip to a wilderness area sometime in the 12 months just preceding the interview. A descriptive profile of those reporting a wilderness trip is presented in Table 1.

Table 1. Profile of Wilderness Users, 1994-95

		%
Age	15-24	22
	25-40	40
	41-55	25
	>55	13
Education:	Less than HS	10
	HS Diploma	21
	Some College or trade school	30
	College Graduate	39
Race:	White	87
	Non-white	13
Income (In thousands):	<15	7
	15-24	9
	25-49	39
	50-74	20
	75-150	8
	>150	16

Although a comparison of profiles of formal adult learners with wilderness users must be interpreted with caution, the striking similarities between these groups is well worth noting. Both profiles describe a population of white, well educated, and relatively high income individuals(numbers in bold lettering, table 1). Sixty-two percent of wilderness users are 40 years old or under, 69 percent have some college, 87 percent are white, and almost half earn $50,000 or more per year. This similarity between profiles suggests that wilderness users very likely are active adult learners. This indicates that wilderness users not only would typically be receptive to educational offerings, but more importantly that they are likely to actively seek such offerings.

IS WILDERNESS A HIDDEN WILDERNESS BENEFIT?

Next, we examined responses to an open-ended question within the NSRE which asked wilderness users to describe "some of the specific ways you (or anyone) benefits from[participation in] your favorite activity." The favorite activity in question was not necessarily wilderness-based, and there was no direct way of tracking whether or not the respondent's favorite activity was of the type that would likely occur in wilderness-like settings. However, we analyzed this question first to explore whether learning or education was identified as a benefit of outdoor recreation (and by extension, wilderness-based participation). We further investigated responses to the benefits question for evidence that might help us to better understand whether the previously described education theories would be informative to future inquiry into wilderness-based learning.

The analysis used the Parts of Speech Data Analysis (POSDA) method. POSDA is a content analysis based first on nouns and verbs. After identifying the relevant parts of speech (POS) as an aid to identifying themes, the analysis requires a recontextualization of the POS. Of the 225 responses, 568 POS (nouns and verbs) were identified. Fifteen percent of these POS related directly to learning or education. For example, "Watching animals teaches you about the animals," and "Learning about new places and things" were two comments made with a specific reference to learning. Other responses described health and fitness benefits (15%), and to a lesser extent relaxation (10%) and stress reduction/escape (7%).

The data offered some support for Situated Cognition theory. Eleven percent of the POS made specific mention of the outdoors environment, second in prevalence behind learning and health and fitness benefits. For example, "escape from civilization," "like to be outdoors," "...family benefits overall from nature" were some of the references made to the outdoor setting. Many respondents spoke about getting away from the everyday routine, a "change of pace," and "getting some quiet." Other descriptors of outdoor recreation benefits included the beauty of nature, the fresh air, "oneness with nature," and "to have a good time and enjoy yourself in the natural surroundings."

To an extent, the data suggested a role for andragogy in outdoor recreation (and possibly wilderness) settings. For example, "understanding nature and developing survival skills," "...not committed to doing anything—it is your own free will," and "escape from civilization" were mentioned. Likewise, there was some support for critical reflectivity in the responses: "to clear your mind," "think through plans while doing activity," "puts things in perspective," "recharge your batteries," and "silence." Many of the responses indirectly suggested that critical reflectivity either could have or does occur, such as in the many references to "peace of mind," "getting away from the phone," and "it's a way to unwind and get away from business."

DISCUSSION

One of the more important results of this investigation was finding that so little attention had previously been given to adult learning and applying adult learning theory in outdoor recreation and wilderness management and research. Likewise, there has been a dearth of attention given to recreation and wilderness as situations or settings in the adult learning field. For example, the NSRE is a theoretically grounded and, we thought, comprehensive survey from which we believed sufficient information could be teased to better understand the relationship of adult learning with recreational (if not wilderness) settings. We found, however, that analysis of the NSRE and to look for applicability of the three adult learning theories had to be highly circumstantial and speculative. There is an obvious opportunity

to improve wilderness education and management by giving more consideration to adult learning theory and principles. If learning is a process that occurs in outdoor settings and through wilderness experiences, and it surely is, then the structures and roles of adult learning in those settings need to be better understood.

Examination of the NSRE and of adult education and wilderness literature indicated that: 1)wilderness users fit very closely the profile of formal adult learners, 2) the wilderness setting maybe an important contributor to adult learning and 3) critical reflectivity and, to a lesser extent andragogy, may enhance our understanding of and effectiveness in providing opportunities for wilderness experiences. If Situated Cognition theory is applicable to wilderness settings, it may further improve our understanding of wilderness-based learning by helping to explain why such learning is often not transferable to everyday life situations.

Analysis of the "benefits of outdoor recreation" data yielded many references to the quality of the natural environment and even a few references to andragogical principles and the importance of critical reflectivity. This is indicative of the potential importance of those concepts for wilderness-based learning. Based on our knowledge of the nature of wilderness experiences, we would expect more support for the applicability of all three educational theories had there been questions in the NSRE that dealt specifically with wilderness. There is an opportunity for educational and wilderness researchers to collaborate to improve our understanding of the role of adult learning within wilderness.

In both wilderness management and research there is a tendency to emphasize recreation, adventure, challenge, scenery, and other such outcomes. But,. based on the ideas and findings presented in this paper, does it make sense to also emphasize learning, curiosity, mystique, revelations, understanding and relating as important outcomes or traits of wilderness experiences? In fact, reflecting and learning may be more significant outcomes from a wilderness management perspective than having fun and facing challenges.

The profile of wilderness users paralleled very closely that of formal adult learners. If wilderness users are active learners to start with, what does this imply for the design or approach in delivering "wilderness education"? Based on the results presented above, it seems that an appropriate agency role would be to "enable" learning for this group in society who seems largely self directed in learning endeavors. Enabling learning by clientele who are self directed would suggest: 1. Minimize structure and organization in message delivery 2. Minimize intrusions and even the visibility of management personnel 3. Provide access to information, but not direction.

Clearly if there is to be closer attention paid to adult learning as a purpose and benefit, a great deal more thought needs to be given to defining the "why" of wilderness education. Examples of reasons sometimes given include:—to gain more and broader advocacy for wilderness—to build a stronger wilderness ethic and stimulate "acceptable" behavior in wilderness—to pass along broader environmental messages—to build self awareness and stimulate personal growth—to build a greater awareness and appreciation of wilderness—to encourage greater understanding of natural processes and human-nature interactions—to improve understanding of the values and benefits of wilderness.

Wilderness is unique in that humans are but visitors and our normal tendency to modify environments to make them more comfortable and convenient does not fit. From an adult learning perspective, if we take actions that lessen that uniqueness of wilderness by, say, allowing roads, helicopter inflights, erection of structures, aircraft overflights, radio-collared dogs for hunting, etc., then it follows that the learning opportunity afforded by wilderness will be changed also. Wilderness should be thought of not only as a tangible land resource with preservation and recreational values, but it also should be thought of as a learning resource. If this perspective is recognized and accepted, then adult learning theories and principles will become especially helpful in clarifying how wilderness might be managed to better affect learning experiences.

Acknowledgments

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A Wilderness Discovery Program for Urban, Youth-at-Risk at the Atlanta Job Corps Center

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Abstract: Wilderness Discovery (WD) is a seven-day wilderness experience program specifically designed for youth-at-risk in the Federal Job Corps to enhance their self esteem, cooperation and social skills in support of their on-going education and job training. Under funding from the Department of Labor and the US Forest Service, Wilderness Discovery was tested in a two year pilot program at three Job Corps Centers in the Northwest during the summer of 1994 and 1995. The Atlanta Job Corps Center was added in 1995 to test the program at an eastern, urban center, taking students to wilderness in the Natahala National Forest in western North Carolina and the Cherokee National Forest in eastern Tennessee. The students at the Atlanta Job Corps, primarily young black women, many with children, posed a new challenge to Wilderness Discovery, since nearly all of them were from intense urban environments and had never been exposed to wilderness. They were placed in an unfamiliar environment, far from their accustomed culture, and asked to complete difficult communal tasks as well as hiking with a 30 pound backpack. Program effects were evaluated using student journal entries, exit interviews, and focus group interviews with steering committees of Job Corps staff. Steering Committee consensus opinions provided a basis for analyzing the potential economic benefits of WD using a benefit/cost model developed by Mathematica (1982), with analysis indicating positive returns from Wilderness Discovery as an adjunct to the Federal Job Corps.
Keywords: youth education, Federal Job Corps Program, National Forests, Atlanta Job Corps

Wilderness Discovery (WD) is a seven-day wilderness experience program specifically designed to empower and strengthen the skills and motivation of youth-at-risk in the Federal Job Corps. We tested Wilderness Discovery in a pilot program during which we ran 45 trips from 1993-1995 at four different Job Corps Centers including: Curlew Job Corps Center on the Colville National Forest in Washington, 1993-95; Trapped Creek Job Corps Center on the Bitterroot National Forest in Montana, 1994-95; Timberlake Job Corps Center on the Mt. Hood National Forest in Oregon, 1994-95; and the downtown Atlanta Job Corps, 1995, run by the Management Training Corporation, under contract to the Department of Labor. This presentation describes our experience running six Wilderness Discovery trips from Atlanta during the Summer of 1995, taking groups of primarily young black women to wilderness in the Natahala and Cherokee National Forests in North Carolina and Tennessee.

Job Corps is a flagship program of the Federal Department of Labor, where, at more than 130 residential centers nationwide, unemployed young people aged 16-24 can receive vocational and educational training. Students may remain in the program for two years, during which they can earn a GED certificate and be trained in social and living skills as well as carpentry, construction, building maintenance, nursing, clerical applications, and many other vocations. Wilderness Discovery is designed to supplement Job Corps' training with a soft skills, low-stress, low-risk wilderness experience designed to improve self esteem, cooperation, and social skills to empower and strengthen the ongoing training students are already receiving.

The focus of the wilderness experience is a 20-25 mile, seven-day backpacking trip, including camping for six nights on the trail, sharing of camp and cooking chores, and completing some wilderness trail work to show appreciation for use of the wilderness by the group. Contact with the wilderness is emphasized by using tarps for shelter in lieu of

tents, no flashlights or watches to foster living by natural rhythms, and a primarily vegetarian, low-sugar diet.

The young women at the Atlanta Job Corps, many with children, posed a new challenge to Wilderness Discovery, with nearly all of them being from intense urban environments without any previous exposure to wilderness. We were pleasantly surprised at how well they liked the experience, and the positive impact on them.

WILDERNESS DISCOVERY IN ATLANTA

The downtown Atlanta Job Corps Center has about 400 students, with approximately 90 percent being African American women, aged 16-24. We brought Wilderness Discovery to Atlanta to test the effects of a wilderness experience program on inner-city minority youth, many of whom had not been outside an urban environment. Wilderness on the Natahala and Cherokee National Forests was only 200 miles away on a map, but represented a world of difference to these young women. Wilderness Discovery placed them in an unfamiliar environment, far removed from their accustomed culture, where they were faced with completing difficult communal tasks, requiring substantial cooperation and social skills, as well as the rigors of hiking with a 30 lb. backpack.

The students had no prior wilderness experience, but quickly fell into the routine of living and traveling in balance with the natural world. Group circles were conducted daily, giving students a chance to speak out and for leaders to assess how they were doing individually and as a group. The opportunity to practice social skills in a neutral environment was a powerful experience for many students. Fears, hopes, dreams, and goals were shared with the group in a non-threatening setting. A community ethic evolved, and the group became a family. Completion of the trip culminated with discussions of what they had learned, and what metaphors could be taken back to their daily lives on center. After the tears and the hugs, the students returned to Atlanta to face the same challenges they had left--for many, the responsibility of caring for young children, as well as school and vocational training to prepare for work and a more productive life.

We were interested in how the Wilderness Discovery program might affect students. What did they learn? How did it affect their social skills? Did completing Wilderness Discovery enhance self esteem—and if so, how might that be a positive influence on their lives, and society? We analyzed student journals, post-trip exit interviews, and debriefed every trip with a WD Steering Committee of Job Corps staff. At the end of the summer, we completed a focus group process with WD Steering Committees at each center to elicit a consensus of expert judgments about the perceived benefits of WD. Following is a summary of the results from this study looking at the effects of Wilderness Discovery on the students at the Atlanta Job Corps, and comparing the findings where appropriate with results from the other three centers where we tested the program.

What Student Journals Revealed

Students were given journals and asked to keep a record of their experience during the seven-day back-packing trip. We gave them time during layover days and after meals, when they could think about pressing issues in their lives and record their thoughts. We knew from an earlier study that many students would record important thoughts, ideas and reflections, but some students would write very little and record few reflective insights (Pitstick, 1995). So we made a work count of each student journal, and counted the number of "reflective comments"—that is journal entries reflecting student insights into their lives and behavior (see Table 1).

Analysis of these data revealed that Wilderness Discovery participants from Atlanta wrote 70 words per day, on the average, about 30 percent more in their journals than averaged by students from the other three centers—and had about 60 percent more reflective comments over the duration of the trip. One might speculate that students writing and recording more words and reflective comments could be due to trip itineraries and WD leadership, but with similar schedules and activities and consistently trained leaders at each center, this doesn't seem likely. We then looked at gender, thinking that if women students at all centers wrote more words and reflective comments than men, that would account for the fact that the predominantly all women trips at Atlanta averaged more words and reflective comments per student than did the mixed gender trips at the other centers. This proved to be partially true. Female Job Corps students at all centers wrote more words in their journals per-day than male

urban culture prompted reflective insights by Atlanta students, which could apply to their daily lives as metaphors. Ninety-two percent of the Atlanta participants stated they were going to apply the lessons learned from WD to their daily lives, a noticeable higher percentage than the other three centers (see Table 2). Their insights included comments such as:

•The fact of being responsible for myself and also for others.

•This brought me an inner peace I didn't know I had. I was never able to get along with people. Out here it has done a lot of good."

•It is gonna affect me in a positive way. It has given me a lot of strength and I feel I can survive when I leave this center on my own, doing things on my own. I don't have to depend on nobody. I know that I can cause I have it in my heart and this was a test to prove that I can do it on my own without any help.

•Spend some time alone when I get frustrated instead of yelling.

•Self esteem and motivation that I learned up here.

•Peace of mind and some confidence.

Table 2: Average responses to exit interviews at the conclusion of each trip for 1995 Wilderness Discovery trip at four Job Corps Centers

Exit Interview Analysis	Atlanta	Timberlake	Trapped Creek	Curlew	Average
% who stated WD is a Good Program for Job Corps	100%	100%	100%	100%	100%
% Who Have never Been Backpacking	92%	70%	81%	76%	80%
% Students Who Will Apply Something Learned on WD Back at Center	92%	70%	81%	76%	80%

Focus Groups of Job Corps Staff

At the end of the summer, a focus group process was used with WD Steering Committees to develop consensus, expert judgments by Job Corps staff about their perceived effects of Wilderness Discovery on students. These Job Corps staff members had followed Wilderness Discovery throughout the summer, and they represented the major program areas on the Center, such as vocational training, education, counseling, residential living, administration, recreation, nursing, and others.

Within 24 hours of the conclusion of each trip at every center, the Wilderness Discovery leaders met with their respective steering committee to debrief the trip. Each student and the group as a whole was discussed in detail as to performance, noteworthy behavior or incidents and what was working well and not so well in the WD program, so changes could be made if necessary.

The Job Corps staff on the WD Steering Committees were professionals in working with youth-at-risk, and collectively were familiar with the student histories prior to entering Job Corps and prior to participating in Wilderness Discovery. They had the chance to see and evaluate student changes in attitude and behavior after participating in WD. Thus, we wanted to test Wilderness Discovery's value against their consensus opinion.

At the focus group session, the WD Steering Committees at each center were asked to explore the benefits of Wilderness Discovery from their perspectives. The following list of benefits emerged in response to a group discussion to the question: What were the benefits of Wilderness Discovery to the students who participated, compared to those who did not participate, in Wilderness Discovery? Table 3 presents the benefits that emerged from the focus group discussion at each center.

Benefit/Cost Analysis

We then asked each focus group how they thought these perceived benefits might affect a student's liklihood to complete their Job Corps training and gain future employment, (which is the main goal of Job Corps), and would affect the four other critical variables that form the heart of a benefit/cost model developed for Job Corps by Mathematica (1982) to assess the economic impact of Job Corps. Each focus group developed a consensus opinion recorded on a seven-point scale, as to what extend they thought WD affected the participants:

Table 3. Benefits to students participating in Wilderness Discovery identified by WD Steering Committee members of Job Corps staff at each center, 1995.

Benefit Category	Curlew	Trapper Creek	Atlanta	Timberlake
Accomplishment	Students realized they had more capability than thought-sense of accomplishment	-Sense of accomplishment -Realize importance of experience	A sense of accomplishment	Self esteem from accomplishment
Appreciation/ Exposure to New Experience	Opportunity to experience some thing they would have missed	Learned camping skills and wilderness travel	Exposure to an outside and different experience	Developed new leisure skills
Challenge	Stretch comfort level	Learn about their limitations and interests		
Communication	Ability to speak to authority figures	Learn practical skill from teamwork	Learn to express feelings better	-Made new acquaintances -Developed leadership skills
Reflection/ Introspective	Opportunity to reflect on and deal with personal issues Neutral environment to confront personal issues	Ability to be introspective and reflect		Gained insight into themselves and other students
Self Confidence	Self confidence and peer acceptance	Increased participation & enthusiasm More confident	Self Confidence	Sense of confidence
Self Esteem	Self esteem-ability to speak up for themselves	Learn respect for themselves and each other		Self esteem for accomplishment
Teamwork/ Cooperation	-Opportunity to help others -Male and female on equal footing -Other students seen in a different light	Learn practical skill in teamwork	-Opportunity for sharing and caring for each other -Learn the importance of teamwork -Learned acceptance of others	-Enhanced trust in themselves and others -Developed leadership skills
Trust/Respect for Authority Figures	-Increased maturity -"More human"	Learn respect for the wilderness and each other	-Respect the staff more -Openness to others	Enhanced trust in themselves and others
Wilderness/Env. Awareness		Awareness of wilderness as a positive experience		Enhanced env. and wilderness awareness

(compared to non-participants)

1. likelihood to terminate Job Corps early;
2. future employability;
3. dependence on welfare;
4. criminal behavior; and,
5. drug and alcohol use. Fig. 1 shows, that at each center, focus groups judged that WD had a positive effect collectively on all these critical variables, and that after giving their initial response and then discussing it, the consensus final judgment was even more positive at each center.

The results of the simulation indicate that by slightly adjusting individual and multiple variables, an adjustment we perceive to be justified by the focus group judgments of Job Corps staff, positive returns in the form of net social benefits can be realized. (See Fig. 2).

Based on these positive judgments, we made a very modest 5 percent positive adjustment for the five benefit variables and ran the benefit/cost model to determine net social benefits from these adjustments. We think the overall process leading to increased social/economic benefits from participating in Wilderness Discovery works this way (see Fig. 3).

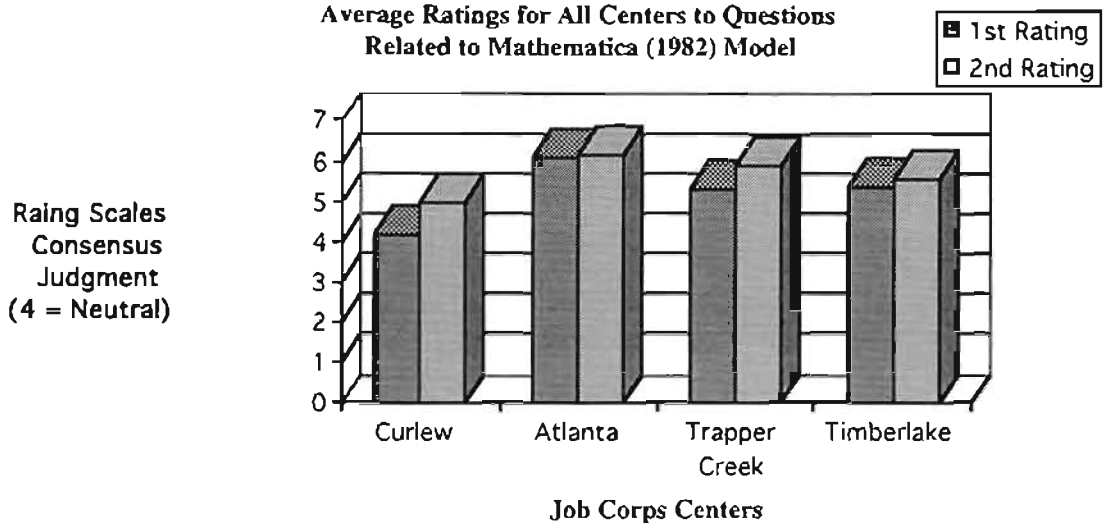

Fig. 1. Average for all WD Steering Committee consensus responses across four participating Job Corps Centers to four questions based on variables the Mathematica (1982) model. Seven point Likert scale ranging from:{1-Strongly Disagree----4-Neutral----7-Strongly Agree}

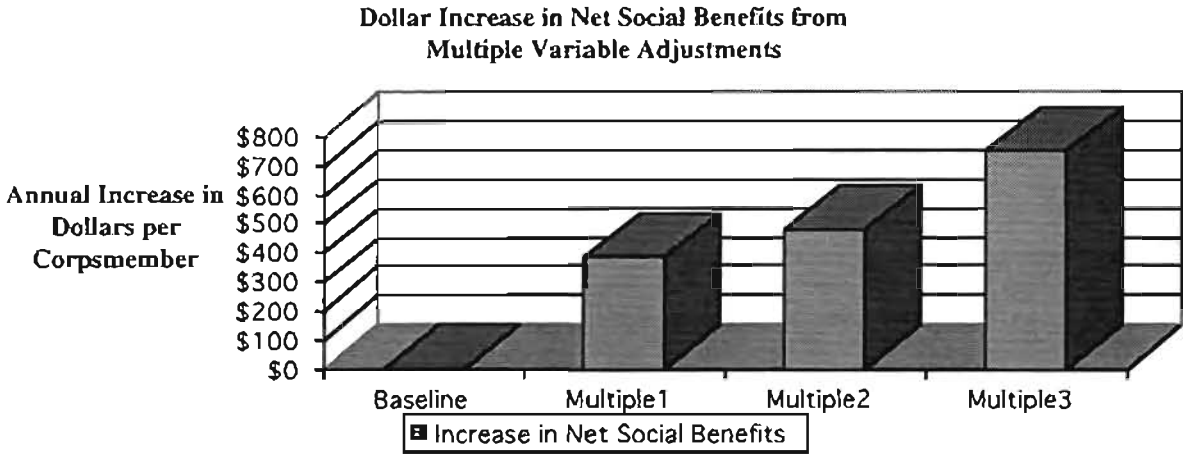

Fig. 2. Dollar increase in net social benefits from multiple variable adjustments

Since we estimate we can run Wilderness Discovery for variable costs of $370 per student over a ten-trip schedule, coupled with the simulated increase in returns of between $470 and $740 per student based on our modest projections, the financial returns of WD as an adjunct to Job Corps ($100-$370 per student) seem financially justified—under the assumptions and methods of this study (Russell, 1996).

Conclusions

Our analysis of student journals, exit interviews, and a focus group process with WD steering committees of Job Corps staff all support the notion that Wilderness Discovery is a positive adjunct to the on-going vocational, educational, and social skills training that Job Corps students are already receiving. This was true at an eastern, urban center serving minority female students, as well as at three mixed gender western centers. Students are returning from WD with a clarified purpose of why they are in Job Corps and with an increased awareness of their behavior and how if affects other people. The students liked Wilderness Discovery and endorsed its value. Many student journals and exit interviews revealed rich insights about why they are in Job Corps, who they are and their goals. Consistent with other studies (Pitstick, 1995) WD is perceived by Job Corps staff

familiar with the program to be targeting skills that will help students remain in Job Corps longer and enhance their employability.

The WD Steering Committees of Job Corps staff, through a focus group process, identified many benefits emerging in WD participants and

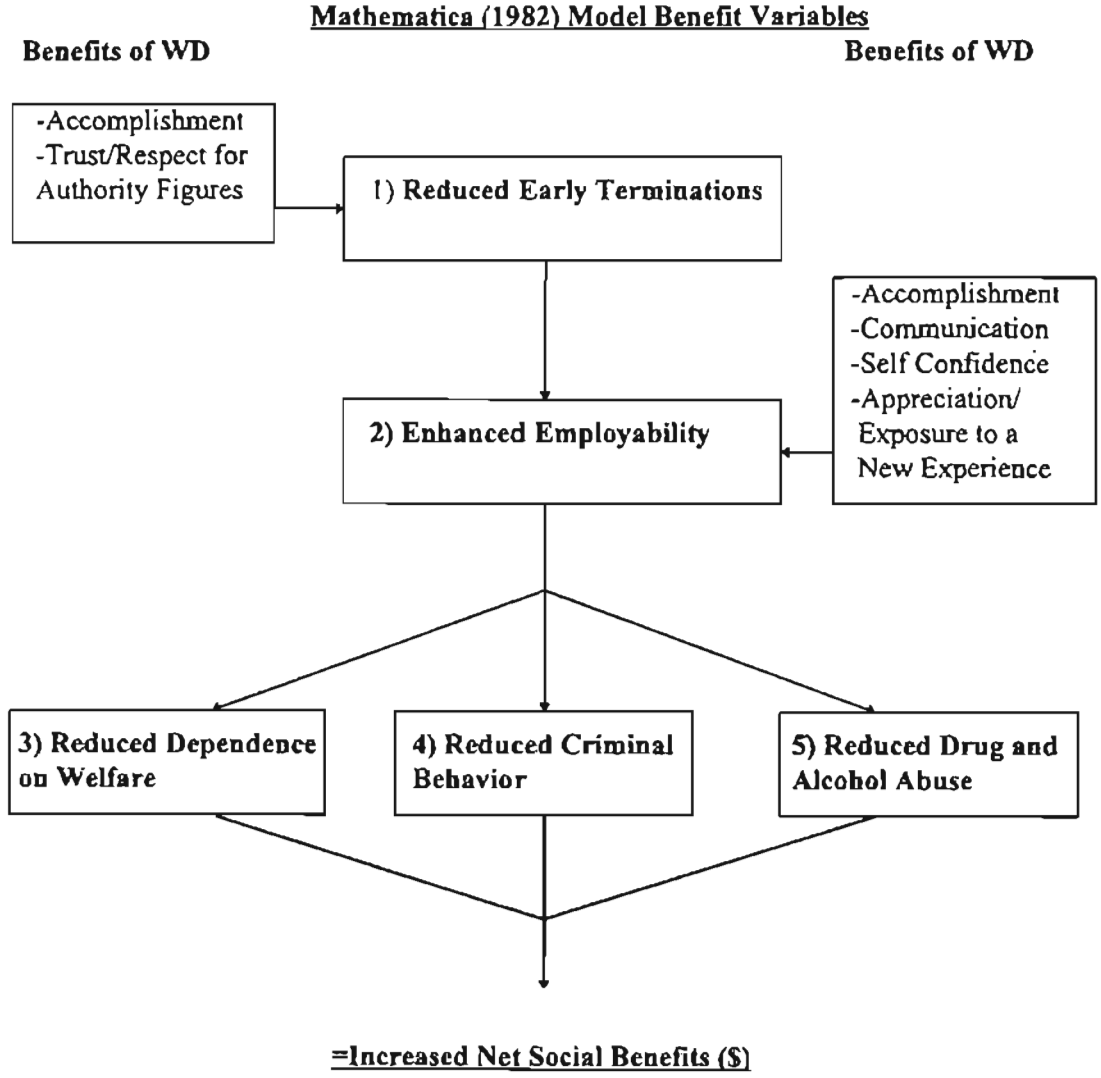

Fig. 3: How benefits to students perceived by Job Corps Staff affect Mathematica (1982) model increasing net social benefits

we were able to relate these benefits to critical variables in the Mathematica (1983) benefit/cost model. WD by providing the chance for insights, practical experience in cooperation and social skills, and to enhance self esteem, is likely to increase the retention rate of students, which furthers their social development and performance in educational and vocational training. Studies by Mathematica (1983) show that completing Job Corps leads to increased future employability. this leads to a reduction in:

1. criminal activity;
2. drug and alcohol abuse; and,
3. dependency on welfare.

Thus, WD as an adjunct to Job Corps, has the potential to increase benefits to society through the enhance productivity of Job Corps students—an increase that our simulation suggests would well exceed the cost of providing Wilderness Discovery. Finally, our study at Atlanta indicates that WD can be a positive experience for inner-city, female minority students, as well as for students from the rural Job Corps centers in the West.

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A Comparison of Preferred Experiences and Setting Conditions in One Eastern and One Western Wilderness Area

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Abstract Using the Recreation Opportunity Spectrum framework, we examine the relationship between visitor experience and setting preferences across an eastern and western wilderness. Hikers in the Cohutta wilderness in TN and GA, and the Comanche Peaks in CO, were administered a mail-back survey during the summers of 1992 and 1994, respectively. Overall, Cohutta visitors exhibited (1) significantly stronger experience preferences for five wilderness dimensions (natural, solitude, primitive, unconfined and remote opportunities) and (2) significantly greater preferences for social, physical and managerial settings in wilderness areas generally, than Comanche Peaks visitors. In addition, visitors rated social and physical conditions as significantly better in the Comanche Peaks than Cohutta. Findings support the ROS notion that different settings may be associated with "specific packages" of experience preferences. Implications for a Wilderness Opportunity Spectrum are discussed.

Keywords: Recreation opportunity spectrum, wilderness recreation, wilderness experience preferences, wilderness setting preferences, wilderness opportunity spectrum.

INTRODUCTION

In identifying areas for future research on the ROS (Recreation Opportunity Spectrum) planning tool, Driver, Brown, Stankey and Gregoire (1987) asked "do users of the same activity in similar settings, but in different geographical areas, realize "similar experiences?" (p.208). Given the widespread adoption of ROS throughout the United States, this remains a pertinent, yet relatively unaddressed, question. In one of the few studies conducted on this topic, Roggenbuck (1980) reported minor differences in user experience and setting preferences across three western and four eastern wilderness areas. Users rated the same experiences (including, scenery, escape, and nature), environmental features (wildlife, water, and views), and management actions as important to their wilderness recreation trip. This finding is somewhat surprising since most eastern wilderness has been founded on less restrictive congressional legislation than western wilderness.

From its origins in 1964, the National Wilderness Preservation System has become increasingly diverse (Cole, 1990). This diversity is most readily apparent in the geographical distribution of wilderness areas and may be attributed to the two Acts of Congress in 1964 (P.L. 88-577) and 1975 (P.L. 93-205). The second act, the so-called Eastern Wilderness Act, relaxed many of the criteria established by the former act; essentially permitting lands smaller in size, closer to urban populations, and with evidence of human modification (e.g., roads, industrial and recreational development) to be designated as wilderness. As a result, not only are eastern wilderness areas physically distinct from western wilderness, but they receive proportionally much higher use. For example, although only 7.5% (approximately 2m acres) of USDA Forest Service wilderness is located east of the 100th Meridian, eastern wilderness areas account for almost 20% (approximately 1.9m) of the total annual wilderness visitor days (from Hendee, Stankey & Lucas, 1990).

The ROS recognizes that specific "packages" of experiences are dependent upon distinct combinations of physical, social, and managerial setting components (Brown, Driver & McConnell, 1978; Brown & Ross, 1982;

Manfredo, Driver & Brown, 1983). Manfredo et al. (1983), for example, identified three groups of wilderness users that could be distinguished according to the types of settings they prefer. More recent work, however, suggests that some experience preferences may be independent of differences in the mix of setting components (Virden & Knopf, 1989; Williams & Knopf, 1985; Yuan & McEwen, 1989). Virden and Knopf (1989) found that for three of four recreation activities, the desire for nature, escape, and social affiliation remained strong regardless of the type of setting preferred. In a study of campers, Yuan and McEwen (1989) report no significant differences in the rating of the four most preferred experiences across three ROS setting classes (rural, roaded natural, and semi-primitive motorized).

The purpose of this study was to examine visitor (hiker's) experience and setting preferences across an eastern and western wilderness. Three objectives were addressed.

Objective #1. To compare setting preferences and experience preferences between hikers of east and west wilderness areas. (This provides a further test of the Roggenbuck study.)

Objective #2. To examine the strength of the setting-experience preference relationship for hikers of east and west wilderness areas. (This addresses the relationship proposed by the ROS).

Objective #3. To compare perceived setting conditions between east and west wilderness hikers. (This is used to examine the perceived similarity between the two wilderness settings.)

METHODS

Study Areas

A comparison of hikers to two wilderness areas, the Cohutta Wilderness in southern Tennessee and northern Georgia and the Comanche Peaks Wilderness in northern Colorado, was made. Both areas are administered by the USDA Forest Service (FS) and are popular places for backcountry hiking, backpacking and camping. Data were collected during the summers of 1992 (Cohutta) and 1994 (Comanche Peaks) using the same methodology and questions.

The selected areas may be considered typical of eastern and western wilderness in terms of ecological and social characteristics. The Cohutta, an area of 37,043 acres, ranges in elevation from 950 feet to 4,200 feet above sea level and consists of densely mixed hardwoods and conifers that are typical of the Appalachian mountains. It is within a two hour drive of three major metropolitan cities, Atlanta, GA, Chattanooga, TN, and Knoxville, TN. In 1986, visitor-days in the Cohutta were 77,300, which averages at 2.09 visitor-days per acre (Hendee et al., 1990). Annual visitor-days for FS administered wilderness in Georgia, Tennessee, and North Carolina are 1.65, 1.53, and 1.88 respectively.

Elevations in the Comanche Peaks, an area of 66,901 acres in the Rocky Mountain range, are from 7,800 feet to 12,700 feet with community types ranging from Ponderosa Pine to alpine tundra. The wilderness is within a two hour drive of Denver, CO and a one hour drive of Fort Collins, CO. Total visitor-days in 1986 for Comanche Peaks was 20,100. Average visitor-days per acre was 0.30 which is consistent with the range of most FS wilderness in the western states: 0.37 in Arizona, 0.48 in Colorado, 0.15 in Idaho, 0.21 in Montana, 0.31 in New Mexico, and 0.21 in Wyoming (Hendee et al., 1990).

Design

Hikers in both wilderness areas were contacted at the trailhead and asked to complete an off-site postage-paid, mail-back survey. A modified Dillman (1978) procedure was used: after the initial on-site contact, one reminder postcard and one follow-up survey were mailed at 10- to 14-day intervals, respectively.

Sampling

A stratified random procedure was used to select days and times for contacting visitors. Two of three possible four-hour daily time blocks (8:00 a.m. to noon, noon to 4:00 p.m. and 4:00 p.m. to 8:00 p.m.) were randomly assigned to clusters of four-day and five-day blocks. All recreational users exiting or entering the wilderness during the selected time period were asked to participate in the study. Subjects were asked to complete the survey at the conclusion of their trip and mail it back by a requested date. Response rates of 66% (f = 361) for the Cohutta and 68% (f = 343) for the Comanche Peaks were obtained. To control for activity, only hikers (both day and overnight) were included in the analysis. The total number of hikers in the samples were 357 (Cohutta) and 305 (Comanche Peaks).

Measurement of Variables

Wilderness experience preferences were measured using twenty items developed by Shafer (1993) and rated on a 7-point scale with polar anchors of "unimportant" to "extremely important," including a neutral response. Items were scored from +1 to +7. Examples of items include, "being in a remote area," "having uninterrupted time with friends and/or family" and "being free from the rules and regulations of society." The items have been to measure five distinct wilderness psychological outcomes that are representative of the language and intent of the 1964 Wilderness Act (Shafer & Hammitt, in press). The five major outcomes represent a desire to be close to nature, experience solitude, experience remoteness, escape physical surroundings and escape social surroundings.

Preferences for wilderness setting conditions were measured by asking respondents to rate how concerned they are with certain conditions in wilderness on a 6-point polar scale from "unconcerned" to "extremely concerned." A total of thirty-four items (eight social, fifteen physical, and eleven managerial) were used, each being scored from +1 to +6.

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The following demographic characteristics were also recorded: age, gender, residence, education and ethnic background.

Data Analysis

Independent t-tests via SPSS/PC+ (Norusis, 1991) were conducted to determine differences in mean responses for experience and setting preferences (objective #1) and perceived setting conditions (objective #2) across east and west wilderness hikers. Objective #2 was tested using the path analysis procedure in LISREL Version 7.20 (Joreskog and Sorbom, 1991). To examine the relative strength of the setting-experience preference relationship between the wilderness areas, a direct comparison of the two coefficients of determination (percent of explained variance) was made.

RESULTS AND DISCUSSION

Demographic Characteristics

Cohutta hikers were younger (mean age = 33.8 years), more likely to be male (74%) and live in metropolitan areas (59% resided in cities greater than 100,000) as compared with Comanche Peaks hikers (mean age = 40.2 years; 60% male, and 30% living in metropolitan cities). No differences between the two groups were found in ethnic background and education level.

Objective #1

Objective #1 examined differences in setting and experience preferences between east and west wilderness hikers. Alpha reliabilities, mean scores, sample size, F-tests, and significance levels are shown in Table 1. All scales, with the exception of the "unconfined" (alpha = .79) and "remote" (alpha = .74) experience preference scales achieved alpha reliabilities in excess of .80. In support of Roggenbuck's (1980) findings, each of the five wilderness experience preference dimensions were ranked in the same order of relative importance by eastern and western wilderness users. The opportunity to experience nature was the primary motivator, followed by (in descending order of importance) preferences for primitive, solitudinal, unconfined, and remote wilderness experiences. Interestingly, however, Cohutta visitors (a) rated all experience preference dimensions as being significantly more important to their wilderness recreation experience and (b) demonstrated significantly stronger affinity toward social, physical, and managerial setting conditions in wilderness than Comanche Peaks users.

Objective #2

Objective #2 tested the strength of the setting-experience preference relationship. Although the amount of variance in the five wilderness experience preference dimensions explained by the three setting preference conditions was considerably greater for the western area (55%) than the eastern area (35%), both coefficients may be considered high, suggesting that setting preferences are important predictors of wilderness experience preferences.

Objective #3

Table 1 shows that social and physical setting variables in the Comanche Peaks were perceived to be in a better condition than in the Cohutta. There were no significant differences in managerial conditions.

Table 1.
Differences in experience preferences, setting preferences, and setting condition perceptions between west (Comanche Peaks) and east (Cohutta) wilderness hikers.

	Comanche (n = 305		Cohutta (n = 375)			
	α	Mean	S.D.	Mean	S.D.	F	p
Experience Preferences [1]							
Natural	.90	23.05	4.52	24.56	3.44	4.86	<.001
Solitude	.82	20.10	4.71	21.28	4.47	3.24	.001
Primitive	.86	20.95	4.95	22.19	4.59	3.32	.001
Unconfinement	.79	17.53	5.61	20.33	5.18	6.55	<.001
Remoteness	.74	17.12	4.94	18.76	4.55	4.40	<.001
Setting Preferences							
Social [2]	.87	32.64	7.90	33.80	6.98	1.84	.050
Physical [3]	.86	60.95	11.45	66.17	9.30	5.32	<.001
Managerial [4]	.84	35.14	9.74	40.95	9.02	6.98	<.001
Setting Perceptions							
Social [2]	.85	34.77	5.80	32.11	7.01	3.59	<.001
Physical [3]	.85	61.53	10.08	58.87	9.90	2.70	.007
Managerial [4]	.84	44.25	8.53	45.24	7.47	0.93	.351

[1] Means range from 4 to 28..
[2] Means range from 8 to 48.
[3] Means range from 15 to 90.
[4] Means range from 11 to 66.

CONCLUSION

Based on the study results, the answer to the question posed by Driver et al. (1987), "do users of the same activity in similar settings, but in different geographical areas, realize similar experiences?" appears to be yes, and no. As with Roggenbuck's (1980) findings, a similar package (based on relative importance) of experience preferences existed for eastern and western wilderness hikers. This would be expected given that both locations are representative of the same ROS (pristine) class. However, Cohutta hikers (eastern) held higher levels of preference for both experience and setting components, indicating that a difference did exist between hikers' "specific packages" at these two locations. The stronger relationship between setting and experience for Comanche Peaks (western) hikers was another indicator of differences between the two groups. One explanation for the findings concerns visitor perceptions of setting conditions in the two wildernesses. Cohutta hikers rated physical and social conditions (e.g., litter, damaged vegetation, number of groups past camp) in a worse state than in the Comanche. Clearly, a better understanding of the similarities and differences in condition indicators and related standards among locations is needed.

Hendee et al. (1990) and Haas, Driver, Brown and Lucas (1987) have suggested intra-wilderness zoning as a means of managing for a spectrum of use opportunities within a given wilderness (i.e., a Wilderness Opportunity Spectrum). Given the apparent differences in the way conditions were perceived to exist in the two wildernesses examined here, an intra-wilderness opportunity spectrum may contribute to management at a regional or national level. Are conditions in designated wilderness locations throughout the system, regardless of their geographic location, perceived to exist at different levels? Do such perceptions across many wildernesses in a region suggest that different condition indicators and standards should be used among areas? Future research

should be directed toward administering the same measures of experience and setting preference as well as perceptions of settings across a representative sample of designated wilderness areas within a region or the national system. Specific measures used across many geographical locations would do much to further our understanding of the relationships between settings, experiences and conditions within a recreation (or wilderness) opportunity class.

Limitations

While Roggenbuck's (1980) study was conducted using seven wilderness areas, the current study examined only one eastern and one western wilderness. Clearly, there are serious limitations to this. Although every effort was made to ensure each wilderness represented its geographical area, no assurances to this effect could be made. Furthermore, basing a comparison on only two study sites limits generalizations. Also data were collected over two different time periods.

Footnote

1. By "similar settings" we presume Driver et al. are referring to settings characterized within the same ROS class (e.g., primitive, semi-primitive motorized, etc.).

2. Data exclude wilderness areas and visitor-days in Alaska.

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Preferences for Solitude in Wild Places

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Abstract: Independent studies of visitors to two wildernesses and one wild and scenic river were conducted between 1990 and 1994. Both the wildernesses and the wild and scenic river are located on the National Forest lands, and the wild and scenic river originates within one wilderness. Numerous commonalities existed among visitors to the two areas, especially regarding their perceptions of the areas with respect to preferences for solitude and privacy during a site visit. Visitors to all areas were highly tolerant of contact with other visitors. For example, approximately two-thirds of river users were unconcerned about the prospect of meeting other individuals or groups during their river visit. On the other hand, less than one percent of wilderness visitors were unconcerned about meeting other people on trails, but over 80 percent would easily tolerate numerous contacts with others. River users were more inclined to participate in a variety of activities than wilderness visitors. The multiple activities of canoeing, swimming, picnicking, and fishing along the river attracted a highly diverse group of visitors. Whereas the same experiences were possible within the wilderness context, visitors were more limited in the purpose of their visit. The more diverse visitor group at the wild and scenic river contributed to the greater proclivity toward social interaction.
Keywords: solitude, wilderness, rivers, social preferences, congestion.

Various notions of why individuals visit wilderness areas have been postulated for many years. For example, in 1964, Westin described *isolation, intimacy, anonymity, and reserve* as four dimensions of privacy. Hammitt and Brown (1984) applied these dimensions in wilderness visitation. Other writers such as Klopfer and Rubenstein (1977), Hammitt and Brown (1984), Rutlin and Hammitt (1993), and Hammitt and Rutlin (1995) all added strength to the notion that privacy or the desire to "get away" is a primary motivation for wilderness visitation. The concept of privacy in wilderness use is not just an American phenomenon. Priest and Bugg (1991) evaluated the findings of Hammitt and Brown on U.S. wilderness with conditions in Australia. Their work supported Hammitt and Brown, although not conclusively.

The privacy concept in leisure motivations is expressed as being as important in attaining other personal goals as the desired goal itself, Manfredo, et al, (1980). Even the Wilderness Act itself defines wilderness in terms of solitude by stating:

> An area of Wilderness is further defined to mean in this act an area of undeveloped Federal land retaining its primeval character and influence, without permanent improvements or human habitation, which is protected and managed so as to preserve its natural conditions and which...*(2) has outstanding opportunities for solitude or a primitive and unconfined type of recreation;*

Use of terms such as "primitive", and "solitude", imply no—or minimal contact with others while on a wilderness visit. Thus, attainment of solitude or privacy were considered essential to a "good" wilderness experience from the beginning.

Preference for solitude has also been considered to hold without respect to place of residence, whether urban or rural. That is, there is no distinction in preferences based on residence (Spencer et al, 1992). However, over the years debate and research about wilderness use and users has shown that wilderness recreation or use is multidimensional, (Brown and Hass, 1980, Schreyer and Roggenbuck 1978 and Watson, et al, 1992). These studies also concluded that escape from society, or solitude, is a major function in wilderness use.

McCloskey (1990) included solitude in his taxonomy of wilderness values under the

heading of "For Enjoyment" and that wilderness is a good place to escape noise and crowds. This may imply that solitude is a wilderness use, not necessarily a reason for wilderness existence.

Young, et al, (1991) in an analysis of acceptable standards for social conditions found what appeared to be inconclusive links between social preferences for contacts with others and acceptable conditions. This study, parallel to the one being reported, opened the door to evidence that preferences for solitude or wild place experiences may be different than previous research indicated.

The purpose of this paper is to assess the validity of perceptions about privacy or solitude with respect to areas designated as wild, such as wilderness or a wild and scenic river. Of particular interest are areas in the Eastern United States where the land area is more confined and population density greater. Also of concern is the possibility that actions to protect the resource itself, which are necessary, may use the privacy or solitude concepts to preclude what many visitors may consider normal density or congestion conditions.

METHODS

Items representing "benefits sought" or "concerns" of visitors to two wilderness areas and one wild and scenic river were evaluated to determine their level of importance. A six-point Likert type scale ranging from "not at all concerned" to "extremely concerned" was presented to area visitors for their response on the selected items. Thus, specific conditions indicating concern for "primitive", "solitude", "natural", and "unconfined" aspects of wilderness or river recreation were isolated. The items used to measure concern were of express interest to National Forest managers who supervised the study areas. The study areas included the Cheaha Wilderness, a 7,940 acre reserve within the Talladega National Forest in Northeastern Alabama; The Sipsey Wilderness, a 25,986 acre segment of the Bankhead National Forest in Northwestern Alabama, and the Sipsey Fork River which originates within the Sipsey Wilderness. All but 17 of the designated 61 miles flow through the wilderness. Thus, many of the wilderness features are also those of the river corridor. However, the major river reach where use occurs is outside the wilderness. Estimated visitor density in 1992-93 on the respective units was 0.73 visitors per acre on the Cheaha, 0.44 per acre on the Sipsey, and 2.54 per acre on the Sipsey Fork River.

In 1992-93, a face-to-face visitor survey was taken on the Cheaha and Sipsey Wilderness areas in Alabama (Clonts, 1994, 1995). A similar survey was initiated within the corridor of the Sipsey Fork Wild and Scenic River in 1993-94. Interviewers were to start at pre-selected points at each visit. A failure to make visitor contact within an hour meant the interviewer would move to an alternative location. Only visitors of at least 15 years of age were asked to participate. A total of 180 observations were obtained on the Cheaha, 193 on the Sipsey, and 205 at the River.

Data on the relationship between visitation frequency and solitude indicators were evaluated using ordinary least squares regression and negative binomial distributions. The general null hypothesis was that preferences for solitude were not significant in explaining frequency of visits (avidity) to a wilderness or wild and scenic river.

The regressions performed took the general form:

$$y = f(x,e)$$

where:

y = number of trips to area in lifetime.
x = variables expressing preferences for solitude.
e = error

Specific variables included were:

x_1 = solitude was trip highlight
x_2 = solitude brought friends closer together
x_3 = time with friends was trip highlight
x_4 = age
x_5 = age^2
x_6 = trip cost
x_7 = income

RESULTS AND DISCUSSION

Comparative descriptive data are shown in Table 1. River visitors were more numerous, had fewer overnight visits, and remained on site for shorter periods. They also tended to visit the river alone and less in organized groups.

Attention is immediately drawn to the proportion of visitors who indicated that solitude and activities which may be indicative of solitude, such as nature study, were engaged in while in the three areas. However, when compared with what they considered as primary reasons for visiting the particular area, the

privacy or solitude issues faded significantly; (See Tables 2 and 3). This doesn't mean that the solitude issue was of no importance, because the frequency of encounters with others was extremely low; (See Table 4). Yet, when asked to rank the importance of solitude and contact with others, differences between river and wilderness visitors became more clearly defined. As Table 5 presents, solitude by itself was not very important for any of the visitors. However, for river visitors, "solitude", which included friends, was quite important. Interestingly, river visitors more often came to the river alone (15.2%), and over half said the number of encounters with others was not important when they were asked to give the optimal number of encounters. Yet, the optimal number of encounters expressed by Alabama wilderness users indicated they simply were not concerned with solitude, or privacy, except when it came to camping near others. Even then, total privacy or solitude was not imperative; (See Tables 4 and 5). Wilderness respondents were willing to accept about five more contacts on the trails than they actually encountered. They also would accept more contact by groups and campers than encountered, but to a lesser extent.

Small, but important differences were observed between the three areas with respect to their site experience; (See Table 6). For example, river users were more prone to reflect preferences for traveling companions. They felt the solitude of the place helped draw friends closer and time with friends was the trip focal point. Sipsey users were far less inclined to feel time with friends as important, yet, more than two-thirds indicated the importance of being with friends on the trip.

Results showed little dependence of actual visitation on the importance of solitude to the visitor. For example, there was virtually no relationship between the total number of prior visits and various measures of solitude preference by area users; (See Table 7). There may be several reasons why these results, which compare favorably with those of Young, et al, may be occurring. First, avidity for using a particular site may not be associated with preference for solitude. Individuals seeking solitude may know that popular places such as those in this study will not provide privacy, so they go elsewhere for that purpose. Second, frequency of visitation is linked to distance traveled. The most frequent visitors live within short driving distances from the sites studied. Access convenience may be more of a factor than preference for the place or solitude. Finally, since the population density in the Eastern U.S. is so great, people may feel that the few encounters they reported are insignificant relative to daily contacts at home or work locations.

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Table 1. Selected Statistics on Visitors to, Cheaha and Sipsey Wilderness Areas, and Sipsey Fork River Corridor, Alabama, 1992-1994

Visit type and length	Units	Cheaha	Sipsey	Sipsey Fork River
Typical visit:		pct.	pct.	pct.
Only a few hours	pct.	21.9	20.7	67.0
A full day	pct.	18.0	28.7	12.4
One or two nights	pct.	44.9	34.6	16.8
More than two nights	pct.	15.2	16.0	8.4
Current visit:				
Day visit	pct.	60.6	68.1	75.6
Overnight	pct.	39.4	31.9	24.4
Total—overnight only	pct.	100.0	100.0	100.0
(all visitors)		(39.4)	(31.9)	(24.4)
Prior visits to area	no.	15.1	20.73	53.75
Number of visits in past 12 months	no.	4.39	5.51	11.07
Party size (mean)	no.	5.44	3.80	4.20
1-2	pct.	44.40	51.80	47.30
3-5	pct.	32.30	37.70	38.10
6-10	pct.	10.50	5.80	10.20
over 10	pct.	12.80	4.70	4.40
Miles traveled to area	mi.	156.80	150.80	74.30

Table 2. Visitor Activities, Percentage Distribution by Wilderness Area and River Corridor, Cheaha and Sipsey Wilderness Areas, Sipsey Fork Wild and Scenic River, Alabama, 1992-93

Activity	Cheaha	Sipsey	Sipsey Fork River	Activity	Cheaha	Sipsey	Sipsey Fork River
	pct.	pct.	pct.		pct.	pct.	pct.
Hiking trails	100.0	100.0	80.0	Bird watching	19.4	22.5	2.9
Hiking off trails	25.6	69.6	14.6	Swimming	5.6	19.6	16.6
Nature study	40.0	50.3	13.2	Photography	37.8	19.1	24.4
Being alone	21.7	54.5	13.7	Hunting and scouting areas to hunt	19.4	15.2	1.0
Camping	39.4	39.1	18.0	Fishing	2.7	11.5	7.8
Visiting with others	25.0	38.7	10.2	Horse riding	1/	2.1	5.0
Picnicking	27.8	32.4	23.9	Canoeing	1/	3.6	8.8
Rock climbing	19.4	30.4	5.4				

1 No designated horse trails or canocable streams on the Cheaha.

Table 3. Primary Reasons For Visiting The Area, Percentage Distribution by Wild Area, Cheaha and Sipsey Wilderness, Sipsey Fork Wild and Scenic River, Alabama, 1992-93

Primary reason for visit	Cheaha	Sipsey	Sipsey Fork River	Primary reason for visit	Cheaha	Sipsey	Sipsey Fork River
	pct.	pct.	pct.		pct.	pct.	pct.
Day hiking	55.6	23.0	56.3	Photography	<.01	3.7	1.5
Hiking and overnight camping	26.1	18.8	7.0	Swimming	1.1	2.6	3.5
Solitude	2.2	9.4	0.5	Fishing	1/	2.6	2.0
Viewing scenery	3.3	9.9	<.01	Curious about area[2]	1.1	2.1	3.5
Hunting	6.7	6.3	1.0	Rock climbing	<.01	1.6	0.5
Nature study	1.1	5.8	0.5	Horse riding	<.01	1.0	5.0
View flowers and foliage	0.6	4.2	<.01	Group activities	<.01	2.6	<.01
Picnicking	<.01	<.01	8.5	Bird watching	<.01	0.5	<.01
Canoeing	<.01	1.6	6.0				

[1] Less Than .01 percent. [2] This may be a weak measurement

Table 4. Observed and Acceptance Levels of Items Influencing Quality of Wild Experience, Cheaha and Sipsey Wilderness and Sipsey Fork Wild and Scenic River, Alabama, 1992-94

	Cheaha Wilderness		Sipsey Wilderness		S.F.River
Experience condition[1]	No. seen	No. accept.[2]	No. seen	No.accept. [2]	No. seen[2]
No encounters (pct of sample)	33.0	—	28.3	—	43.4
No. of canoeists [3]	—	—	—	—	3.2
No. of hiker groups camping nearby	4.4	3.0	4.4	2.5	9.5
No. people seen on trail	3.6	17.9	3.7	10.5	3.8
Number of hiker groups seen on trail	3.5	6.7	3.5	5.0	3.8
Optimal number of encounters on visit[4]	—	—	—	—	3.7

[1]Ratings - 1=not at all; 2=slightly; 3=somewhat; 4=moderate; 5=very much; 6=extremely. [2]No canoeable streams on the Cheaha.[3]Acceptance levels were the actual number of encounters visitors would tolerate. Acceptance was not measured for the Sipsey Fork Wild and Scenic River. [4]Optimal encounter number recorded only for River visitors.

Table 5. Visitor Ratings of the Relative Importance of Potential Indicators of Wild Experience Quality, Cheaha and Sipsey Wilderness Areas, Alabama, 1992-1993 [1]

	Cheaha Wilderness		Sipsey Wilderness		Sipsey Fork River	
Potential indicator	Mean	Rank	Mean	Rank	Mean	Rank
Amount of litter seen	5.81	1	5.43	1	4.97	1
Wildlife seen	5.03	2	4.39	3	4.80	2
Number of groups that camped within sight or sound	4.44	3	4.40	2	4.46	3
Total number of people seen along trail/river	3.55	4	3.73	4	3.37	9
Number of hiker groups seen along trail/river	3.46	5	3.48	5	3.36	10
Being alone was trip highlight	2.61	6	2.18	7	4.08	6
Solitude was main purpose of visit	1.70	11	1.53	11	1.50	11
Socializing with friends was trip highlight	1.96	8	2.19	6	3.97	8
Solitude brought friends closer together	1.88	9	1.83	8	4.19	5
Tried to learn all possible about site	1.98	7	1.83	9	4.02	7
Stopped often to examine site environment	1.92	10	1.66	10	4.40	4

[1] Ratings - 1=not at all; 2=slightly; 3=somewhat; 4=moderate; 5=very much; 6=extremely.

Table 6. Visitor Experiences During Most Recent Wild Area Visit, Percentage Distribution by Site Visited, Cheaha and Sipsey Wilderness Areas and Sipsey Fork Wild and Scenic River, Alabama, 1992-1994

Experience factor	Experience satisfaction		
	Cheaha	Sipsey	Sipsey Fork River
	pct.	pct.	pct.
Tried to learn as much as possible about land/river	81.7	81.1	80.5
Solitude of place helped bring companions closer	85.5	87.0	90.2
Time with friends was focal point of trip	78.3	67.5	80.5
Use of outdoor skills enhanced feelings about self	81.1	74.3	na
Stopped often along trail/river to examine environment	81.1	92.2	92.2
Being alone was trip highlight	53.9	70.7	86.4

[1] na= not asked in survey

Table 7. Statistical Parameter Estimates for Wilderness and Wild and Scenic River Visitors, Alabama, 1993-95

Variables	Negative binomial	Ordinary least squares
Cheaha Wilderness: (constant)	- 0.429 (2.527)	-76.587 (95.62)
Being alone was trip highlight	0.734 (0.481)	27.059 (19.41)
Solitude helped bring companions closer together	0.569 (0.347)	- 0.578* (17.76)
Time with friends was trip highlight	- 0.9382(0.6042)	-38.693(25.10)
Age	0.2415*(0.1396)	6.704(5.140)
Age^2	- 0.003(0.002)	- 0.071(0.063)
Trip cost	- 0.330**(0.177)	- 0.165(0.123)
Income	0.00015)(0.00011)	- 0.002(0.004)
$/R^2$	4.1459(1.395)**	0.0626
Sipsey Wilderness: (constant)	2.493*(1.373)	32.78(25.04)
Being alone was trip highlight	- 0.451(0.3001)	- 9.308(5.010)
Solitude helped bring companions closer together	- 0.243(0.4223)	- 2.473(7.264)
Time with friends was trip highlight	- 0.427(0.322)	- 8.022(5.146)
Age	0.0424(0.074)	- 0.212(1.322)
Age^2	- 0.00043(0.00098)	0.0048(0.0170)
Trip cost	- 0.0073**(0.00274)	- 0.0775(0.0471)
Income	0.00012*(0.000068)	0.00019(0.0001)
$/R^2$	2.3100(0.612)**	0.0857
Sipsey Fork Wild and Scenic: River (Constant)	- 2.132(2.493)	-135.16(126.7)
Being alone was trip highlight	0.184(0.747)	6.787(36.43)
Solitude helped bring companions closer together	0.1239(1.278)	4.457(43.36)
Time with friends was trip highlight	0.101(0.490)	23.702(33.11)
Age	0.3054(0.1186)*	8.247(5.888)
Age^2	- 0.289(0.1389)*	- 0.0734(0.0661)
Trip cost	- 0.017050.00603)**	- 0.2548(0.2542)
Income	- 0.000429(0.0002)*	- 0.01(0.00951)
$/R^2$	2.496(0.551)**	0.0623

**significant at 5% level or better.

*significant at 10% level.

Visitor Information, Education and Interpretation in Wilderness and Natural Areas *

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Introduction

The term "wilderness," since it has been applied to specially designated natural resource areas, has created a conceptual dichotomy. On the surface, the term "wilderness" would seem to denote areas devoid of human impact and management. However, when applied to specific politically bounded land parcels that are identified as "wilderness" for their specific characteristics and management approaches, wilderness identifies areas requiring active management just as do any other natural resource areas (parks, preserves, forests, natural areas, etc.). This means prohibiting certain types of activity (both visitor use and management activity) as much as allowing certain types of uses. Designation also has served as a sort of magnet for outdoor recreationists who seek solitude, personal challenge, escape and a variety of other experiential benefits dependent on "untrammeled," isolated (at least perceived as such), natural resources. While provision of this type of recreational experience was not the primary rationale for protecting large natural ecosystem tracts, "wilderness" attracted people, and agencies responsible for wilderness management also became responsible for management of people.

Eastern wilderness areas, which tend to be smaller than wilderness parcels in other parts of the United States, often have been impacted previously (sometimes extensively) by human habitation or other use. Being close to large population centers, they have sustained traditional uses (both recreational and non-recreational) by local residents as well as attracted large numbers of visitors, especially relative to parcel size. On-site use as well as local and regional development and industrial activity require management of people, their actions, and their decision-making. Almost by default, managing people requires communication.

Often the assumption made, particularly by wilderness users, is that communication provided by managing agencies is confined to informing potential visitors of the types of recreational experiences available, how to get to the sites, where to park, how to move through the sites (maps), etc. While this definitely is one type of information needed, there are other information and education needs for managing wilderness and providing helpful information for users:

- how to navigate and move safely through the wilderness;
- how to travel and camp with minimum impact to the resources;
- how to dispose of waste appropriately;
- how to identify flora and fauna of the area;
- potential dangers and how to minimize personal risk;
- information about how the particular ecosystem functions; and
- explanations of regulations and restrictions.

Most of the above deal directly with guiding and enhancing recreational use of wilderness. However, direct users are not the only people in need of wilderness information and education. Non-user groups (such as adjacent landowners, nearby community residents and business owners, industrial managers and operators, and the "general public" across the country) also are important target audiences for wilderness information and education. If the citizens of the United States are to support existence of wilderness, they must understand and support its multiple values (ecosystem

values--biodiversity and habitat protection, watershed protection, air cleansing; spiritual values; economic values; social values; therapeutic values; and existence value in addition to recreation and tourism values). If they are to be environmental stewards and support protection of such areas, in spirit and in action, they must personally understand and value the resources. If local landowners and business people (including expedition guides and other tourism business operators) are to work in cooperation with wilderness managers in ways that enhance the goals of each, all these constituents and potential adversaries must be informed and educated, as well as provided the opportunity for participation and input, during the process.

In the eastern United States, many gateway and surrounding communities are heavily dependent on visitor use of wilderness and associated park areas for their economic health. In turn, their actions (development, level of use, traffic, water and air emissions, noise levels, etc.) impact on environmental quality of both the designated wilderness and the buffer areas. Protecting the integrity of wilderness should be a priority for long-term economic viability as well as quality of life for area residents. However, without understanding the impacts and interrelationships, stakeholders may make decisions inappropriate for long-term ecosystem and economic viability. Again, education, interpretation, information and opportunities for two-way communication are critical for appropriate decision-making.

This section of the proceedings is comprised of papers that discuss a variety of innovative and effective programs in environmental education, environmental interpretation, and other communication-based strategies to enhance experiences of wilderness and natural area visitors as well as more effectively manage the resources. Before providing an introduction to the specific papers, let's review some of the background and rationale for use of information, interpretation and education for wilderness and natural area management.

History of Interpretation and Environmental Education

While scientists interested in natural history were involved in research and writing from the early days of the United States, and botanical gardens and science museums were established in the late 1700s and early 1800s, a big surge of interest in the environment and its protection occurred in the late 1800s and early 1900s. Botanical gardens, such as the Arnold Arboretum at Harvard and the New York Botanical Garden, were constructed during this time as were zoological parks in major urban areas such as Cincinnati, Philadelphia and New York City. Writers, including John Muir and Henry David Thoreau, sparked interest and challenged beliefs and assumptions about use, abuse and protection of the environment. Paintings by Thomas Moran, Albert Biestadt and Alfred Jacob Miller took images of the spectacular natural features of western North America to citizens in the east. Nature guiding activities were conducted in the late 1800s, too. For example, Enos Mills was leading nature-oriented field trips up Longs Peak in Colorado as early as the summer of 1889. Soon after World War I, Charles Goethe, after a trip to Switzerland, organized nature activities at a resort near Lake Tahoe. After attending one of these programs, Stephen Mather, who would become the first director of the National Park Service, developed a similar nature program at Yosemite National Park in 1919. These early nature programs were used both to enhance visitors' experiences at parks and nearby resorts and to gain political support for protecting areas and to increase tourism. Since those early beginnings, nature-based activities have been conducted in many places, both on-site and via outreach activities, and by numerous agencies and private nonprofit organizations.

Interest and funding for nature interpretation in general has waxed and waned over the years, depending on broader social trends and priorities, global events (e.g., wars, oil embargo), climatic changes and concerns (e.g., dust bowl, drought, floods, global warming, ozone depletion, acid rain, volcanic impacts on climate), and periods of environmental degradation (e.g., Love Canal, the burning Cuyahoga River, nuclear accidents such as at Three Mile Island). A major surge in interest occurred in the late 1960s and early 1970s, highlighted by the first Earth Day in 1970. During this time, many environmental education programs were developed for school districts across the country, numerous nature centers were built, many visitor information and interpretive centers were built in the National Parks (a response to the Outdoor Recreation Resources Review Commission report), and enrollment in university programs dealing with the environment (e.g., forestry, parks and recreation, fisheries and wildlife, and environmental science) grew dramatically. Interest and funding waned in the late 1970s and early 1980s, but has increased in some sectors since then. The 20th anniversary of

Earth Day in 1990 created broad community awareness of environmental issues through extensive media coverage and numerous organized activities. But most of the programs and mass media messages focused on issues such as recycling and tree planting, issues and activities having direct relevance to urban audiences; wilderness generally was ignored.

Interpretation, Education and the Wilderness System

The Wilderness Act of 1964 officially provided a rationale, management structure and philosophy for designating specific wilderness areas. Obviously, the history of interpretation, environmental education, and other information preceded its passage. However, the techniques were rapidly applied to wilderness areas. Use of nonformal interpretive programs and other information distribution systems (e.g., brochures, trailhead exhibits, videos) for wilderness area users probably have been the most numerous throughout the history of designated wilderness. However, incorporation of environmental education programs (particularly in cooperation with school and other youth groups) have continued to expand (though unevenly, dependent on resources and managing agency priority). In recent years, increasingly more efforts are being made to reach the non-users and non-traditional groups.

Whether labeled information, interpretation or education, the combined communication efforts remain an important component of wilderness and natural area management. Evidence of this recognition is apparent in numerous published materials, both in state and federal land management publications (such as inclusion of a chapter on environmental education and interpretation in the March 1993 publication titled *Fostering Environmental Stewardship*, produced by the New York State Office of Parks, Recreation and Historic Preservation, and the proceedings of a series of round table sessions jointly sponsored by federal U.S. and Canada land management agencies and the National Association for Interpretation, titled *Preparing for the 21st Century: Solving Management Problems through Interpretation*, 1990) and in professional academic proceedings (for example, inclusion of three sections of articles dealing with use of education and interpretation for managing wilderness areas in *Managing America's Enduring Wilderness Resource*, 1990, and a section in the Proceedings of the Fourth International Outdoor Recreation and Tourism Trends Symposium, 1995). Inclusion of a full track on environmental interpretation and education in the Wilderness and Natural Areas symposium, as presented in this proceedings, continues that recognition, effort and emphasis. Challenges are discussed later in this paper.

How are Information, Interpretation and Environmental Education Applied to Wilderness and Natural Areas?

The term "information" typically refers to a collection of facts, with the focus on providing tidbits of information to help people make decisions and find places. Information, in this context, would include such things as routes and wayfinding with maps, fees, hours/seasons of operation, descriptions of terrain, parking information, and site use registration requirements and procedures. Interpretation and education go beyond provision of simple facts. However, through the years, there has been active debate about the differences and similarities between interpretation and environmental education. Without reviewing details of the debate or arguing one perspective over another, some of the more commonly accepted descriptions are presented here.

Interpretation is a communication process that can occur in many places and through many modes or media. Typically it occurs in settings that are informal or nonformal (such as parks, wilderness and natural areas) so that:

- target audiences are voluntary (non-captive);
- the interpretive experience usually is short term (single, stand-alone experience) rather than part of a series of sessions or experiences over an extended period of time;
- topics can range widely (history, culture, nature--thus appropriate for wilderness and natural area applications);
- participants often do not know each other;
- messages can be delivered personally or non-personally;
- interpretive experiences can be either in groups or solo; and
- goals of interpretation are more diverse than having the target audience learn specific facts.

Additionally, traditional outcome accountability (e.g., knowledge testing) usually does not exist.

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However, interpretation also can be delivered and incorporated into more formal learning environments, such as schools. This is where much of the blurring and debate occurs.

Environmental education often is misperceived as that education about the environment which occurs primarily within schools and with youth. While the formal school setting is one place where environmental education can occur, the setting is not the defining characteristic for environmental education, nor are schools the only venue for it. As for interpretation, environmental education can occur in formal, nonformal and informal settings, each having its own contextual attributes which influence how information is presented (Tamir, 1990/91). Additionally, environmental education is not restricted to youth; rather, it can be directed at people of all ages. The more defining characteristic is the goal of environmental education. As stated by Hungerford and Volk, widely acknowledged as leaders in the field of environmental education, the superordinate goal of environmental education is "to aid citizens in becoming environmentally knowledgeable and, above all, skilled and dedicated citizens who are willing to work, individually and collectively, toward achieving and/or maintaining a dynamic equilibrium between quality of life and quality of the environment" (Hungerford and Volk, 1990, p. 19). This definition adds the components of decision making and action to knowledge and awareness. Therefore, environmental education seeks to work with people of all ages, at multiple levels, including promotion of awareness and sensitivity to environmental issues, development of attitudes of concern and skills for identifying and solving environmental problems, and, ultimately, active participation to resolve environmental problems.

Recently, however, the term "environmental education" has come under attack from several sources, with claims that it is really environmental preaching or brain-washing. According to claims, its specific goal is to preserve all natural resources and species, regardless of personal freedom constraints or negative economic impacts, rather than providing individuals with cognitive knowledge base and critical thinking skills to assess, then make their own decisions about personal and collective actions related to resource use and protection. Thus, the challenges to effective environmental education may be increasing.

Nevertheless, wilderness certainly is an appropriate topic or arena for environmental education; additionally, wilderness can be used as a venue or system for teaching a variety of environmental topics and issues. Perhaps it is useful to simply term all communication efforts related to wilderness as "wilderness education." As adapted (to include non-users as well as users of wilderness) from a summary by Roggenbuck and Manfredo (1990), nine major purposes of wilderness and natural area education include:

- providing information about wilderness (or other natural area) site characteristics to help potential visitors plan and attain experiences they seek;
- separating wilderness and other natural resource user groups whose activities and behaviors may be incompatible and result in user conflict;
- directing natural resource users whose preferred experiences and activities are not dependent on wilderness to other, more appropriate resource areas;
- redistributing use from heavily used to lightly used wilderness areas (or to more appropriate non-wilderness areas);
- redistributing use across time to minimize social and environmental impact resulting from heavy concurrent use of the resource;
- eliminating or reducing depreciative or other problem behaviors;
- teaching a wilderness or natural resource stewardship ethic (to users and non-users);
- gaining cooperation of wilderness users as well as other constituents and stakeholders in helping solve wilderness and other resource management problems; and
- retaining freedom of choice (freedom from excessive constraint) by users within wilderness.

Challenges for Wilderness Education

While there is still great need for wilderness and natural education for adults as well as youth, there are numerous challenges in communicating with individuals. People are so bombarded by information and sensory stimuli. Advertising seems to invade previously sacred territory--school buses, school hallways, restrooms, web sites, telephone systems (free telephone service, available in Sweden, which incorporates 10-second commercials periodically), restrooms, rental videos, walkways, organization newsletters, etc. Additionally, more and more people are becoming

increasingly segregated, physically and spiritually, from the natural world. We become more accustomed to sanitized, short and simplistic sound bytes as a way to explain our world which, by its nature, is not sanitary or simple. How can we reach the many audiences in need of wilderness education? Perhaps the direct users are the most amenable and receptive to such education. But non-users pose a great challenge and demand the most effective of outreach efforts. Other challenges facing those involved with wilderness and natural area education are presented below.

- Rapid technology changes (including widespread use of computers and electronic media) challenge traditional ways of communicating messages; however, traditional strategies cannot be abandoned because not all people have access to or like electronic communication.
- Diverse populations (age, cultures, ethnic groups, economic classes, various disabilities) create demands for non-traditional approaches and outreach programs as well as different conceptualizations to make messages relevant to them.
- Changes in organizational structures (fewer full-time staff members, more use of contractors and consulting services) and increased use of team approaches to design and development, as well as changing technology, create demand for job skill diversification.
- Funding reductions from traditional sources create a demand for alternative funds development, marketing skill, and partnership development.
- Public demand for accountability (which includes an expectation of serving ALL people) creates an environment of public participation, inclusion and community focus as well as demand for quality and relevant services; people want to have input in wilderness and other natural resource management decisions, especially when those decisions impact them.
- Public demand for accountability requires increased emphasis on visitor research, marketing, and public input during development and implementation on-site and outreach program as well as resource management strategies. Evaluation of programs, services and management approaches is also important.

Section Overview

While several of the articles presented in this section focus on the traditional target audience for environmental education and interpretation--school and other youth groups--other audiences and issues are addressed. The section begins with an inspirational overview article by Thomas Rillo titled The Role of Wilderness in Environmental Education. Based on years of experience and a deep commitment to the value of interpretation and environmental education, he illustrates that not only can those communication strategies play a role in wilderness, but that wilderness has a very real role to play in the education of our citizenry, especially the youth.

Of the youth-focused articles, one (*Parks as Classrooms*) describes an extended park-based program conducted in the National Park Service's Great Smoky Mountains which integrates classroom programs with a rather extensive on-site experience by upper elementary school children living in the region. This program integrates both natural and cultural resource components. Another paper, *Solving Wilderness Issues: An Environmental Education Partnership that Involves Students in Wilderness Management* (Knapp and Marsan), describes and evaluates another extensive school/management agency (this time, the US Forest Service) partnership that combines classroom education and on-site research experiences by the middle school participants. This program expands its objectives beyond knowledge to include understanding and involvement by the youth in resource research and development of resource management recommendations. A third paper, *Integrating the Wilderness Land Ethic Box into Elementary and Middle Schools* (Arnaudin), also targets youth, but relies on outreach education and use of local areas rather than demanding a field trip to a distant wilderness area. All three of these articles, in addition to describing the programs, discuss challenges and recommendations for developing and implementing partnership education programs.

Another article, *Great Smoky Mountains Institute at Tremont: Connecting People and Nature* (Voorhis), briefly describes a series of program offerings by a nonprofit organization which target adult as well as youth groups. In Michigan, the Department of Natural Resources has implemented a variety of new interpretive programs, including both on-site and outreach programs, in an effort to reach non-traditional park audiences (adults and youth) in an effort to assist development among residents and visitors a stewardship ethic. The paper is titled *Michigan State Parks: Interpretive Programs for the 21st Century* (Nagle).

The remaining articles discuss a variety of issues related to planning wilderness and natural resource use information strategies, soliciting public input for management strategy development, and training and education of future resource managers. Parker and Koesler, in Urban Populations as an Impact on Wilderness: A Study of Values in the Los Angeles Basin, address issues of cultural diversity and urban perspectives as important considerations in development of resource management strategies as well as information content and techniques relative to resource opportunities and use. Wadzinski, in Saving an "Unwild" Wilderness Through Interpretation, describes a program in which public input was used in a partnership program (university and resource management agency) to develop an interpretive program focused on appropriate use of a wilderness area located close to a metropolitan area. Benefits beyond creation of the program included direct interaction between residents, site users and the resource agency, helping each group to better understand the concerns and perspectives of the others. Finally, an article by Vander Stoep (You Can't Talk to the Trees: Providing Resource Managers with Training in Interpretation, Education and Other Communication Skills) discusses the need and provides recommendations for communication training (or retraining) by all current and future natural resource managers.

Read On . . .

We hope these papers provide ideas, spark innovative thinking, and further encourage development and implementation of interpretation, education and other communication efforts by agencies, in partnership with constituents and other organizations, to improve management and protection of wilderness and natural areas, to enhance experiences of site users, and to contribute to development of a resource stewardship ethic among citizens.

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The Role of Wilderness in Environmental Education

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Abstract: Ten propositions define the role of wilderness in environmental education, six of them applying directly to wilderness. Wilderness as a concept can be defined in direct correlation with the individual's sense of perception based on experience. The human animal is uniquely designed both physiologically and psychologically for the outdoor environment. The environmental condition of planet earth is threatened with severe imbalance and only environmental literacy can insure a harmonious balance. Environmental literacy is a prerequisite to wilderness and other natural openspace preservation. All institutions, agencies, and organizations dealing with people should accept responsibility for environmental education and consequently wilderness education. Environmental education is a prerequisite to wise and judicious wilderness consumption.
Keywords: environmental literacy, environmental education, wilderness education

It is a distinct honor to be invited to speak to you this morning about a topic that is so dear to my heart. Over fifty years ago I began my professional career in outdoor education. So you see, I am a living anachronism like the Anhinga, the living avian fossil of Florida's waterways.When Mike Legg invited me to make this presentation I was reminded of a story that tells about an old storekeeper who ran a general store here in the Smokies, not too far from Cades Cove. It was just after the Civil War that this story took place. It seems that the storekeeper was known to recite something from the scriptures whenever he went to the cash register to deposit money from a sale. It was a typical general store of the period and there was the usual group of old cronies who hung around the pot-bellied stove and chewed and chawed for most of the winter days. One cold winter afternoon a little boy from the community came in to buy some hard candies. A hush fell over the cracker barrel old timers as the storekeeper made his sale and recited as he struck down the cash register keys, "Blessed are the children for they shall come unto me". A little later a woman came in to buy a loaf of bread. Once again the storekeeper made the sale, took the coins and said as he punched the cash register keys, "Bread is the staff of all life." Much later a stranger came into the store brushing the snow from his greatcoat. He said to the storekeeper, "I want to buy a horse blanket for my horse. It is a very cold evening and he is a very fine horse." Once again a hush fell over the cracker barrel and wood stove group. They knew that the storekeeper had one kind of horse blanket in three different colors. The storekeeper showed the blue blanket first. The man felt it and said, "How much is it?" The storekeeper replied, "Ten dollars." The stranger said, "It is a very cold evening and he is a mighty fine horse. Do you have something better?" The crafty storekeeper pulled down a brown blanket and said, "This is fifteen dollars." The stranger replied, "Do you have a better one for it is a cold evening and I have a mighty fine horse?" The storekeeper displayed a red horse blanket and stated, "This will cost twenty-five dollars." The man said, "Fine. I'll take it." He paid his money and left. The storekeeper took the money over to the cash register while the chewing and chawing group quieted down to listen. The storekeeper punched the keys and said, "He was but a stranger and I took him ...in."

So, you see, I was but a stranger and Don Brown, Mike Legg and a few others took me ...in! I am in a unique position this morning of not caring whether you like what I am going to say or not. As an emeritus professor with all the rights and privileges that go with it, I do not have to worry about promotion, making tenure, or pleasing my dean. Seriously, I do care about you and sharing some thoughts with you. I am here because someone felt that osmosis had to occur with the old fellow (that is, the process of going from the dense to the less dense) and he had to have learned something in fifty years.

I would like to make my presentation with

ten propositions for which I take full responsibility. The first proposition is as follows: *Wilderness as a Concept Can Be Defined in Direct Correlation with the Individual's Sense of Perception Based on Experience.* We would be remiss if we thought everyone had the same definition of wilderness. It is based on how one perceives wilderness from previous experiences. A sidewalk median, a vacant lot, a city park could be thought of as being wilderness to an urban child living in the inner city. If wilderness contains the characteristics of the unknown, of challenge and danger, then it need not have to be a vast area such as the Bob Marshall Wilderness in Montana. Colin Fletcher, in his book *The Man Who Walked Through Time* makes this point clear when he said:

> I think some element of fear lies at the root of every substantial challenge and it makes no difference at all whether the challenge is to your mind or to your body, or, whether with richer promise than either alone, it embraces both.

Edward Abbey, the desert anarchist, stated in his book *Journey Home*, "Why the surly hatred of progress, the churlish resistance to all popular improvements—why wilderness? Because we like the smell of danger."

I remember one of my mentors, Dr. William "Cap'n Bill" G. Vinal, late professor of nature education at the University of Massachusetts demonstrating how a 12-inch piece of string and a hand lens could lead a child into a micro-wilderness that was never before explored by that child. All of the great outdoor teachers from whom I have learned had the capacity and skill of teaching in sequential steps leading from the smallest learning environment to the largest. Such individuals as E. Laurence Palmer of Cornell; Dr. L. B. Sharp, a pioneer in outdoor education; Dr. William "Moosewood Bill" Harlow, dendrologist, Syracuse University; Dr. Reynold E. Carson, outdoor educator, Indiana University; Dr. Helen Ross Russell, urban environmental educator, Jersey City, N.J., are but a few of my mentors and colleagues who taught in the micro-wilderness environment as well as the macro-wilderness environment.

Carl Sandburg, the renowned poet laureate, defined wilderness in his poem "Wilderness". It went like this:

> There is an eagle in me and a mockingbird... And the eagle flies among the rocky mountains of my dreams and fights among the Sierra crags of what I want... And the mockingbird warbles in the early forenoon before the dew is gone, warbles in the underbrush of my Chattanoogas of hope. Gushes over the blue foothills of my wishes... And I got the eagle and the mockingbird from the wilderness.

To Sandburg, the eagle represented the macro-wilderness and the mockingbird the micro-wilderness. The macro-wilderness, such as the Bob Marshall, the Quetico-Superior, the Bridger-Teton, ought to represent an overall goal, the upward reach for all of us to achieve someday. Perhaps this goal will never be reached by most of us and perhaps this is good, especially for the stability and preservation of wilderness areas.

My second proposition is *The Human Animal is Uniquely Designed or Adapted Both Physiologically and Psychologically for the Outdoor Environment.* Let's look at the physiological aspect first. If we look at the anatomical features of our bodies we can readily see how we are designed for life in the out-of-doors. The plantar flexion of the foot, the spreading of the toes, the hinged knee, and the pelvic girdle with movable femur bones are all enablers that help us to move about on undulating terrain. The prehensile movement of the thumb, the flexibility and movement of the arms, the recessed eye sockets, hair on the body, hair in the nose, hair in the ears, the eyelash movement are some of the evolutionary adaptations of the human body to the outdoor environment. We are outdoor animals basically and future evolutionary changes to us, anatomically speaking, may be too distant to even comprehend.

Psychologically we are products of a very long existence in the outdoors. We have lived outdoors as a species far longer than we have lived indoors. In fact, we have lived indoors only for 3,000 years, and in the outdoors for approximately 3,000,000 years. In the Olduvai Gorge in Africa, Thomas Leakey, son of famous anthropologist Dr. Louis Leakey, discovered a human life form which he called Lucy. Lucy was carbon dated to be approximately 3,000,000 years old. Regardless of skeptics and critics, we as a species have been living outdoors for a far greater length of time than we have lived in human-made shelters. The human mind has stored in its vast memory cells instinctive aspects of this longevity of life in the outdoor environment. My good friend and colleague Dr. Tom Smith, a behavioral

psychologist, believes that there is a wilderness beyond and a wilderness within. He uses the wilderness setting as a therapeutic environment organizing climbing treks and canoe trips, sharing with people their search for better understanding of self and guiding them toward a new awareness of their relationships, their behaviors, and their decisions. The wilderness within, for me, is an association with the outdoors effectively stored in the computer-like memory cells of the human mind. It calls us to the outdoors for all sorts of leisure outdoor recreational activities. Just witness the exodus of the masses to get out of the city to open spaces, water sites, mountains, etc.—vehicles crossing bridges, going through tunnels, winding through traffic arteries, all loaded down with outdoor paraphernalia. The psychological adaptation to the outdoors lies dormant in even the most urban of us until just the right conditions prevail. Then, even the most citified of us fling ourselves with great fervor to the wilderness beyond without ever realizing that the catalyst propelling us comes from the wilderness within.

My third proposition is *The Environmental Condition of Planet Earth is Threatened with Severe Imbalance and Only Environmental Literacy Can Insure a Harmonious Balance.* Environmental literacy should begin developing with parents teaching their children. We know that this is not universally possible until the parents themselves are products of an environmental education program and are inwardly motivated to teach their children what they believe to be basic values and attitudes toward stewardship of the environment. They are too busy or just not informed enough to know how to initiate this imperative for survival that we call environmental education. It falls upon the shoulders of agencies, institutions, and particularly schools to assume this responsibility. The goal of any outdoor education program should be the development of an environmentally literate citizenry—a citizenry that is aware of the environmental programs, informed enough to articulate effectively, and active in programs leading to the restoration of environmental quality for all forms of life and non-life. Only through experiential programs leading to awareness, articulation, and action can there be an enlightened citizenry that will fight for a sanative environment. Stanley Casson, a British anthropologist, wrote *Progress or Catastrophe* in 1938. In this provocative book he stated, "When man's practical inventiveness runs ahead of his moral consciousness and social obligation then he ultimately faces disaster." Although Casson wrote this book fifty-eight years ago, the message still is very much applicable to our world environmental situation today.

My next proposition closely follows the preceding one. It goes like this: *The Public or Private School as an Educational Institution has the Greatest Responsibility for Environmental Education because of Mandatory Attendance.* The public or private school sector is a captive audience. The students have to attend school to the mandatory age of sixteen. The opportunity to integrate and correlate environmental concepts with on-going school curriculum is great. This does not mean that the sole responsibility lies with the public and private school. Wherever other agencies and institutions work with people in an educational sense, the responsibility to enhance environmental literacy is equally important. It's just that the schools have the greatest opportunity, and they can begin when a child first enters school at the age of five.

An experiential program of environmental education should be so designed as to integrate all curriculum areas to outdoor and indoor activities leading ultimately to environmental literacy. In designing a program the focus or concentration should be in the affective domain for kindergarten to grade three—the affective domain being that area of sensitivity and discovery that is paramount to that age group. In grades four to eight, the emphasis should be placed on the cognitive domain, which is defined as being that area of factual knowledge in which the learning steps of observation, reflection and research manifest themselves. It is here that the students gather data in the field, organize the data, and then proceed to report it in a systematic manner. At the upper grade levels, nine to twelve, the focus should be on the environmental behavior domain. It is here that students monitor environmental situations where possible degradation can or has occurred. It is at this level where advocacy can be directly experienced by the participants. It is at this level also that the students can experience environmental action programs very akin to those they will engage in as adult citizens in their respective communities. As agency personnel, it behooves you to know how schools structure their outdoor learning programs and how your resources can best be utilized. Your activities

should *enrich*, *expand*, and *extend* the outdoor learning curriculum. They are the three "Es" that an off-site agency can establish as guidelines when cooperating with visiting school groups or agency outreach programs. Ideally, it would be best if the agency would employ a liaison whose background would be in education.

Proposition five is *Environmental Education is a Prerequisite to Wise and Judicious Wilderness Consumption.* The basic values and attitudes leading to a love of the woods and open spaces can effectively and efficiently be learned through a direct hands-on approach. This experiential approach can be formal or informal in design. However, in our busy and often chaotic society the formal approach seems to be the best one to follow. Parents taking to the outdoors with their children doesn't always result in the passing on of sound fundamental values with reference to environmental quality. Dr. William B. Stapp, environmental educator at Michigan University, has stated that over 85 percent of our population in the U.S. are urban and suburban, and the opportunities for environmental education should be directed to this potential voting population. They can best be reached through a formal program rather than one that is informal.

The basic beliefs and values for environmental understanding can begin with a kindergarten class exploring the wilderness of a school playground or sidewalk. So many times young outdoor adventurers have been indicted for unwise consumption of outdoor resources when, in fact, they did not know any better and acted in ignorance.

Paul Petzoldt, leading authority in wilderness education, often has said that there needs to be a certification program for wilderness leaders. These leaders would then impart their knowledge to participants in their respective programs. In fact, Paul Petzoldt devoted his entire career to educating for wise and judicious use of wilderness resources. He founded the National Outdoor Leadership School (NOLS) and through this school prepared many fine wilderness leaders who practiced low impact use of resources. Some of their techniques of wilderness travel are among the finest in the world. Some school systems in the United States have offered adventure programs as alternatives to physical education classes and, consequently, offered courses that prepared young outdoor recreationists to be better consumers of the wild outdoors. Petzoldt defined wild outdoors as being that area beyond the roadhead.

Proposition six is as follows: *Environmental Literacy is a Prerequisite to Wilderness and Other Natural Open Space Preservation.* For the very same reasons that proposition five directs attention to wise and judicious wilderness consumption, proposition six focuses on environmental literacy as a prerequisite for wilderness preservation. An outstanding example of this was Theodore Roosevelt and his involvement with wilderness preservation. Because of his sickly condition and his recovery to health, his interest in conservation and preservation manifested itself. His need to recover good health in the wild west of our country and his interest in hunting afforded those fundamental experiences necessary for him to develop a strong love for the outdoors. His environmental literacy came as a result of direct, informal experiences in wild places.

Edward Abbey, again in his book *Journey Home*, stipulated this basic need for wild places and accruing positive experiences. He said:

> Who needs wilderness? Civilization needs wilderness. The idea of wilderness preservation is one of the fruits of civilization, like Bach's music, Tolstoy's novels, scientific medicine, novocaine, space travel, free love, the double martini, the secret ballot, the private home and private property, the public park and public property, freedom of travel, the Bill of Rights,

Under Teddy Roosevelt's presidential administration five new national parks were developed, forty-six wildlife refuges were started, and a host of new national monuments were established. Jimmy Carter, ex-president of our nation, has become in retirement one of our most effective presidents. During his administration more land was allocated as wilderness than during any other presidential administration since Teddy Roosevelt. There are a host of wilderness visionaries who, because of their environmental literacy, have left their mark in the realm of wilderness preservation. Names like Sigurd Olson, John Muir, Bob Marshall, David Brower come to mind. Where did they get their environmental literacy? Perhaps a doctoral study devoted entirely to this question would make a significant contribution. Once we know what the common denominators are, we can bottle them up and include them in our environmental education programs.

There are countless lesser known individuals who have toiled in the vineyards of the

environmental movement. What has motivated them? What common background experiences have they had? We all know a few of these environmental advocates personally. What motivates them and how can this information be incorporated into programs designed for younger people?

Henry David Thoreau stated, "In wildness is the preservation of the world". This Thoreau quotation, which the Wilderness Society has long used almost as a motto, reveals that he discovered more than 134 years ago that a leaven of wilderness is necessary for the health of the human spirit, a truth we seem to have forgotten in our headlong rush to control all of nature.

My seventh proposition focuses upon where environmental education should begin and is stated as: *Environmental Education Should Emanate from Where an Individual Lives with Regard to Education, Family Relationships, Spiritual Uplift, and Leisure Activities—In Short, the Individual's Immediate Environment.* I strongly believe in the concept that learning should be sequential and that there are fundamental facts or experiences that precede those that follow. Athletic coaches at the upper levels of competition, especially the college or university level, fully expect that fundamentals of the sport will be mastered before competing. This may be a simplistic analogy, but it applies to academic learning as well as the athletic scene. I feel that environmental education should begin where an individual spends most of his or her time. The immediate living environment, be it the six-block world of the inner city child or the farming community of a rural child. This is the first zone to be explored in outdoor environmental learning. From here each environmental zone should be thoroughly explored and concepts assimilated before moving on to the next. This is important if basic beliefs and values are to be developed for constructive action leading to the restoration of quality in the living environment.

I call the first series of environmental learning zones *innerland*. It is comprised of the immediate environment, the neighborhood, the community, and the city. We should explore each zone in sequence. Certain resources for environmental understanding will be found in each of these zones. Wilderness areas may be found in these zones also. They may be small, such as railroad tracks, vest pocket parks, vacant lots, sidewalks, playgrounds, etc. Edward Abbey succinctly supported this when he said in his book *Journey Home*,

> When I lived in Hoboken, just across the lacquered Hudson from Manhattan, we had all the wilderness we needed. There was the waterfront with decaying piers and abandoned warehouses, the old ferry slips, the mildew-green cathedral of the Erie-Lackawanna Railway terminal.

This was Abbey's *innerland* and his wilderness was found there.

Outerland is made up of the zones that I call rural areas, state, country, and global. It is in these outer zones that many of our larger macro-wilderness areas can be found. In my paradigm there are two lines. One line of direction is centrifugal. This is the sequential movement from one zone to the next as learning takes place. The other line is centripetal, moving inward toward the center. This is equally as important as the first line of direction. Young adults should be encouraged to stay in the cities and contribute to the quality of the city and its inherent culture. Indeed, it is the hope we have of saving our cities from total decay. The same could be said of encouraging young people to move back to their rural communities and continuing to pump their life blood into restoring quality to that living environment. Agencies such as yours have a social and moral obligation to outreach to these urban and rural areas with resources that will insure that environmental values and basic beliefs are assimilated by the young. Sigurd Olson once was asked the question, "What is the hope of the world?" He replied, "You are the hope of the world. You are like this red pine sapling, full of life and vigor. I am like this old red pine tree, old and ready to topple with the next wind storm."

Proposition nine may really hit home to many of you. It is *All Institutions, Agencies, and Organizations Dealing with People Should Accept Responsibility for Environmental Education and Consequently Wilderness Education.* Whenever and wherever agencies and other organizations work with people in the outdoors they have a responsibility for environmental education. It is a great opportunity for you to teach these people who are in your charge during their leisure time. They are looking for fun, for challenge, and for adventure. This makes your responsibility far more challenging than the school sector's. They are there by choice and your programs had better be good. Also, the schools are not accepting

responsibility for environmental education at a rate fast enough to be effective universally. There are many agencies, such as the National Park Service and the U.S. Forest Service, that have met the challenge of educating the visiting public. Operating mostly in *outerland*, they have been very effective in what they do. However, just what percentage of our population is traveling to the large parks and U. S. forests of our nation? If one would venture to say fifteen percent, this would be an over-estimate. What about the eighty-five to ninety percent of our population that never visits these macro-wilderness areas? Can outreach programs be developed to a greater number supplementing what the schools are already doing? Many of the programs designed by the federal agencies as an outreach to the schools did not last very long. Project NEED of the National Park Service is but one example of a short-lived program. The Forest Service had one, too. What happened? My theory is that adequately trained leadership was not available to insure that the programs could be implemented at the local level. Project Wild has been very successful because the very nature of its approach continually trains leaders. Just why didn't the Youth Conservation Corps (YCC) succeed like the old Civilian Conservation Corps (CCC) of the 1930s? The leadership was there in the thirties for its members were unemployed and needed work. In our program planning, both at the school level and the agency level, emphasis should be placed on leadership training. Agencies can participate in leadership training at both levels. This sounds idealistic with today's budget cuts and accountability constraints. If you don't have an upward reach, then you will never get off the ground. You remember the ostrich who flew when attacked by a lion. The ostrich didn't realize what it could do until it had the right motivation.

The ninth proposition that I offer is *Wilderness Education Can and Should be Taught Through an Interdisciplinary Approach.* So often we see environmental education being taught through the scientific discipline. Biology is a natural approach in exploring the outdoors. However, this is not an appropriate approach. There are other disciplines through which environmental learning can occur. Music, art, social studies, language arts, mathematics, and physical education also have potential for enrichment through outdoor activity. Years ago, I remember meeting a young park interpreter who utilized music and the performing arts to convey an environmental message to the visiting public. I was pleased to learn that this same interpreter is on your conference program. Her name is Rita Cantu and you should be pleased that she is a part of your conference. A number of years ago I had the opportunity to visit with Pete Seegar and Arlo Guthrie at an outdoor education conference in New York State. I was impressed with how they were able to address environmental issues in such an efficient and effective manner through music. I felt, at that time and I still do, that they were far more successful with their approach than most of the podium speakers at that conference.

I do something in the outdoors with groups that I refer to as a humanities walk. I give each participant five laminated index cards with passages from classical literature. Often I use the transcendentalists, such as Thoreau, Emerson, Whitman as well as the native American sages, in my walk.It is a silent walk. When a participant wants to read from one of the cards, he/she simply raises a hand for a halt and proceeds to read. For example, we are about to enter the woods from an open field and a participant raises a hand and reads, "I went to the woods because I wished to live deliberately, to front only the essential facts of life, and not learn when I came to die that I had not lived." A greater understanding of the poet, the poem, and the inherent message comes flowing forth to the rest of the group as it listens. I sometimes place participants on solo locations in a natural area, and I have them write poetry from what they perceive. I use the Japanese format of Haiku, Tanka, Diamente, Cinquain, or the Korean Synthu because they demand a sense of nature and a juxaposition of ideas. If we were to neglect the other disciplines, we would be remiss. Those teachers of other disciplines would be lost to the field of environmental education. Also, life is experienced on an interdisciplinary plane. It is not just compartmentalized into science.

Imagine reading to a group the following passage by John Muir. "I only went out for a walk, and finally concluded to stay out till sundown, for going out, I found I was really going in." If you read this in the outdoors and the participants discuss just what Muir meant by "going out was really going in", can this be interpreted as being the wilderness within and the wilderness beyond?

A book that had a profound influence on me

was *On the Shred of A Cloud* by Rolph Edberg. It is a very provocative book, just filled with philosophical environmental messages. I used this book a great deal in my outdoor teaching. For example, I have used it on a mountain top in the Gros Ventre mountains of Wyoming. Teaching for the American Wilderness Leadership School, sponsored by Safari Club International, I have many opportunities to teach on an interdisciplinary level. Language arts is one of my favorite approaches to environmental learning. Perhaps Don Brown, friend, colleague, and director of the School, employs me for this very reason. Putting our backs against the granite rocks of the mountain top, I read from the book *On the Shred of a Cloud*

> With every breath you inhale a thousand billion atoms. A few million of them are long living argon atoms that are exhaled within a second and dispersed with the winds. Time mixes them and has been mixing them for a long time. Some of them may have visited Buddha or Caesar, or even paid an earlier call on the man from Makapan.

What an opportunity to imagine who has been here before us and breathed the same atoms on our mountain top. The native Americans—Shoshone, Teton Sioux—or the fur trappers called mountain men could emerge as having inhaled and exhaled the same atoms of air that we were currently breathing. I think of my techniques as simply shoehorns that pry open vast opportunities for learning. I believe in teachable moments—I do my best so they happen.

My tenth and last proposition is borrowed in paraphrased form from one of my long-ago speakers, Renee Dubois. It goes like this: *Nothing Constructive Can Ever Come from Pessimism But Only Through Optimism. However, It Is All Right To Be A Despairing Optimist.* Many years ago I was sitting in a graduate class at New York University. A visiting professor was invited by our regular professor to give a two-hour lecture. His name was Renee Dubois, eminent scientist and philosopher from Rockefeller University in New York City. He had just written a book entitled *Reason Awake*. He had previously written a best seller entitled *So Human An Animal*. Some of you might remember the book. In *Reason Awake*, Dubois titled the third chapter "The Despairing Optimist". Essentially the inherent message in that chapter was that nothing constructive can evolve from pessimism. Using a limited amount of despair is all right as long as it is a catalytic agent for optimism. It is all right to worry a little but be optimistic in your total outlook. We have had a lot of gloom and doomers write articles and books about the environment. They were very prevalent during the sixties and seventies. Gloom and doom sometimes spawns apathy and lethargic attitudes. This is the very thing that we are trying to overcome in environmental education. One can easily say, "I am sorry that the stream is polluted but what can I do about it? I am only one person." If a single raindrop felt like this then there would be no streams, rivers, lakes, oceans. It takes action by all of us in concerted effort. I had mentioned earlier that the goal of all outdoor environmental education programs is the development of an environmentally literate citizenry that is aware, articulate and activated with regard to environmental problems.

In conclusion, I address the title of my presentation: What is the role of wilderness in environmental education? It could have been the reverse of this and the title could have read: What is the role of environmental education in wilderness? Does wilderness provide the outdoor laboratory for concepts to be experienced and assimilated firsthand? Does wilderness need environmental education if it is to remain wilderness, untouched by the technological manifestations of humankind? Does the Wilderness Act remain unchanged or should it be modified to meet modern demands of energy supplies?

I think that the question proposed by the title of this presentation has been met in part by my ten propositions. Aldo Leopold once said, "Books on nature seldom mention wind, they are written behind stoves." I hope that my presentation has been composed from my long experience in the field. I hope, indeed, that osmosis has occurred and that I have gone from the dense to the less dense. At least I can mention "wind" for that is what we full professors are usually full of. Thank you for the opportunity to address you this morning. We are all in the fight together. As Fairfield Osborn said in *Plundered Planet*

> Each part is dependent upon another, all are related to the movement of the whole. Forests, grasslands, soils, water, animal life—without one of these the earth would die, and become as dead as the moon. This is provable beyond question.

Parks as Classrooms

Steven A. McCoy, Great Smoky Mountains National Park, Gatlinburg, TN

Rationale: The PAC experience is in full flower at Pi Beta Phi with the final few units being constructed by the seventh and eighth grade faculty. All other grades have completed all thematic units and have attempted each unit at least once. It is at this point that the program is due for a thorough examination.

Evaluation is critical for the continuing growth and development of this project. The scope of the project is vast in its curricular and instructional objectives. The staff members of the school and park, so heavily invested in the creative change process, cannot easily step outside those roles to evaluate their own work at the levels necessary to guide this project into the future. These staff members have been constantly evaluating the effectiveness of individual lessons and units and the progress of the students as they work through the program. These evaluations are also critically important and have served and will continue to serve to keep the program firmly rooted in the reality of attainment of educational objectives.

There are needs beyond that, however, to consider the implications of this program in a broader perspective. PAC aspires to be a model both regionally and nationally. To reach that goal, feedback from experts at those levels is required. It is necessary for this feedback to serve the dual aims of recognizing those elements of strength in the program and to identify areas for potential improvement. For the program to be successful as a role model, its unique aspects should be clearly identified. Those areas of particular merit should be targeted for even greater emphasis while areas that are less distinguished should be examined in light of changes that would strengthen the program.

The quality of evaluation at this level is a reflection of the commitment to evaluation on the part on the part of the program's personnel as well as the individual and collective talents and interests of the visiting committee. It is again critical to the gathering of data that the committee members have a diverse background of excellence in their fields of expertise. These persons will bring to the program fresh insights from differing points-of-view. Through an effective program of intense scrutiny these experts can reflect upon the program and share their own unique perspectives. This sharing will help the program grow in new directions.

Another benefit of subjecting the program to the review of an outside panel is to help connect the program to a wider audience. By expanding the network of professionals associated with the program, connections across the region and nation can be established through person-to person links. This kind of outreach and interpersonal sharing can benefit both the program, as it receives input from a wider variety of sources, and others whose missions could build upon the good works already accomplished through PAC.

The final task of a visiting committee would be to help establish a plan for the on-going evaluation and evolution of the program. Any project as comprehensive as this must continue to undergo change in order to function effectively. The status quo can become deadly if it is maintained through a unquestioning acceptance. Constant evaluation and appropriate responses to the data gathered is one of the steps necessary to ensure the vitality of a program of change. The committee's help in creating such a component for PAC is as vital as the evaluation of the present condition.

Integrating Thematic, Holistic Instruction and Authentic Assessment Using Outdoor Teaching and Learning

A new kind of partnership: Parks as Classrooms

Adjacent to the most visited national park in America, The Great Smoky Mountains National Park, is the gateway community of Gatlinburg. This small community supports Pi Beta Phi Elementary School serving 430 students in

grades K-8. Historically, some of the families whose children attend our school lived in communities now dissolved within the park boundaries. Many of the school to the park and the community's tourism-based economy tie our students to the park in a unique bond.

Recognition of this bong lead to the creation of a close working partnership between the staff members of the school and the visitor's services division of the park. The end product of five years of partnership is a program described by its title, **Parks As Classrooms**. The program was initiated through the joint leadership of the school's principal, Mr. Glenn Bogart, and the chief of visitor's services, Mr. Gene Cox. The vision shared by the leaders was that of two institutions collaborating to more completely fulfill their separate yet shared missions.

To bring that vision to life, a committee was formed representing each organization. This steering committee created a mission statement, objectives and rationale that served to guide the collaborative efforts to come. These principles reflect the convergent aims of both organizations to educate our youth in a conservation ethos that will empower them to protect and serve the needs of the environment and their fellow citizens.

MISSION STATEMENT

To develop a holistic instructional model for Pi Beta Phi Elementary School that will provide interdisciplinary learning experiences for all students, K-8, integrating the natural and cultural values/resources of the Great Smoky Mountains National Park while meeting the educational standards of Sevier County and the State of Tennessee.

PROJECT GOALS

These goals represent statements of intended outcomes for participants in the Parks As Classrooms project and were developed jointly by the school staff and personnel from the Great Smoky Mountains Natural Park.

1. To increase the awareness of students and teachers in the surrounding community of the significant opportunities provided by the Great Smoky Mountains National Park for education recreation, and personal enrichment.
2. To inform students of the park's critical resource management issues so that they develop and understanding of the complex relationships that exist between people and natural systems and better understand National Park Service ethics of resource conservation and stewardship.
3. To help students become aware of the biological diversity within the park and the organization of natural communities and their ecological interactions.
4. To instill in students an appreciation for the unique cultural heritage of the Southern Appalachians.
5. To promote an understanding of the relationships between the Great Smoky Mountains National Park and global environmental and social issues so that students
6. To provide a variety of rewarding interdisciplinary experiences that take students from the classroom setting to the natural setting for supplementary study challenges.
7. To establish a working relationship between park staff and teachers for the exchange of ideas and information that will increase the comfort level of both groups in providing instruction in non-traditional settings.
8. To increase the awareness of students about the mission of the National Park Service and to provide career investigation opportunities for students as appropriate.

With the creation of these objectives, the stage was set for a radical overhaul of educational practices in both the school and the park.

A new framework for instruction: Thematic Organization

In the process of planning for change, the steering committee made a commitment to holistic, interdisciplinary instruction. To facilitate this change from more traditional, text-book defined teaching, six themes were chosen around which all instruction would be organized. The themes are **Order, Change, Interactions, Patterns,** and **Structure**. These "big ideas" were chosen because they provide a flexible framework for integration of the Tennessee State Curriculum objectives and the critical issues facing the park. Teachers at each grade level were charged with reorganizing their instruction throughout the academic calendar to teach to each of these six themes.

In each thematic unit, lessons are grouped into the categories of pre-site, on-site, and post-site. All subject areas, including music, art, computers, and guidance re expected to be coordinated into the fabric of each unit. Park service staff worked with teams of grade-level

and specialty teachers to select appropriate areas within the park for instruction. These teams then planned on-site activities that would help develop the students' understanding of the particular theme of the unit.

During the first year, teams from the first, fourth and sixth grades piloted this process by creating three units and field-testing at least one of them. These teams worked independently under the oversight of the original steering committee. The following year, the entire instructional staff began working on the project. Each grade level team[1] was joined by a park service employee and one of the teachers from the pilot groups to share the earlier experiences and to promote coordination between grade levels. The process of curriculum reorganization included

•writing a rationale for each unit,

•a detailed site description of the area in the park used for on-site instruction,

•detailing of the Tennessee curriculum objectives to be taught.

•construction of a pre-test, and

•writing of all the pre-site, and post-site lessons.

A standard lesson plan following the Tennessee Instructional Model was used. Teachers were employed for one week in the summer as part of this effort. During the school-year, substitutes were used to free teachers for planning and writing, again for approximately one week. The creative part of the program took three years to complete.

By the fourth year, all grade levels had planned six thematic units and were using these throughout the academic year to teach the traditional subject matter in non-traditional ways. Students were taking part in three to six field trips into the park to study the themes.

New instructional techniques: Outdoor Education

The cooperation between park service staff an teachers created a beneficial experience for both sets of professionals. Park service interpreters learned a great deal about the demands of the total curriculum and about child development. Teachers learned how to structure academic instruction beyond the walls of the traditional classroom.

Our students now experience a wide range of activities that are age-appropriate, cooperative, exciting, and impossible to re-create indoors. They work together in teams to measure stream flow, restore wetlands, and pull sledges down historic Native American roads. They measure stream temperatures, pH, metallic contamination, and other variables and relate these to the health of the biotic community. They hike among the dying Spruce forests of the higher elevations and witness the impacts of air pollution and exotic insects. They see first-hand the process of forest succession in the valleys their ancestors once farmed. They participate in spelling bees in a one-room log school house, shuck corn and haul it to the tub mill, spot exotic plants and animals, hike to the cemeteries of their ancestors, do biodiversity surveys, and more.

They experience all parts of the park that are within one day's transport, which accounts for approximately two thirds of the 500,000 acre reserve. Most importantly, as they are learning, *they have fun* . All of the outdoors activities are embedded within units that include many specific lessons taught in the classroom but tied to the on-site experiences. In this way the motivating effects of the outdoor activities are utilized in support of academic instruction taking place in more traditional settings.

This hands-on familiarity with the park and its resources gives the students a special understanding of the fragility of the natural world and the constant need to make informed and conscientious decisions about how resources are used. By experiencing the park in such an in-depth way, they develop an unambiguous understanding of the connections between this resource and the rest of the world and of the connections between behaviors and environmental impact.

The students work on projects that cannot be accomplished alone. The on-site experiences involve park service personnel, teachers, and parents working together, as well as students. The adults provide models for effective working partnerships, enabling the students to learn such skills through direct observation and practice.

Another component that builds on these cooperative skills is service learning. As opportunities arise, students take part in activities designed to address specific needs in the park. Our park, like others in the national system, is more dependent than ever on the work of volunteers. As budgets shrink and staffing needs go unfilled, the efforts of volunteers are needed to ensure that the park can fulfill its mission. Our students, while limited by

their youth, are doing age appropriate tasks that help instill in them a sense of responsibility. The molding of an effective stewardship ethic in our students is an important goal of the program and it is gratifying to see children eagerly researching an interpretive guide to a trail for the disabled, restoring a wetland, or even picking up trash.

New evaluation techniques: Authentic Assessments

The break from routine instruction provided by outdoor education has the added benefit of requiring non-traditional assessments. Our teachers have developed many creative ways to allow students to demonstrate what they have learned. Student products related to PAC experiences involve a wide range of expressive media. In particular, the art and computer teachers provide a great deal of input and support to students as they prepare products to illustrate how they have grown and changed.

Skits and plays illustrate changes between the past and the present. Games recreate the interactions between species in the natural setting. Students produce posters, drawings, and other art projects that show what they have learned. Older students stage structured discussion groups or debates to reflect upon critical issues related to change and interactions. Replicas of tools and artifacts from the past are made and tried out to demonstrate understanding of historic and prehistoric lifeways. Students cook and eat corn meal recipes as part of the culture unit in fourth grade. Sixth graders stage a tea party as they examine manners and traditions related to culture. Maps and charts are often used to present and analyze data gathered in relationship to patterns, structure, and interactions. Award-winning science fair projects have been created as outgrowths of PAC experiences.

This emphasis on varied, creative productions to demonstrate learning has lead to the adoption of cooperative learning techniques and assessments based upon student products. The addition of portfolio assessment has been a natural outgrowth of this reliance on learning through experience. The collection and organization of students' output have become an important learning tool that helps extend the impact of process learning. Students are responsible for collecting, archiving, and reflecting upon their own work. The creation and maintenance of a portfolio reinforce the learning that has taken place as well as enabling students to acquire the skill of critically examining their work.

A new learner outcome: Enthusiastic, Informed, And Empowered Students

The long-term impacts of the program will be revealed over time, but if the short-term results are any guide, the net effect will be very positive. Students who have participated in all five years of the PAC experience have more knowledge of the park and the challenges facing it than many adults in the region. They show enthusiasm for park related activities and demonstrate a desire to care for the park and its resources. They understand how to enjoy the park responsibly and safely. They are well versed in career fields related to the park and to recreation and tourism. They discuss and debate the unique relationships that exist between the park and the communities that surround it.

By having learned in the park as well as learned about it, they are more ready to assume the mantle of stewards of the region. Many of them will depend upon the tourism that is the economic engine of the area. All of them will be informed consumers of recreational services. When the time comes for them to lead, they will have a deeply rooted understanding of the unique heritage and resource that is ours to protect and share.

Footnotes

1 Our School typically has two self-contained rooms at each grade level K-6.1 The four 7th and 8th grade teachers departmentalize to a degree.

Solving Wilderness Issues: An Environmental Education Partnership that Involves Students in Wilderness Management

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Abstract: This paper reviews the results of the first two years of the South Central Indiana Environmental Education Project. This project formed a partnership with Indiana University and the Hoosier National Forest to provide environmental education to middle school teachers and students and to promote their involvement in the management of the Charles Deam Wilderness. This paper will review the findings of the first two years of the project and discuss potential strengths and weaknesses of this interpretation partnership.
Keywords: environmental interpretation, environmental education, wilderness education, evaluation

In a middle school auditorium in southern Indiana the Hoosier National Forest Supervisor calmly outlined the future of the access policies to the Charles C. Deam Wilderness. A gravel road that bisects the 13,000 acre wilderness would remain open. Before this statement the atmosphere in the assembly was similar to many other middle school events. A handful of students were attentive while the remainder seemed disinterested. However, as the speaker voiced the decision to keep the road open a different mood enveloped the room. Many students began asking more specific questions about the issues. The candid replies from the Forest Service brought even more hands into the air. The prior apathy was replaced with a relentless pursuit of answers to a variety of important questions. Eventually, the moderator offered the closing comments and the students resumed their normal schedules. An assembly which was scheduled for forty-five minutes lasted nearly an hour and a half due to a strong interest in a wilderness the students knew nothing about six months earlier.

The apparent interest of these middle school students was the product of a year-long interpretive project which established a unique partnership between a local school district and community environmental education resources. The emotional yet thoughtful questions posed to the Forest Service officials reflected an investment made by these students regarding a local environmental issue.

Investment and ownership are considered key variables by many interpreters and educators in developing responsible environmental behavior (Hines, Hungerford, and Tomera, 1986-87; Hungerford and Volk, 1990; Knapp 1995). Unfortunately, the inherent short term nature of environmental interpretation makes it extremely difficult to allow its constituents (whether at a park, nature center, museum, etc.) to promote ownership variables which are associated with long term experiences.

In an attempt to provide an educational experience which promoted this investment, a partnership was formed between the Department of Recreation and Park Administration at Indiana University, the United States Forest Service, and surrounding school districts. These institutions pooled resources to offer a wilderness program that combined environmental interpretation with middle schools' science curricula. This program, entitled the South Central Indiana Environmental Education Partnership Project (SCIEEPP), was funded through a research grant provided by the U.S. Forest Service.

The primary objective of the project was to create an active partnership between a public agency (the U.S. Forest Service) and the middle school classroom. Unlike traditional "one shot" interpretive events, the Forest Service provided four interpretive experiences which represented a sequential environmental education curriculum. The model was designed to be a template for interpretive programs throughout the country.

Partnership Model

The assembly program depicted at the introduction to this paper was the final event of a five phase curriculum that represents all of the major variables associated with environmental behavior change (Knapp 1994). Below is a description of each of the five phases of the SCIEEPP model:

Phase#1—Basic Knowledge of Wilderness Site: Focused on basic ecological principles regarding south central Indiana ecosystems, as well as the natural and cultural history of the Deam Wilderness.

Phase#2—Awareness of Problems and Issues Associated with Site: Students learned about the problems and issues associated with the Deam Wilderness by analyzing some wilderness site issues and examining certain Wilderness problems.

Phase#3—Investigation of Wilderness Site Issues: Strategies and methods were taught with respect to collecting data and summarizing results. Students developed surveys and performed class research projects during this period.

Phase #4—Knowledge of Citizen Participation Skills: Students were taught methods of communicating their results in a public setting. In addition, students were taught different action skills related to responsible environmental behavior.

Phase #5—Wilderness Summit: All of the participating students met with the U.S. Forest Service officials to report recommendations regarding management of the Deam Wilderness. These recommendations were a result of their surveys and research completed between phases three and four.

In order to implement the program, close coordination was necessary between the participating teachers and environmental educators. Several training sessions were held to prepare the teachers and interpreters for the pre- and post-activities, field trip lessons, and to develop guidelines for the student research projects.

As mentioned above, an assembly was held each year after the interpretive experiences where the student research projects were reviewed. At this meeting, the students were able to showcase their efforts in front of peers, instructors, and Forest Service officials. The event's format allowed Forest Service officials to respond to comments and questions generated during the student presentations. Finally, this led into a spirited question and answer period in which students were able to voice their opinions on a variety of issues.

Program Evaluation

Evaluating the success of the partnership was an integral part of the project. It was important to learn what impact, if any, this curriculum had on the environmental attitude/behavior of seventh and eighth grade students. It was also important to learn the potential for this model to be a template for other interpretive agencies across the country.

First Year—Quantitative Results

A fifteen item questionnaire was developed to measure students' knowledge, attitudes, and behaviors with respect to the Deam Wilderness. This evaluation was based on prior instruments developed by Drake and Knapp (1994). The instrument was administered before and after each of the interpretive experiences as well as before the start of the program. The population tested were 120 seventh and eighth grade students who participated in the wilderness program. Of the three variables (knowledge, attitude, and behavior), only the knowledge questions showed a significant increase throughout the program. Using an independent samples t-test, the researchers determined that the greatest increase in knowledge took place during the first phase of the program in which students were taught basic ecological principles as well as the natural and cultural history of the Deam Wilderness. Alternatively, the attitude and behavior variables did not reflect a significant change throughout the program.

First Year—Qualitative Results

The teacher comments during the first two phases were generally positive with the exception of a desire to spend more time exploring the wilderness and less time engaged

in specific activities. Teacher comments during the third and fourth phases of the program were very mixed. First, they felt the investment on the part of the students was a valuable component to developing a positive attitude and behavior with respect to the wilderness. However, they did feel that the research projects took a great deal of time out of their already busy schedule.

Teacher responses were also mixed with respect to the Wilderness Summit meeting. The teachers did observe a heightened sense of awareness in students during the assembly. However, it was difficult to tell if students had reached the goal of empowerment associated with the objectives of environmental interpretation. Observations during the Summit revealed many students had developed an interest in the issues associated with their projects. However, there is still a difference between a stronger interest in an issue and a positive attitude change. For this reason, the behavior of the students at the summit meeting must be analyzed with caution.

Surprisingly, some of the students who performed well in the activities and showed a great deal of excitement for the program were those who, according to their teachers, did not perform well in a traditional school setting. These findings are consistent with Milton et al. (1995). These students often requested an important role in a given activity. It appeared as though the non-traditional forum led to an increased willingness to participate in the program.

Second Year—Quantitative Results

A revised twenty item questionnaire was developed to measure the second year's program on students' knowledge, attitude, and behavior toward the wilderness. This evaluation was based on prior instruments developed by Drake and Knapp (1994) and the Middle School Environmental Literacy Instrument developed by Hungerford, Ramsey, Volk, and Bluhm (1993). The instrument was administered before and after each of the interpretive experiences as well as before the start of the program. The population tested were 71 eighth grade students who participated in the wilderness program. Of the three variables tested (knowledge, attitude, and behavior), only the knowledge questions showed a significant increase throughout the program. Using a t-test: Paired Two-Sample for Means, the researchers determined that the greatest increase in knowledge took place during the first phase of the program in which students were taught basic ecological principles as well as the natural and cultural history of the Deam Wilderness. Alternatively, the attitude and behavior variables did not reflect a significant change throughout the program.

Second Year—Qualitative Results

The teacher comments during the first two phases were similar to those from the first year. They generally conveyed a positive attitude toward the field trips. They also believed that the information on the issues of the Deam Wilderness was quite helpful. However, they found the project to be a challenge in regard to the time commitment for both teacher preparation and student involvement.

The Wilderness Summit for the second year paralleled the energy that was evident in the first year. Students questioned the Forest Service officials for well over 40 minutes - twice as long as was planned.

SUMMARY OF RESULTS

There were both perceived positive and negative outcomes as a result of this program. Below is a list of outcomes which should serve as an instructional purpose for future long-term interpretive programs:

Positive Results/Feedback

- Significant change in wilderness knowledge during phase one of each program
- Positive feedback on field trip activities from teachers and students
- Strong interest from students who didn't perform well in a traditional classroom setting
- Visible difference in students' attitudes at both Wilderness Summit meetings

Negative Results/Feedback

- No statistically significant change in attitude or intent to behave responsibly toward the wilderness site
- Teachers felt they spent too much time on research projects/taking time away from school curricula

DISCUSSION

The results indicated a positive change in students' knowledge of the wilderness. This entry-level variable, however, was intended to lead to a better attitude and subsequent behavior change throughout the remainder of the program. The quantitative analysis revealed little

in terms of an attitude or behavior change.

The Wilderness Summit provided the most evidence in support of the empowerment and ownership variables of the Knapp model. It was clear that the investment in the research project developed strong opinions with respect to the Deam Wilderness. In turn, some students were willing to defend their results and challenge Forest Service policies at both meetings. Nevertheless, despite this visible display of concern for issues in the Deam Wilderness, the lack of quantitative data makes it difficult to affirm a significant positive attitude or behavior change.

Many important lessons were learned as a result of the first two years of the partnership project. Most importantly, such a program involves a tremendous investment on the part of teachers, students, and instructors from external sources. It is critical to have highly motivated teachers to carry out all aspects of the five phase program. Indeed, this can be very difficult when teachers are faced with an already full schedule which might suffer when another intensive program is added. Future efforts must recognize that changes in students' environmental attitudes and behaviors must be preceded by teacher commitment and ownership in the program.

Perhaps the most revealing need was for a more involved training program for the teachers. Although the research team held several short workshops throughout the program, it was clear that it was not enough for the teachers to acquire ownership and complete confidence in the instructional aspects of the program. This may be inherent in an extra-curricular program as opposed to a fully integrated program which is part of the curriculum. In any case, effective implementation is reliant upon teacher training which will instill knowledge, confidence, and commitment to achieving the desired objectives of the program.

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Integrating the Wilderness Land Ethic Box into Elementary and Middle Schools

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Abstract: Since 1994 a USFS Wilderness Box team in North Carolina has been piloting a strategy for integrating the Wilderness Land Ethic Box curriculum into southeastern elementary and middle schools. Six teachers and approximately 250 students have participated in the program. Key factors for integrating the Box into schools were an effective team, teacher input, thorough workshops, and continued support of teachers after the workshops.
Keywords: Wilderness, Wilderness Land Ethics Box, wilderness education, elementary schools, middle schools

The Wilderness Land Ethic Box is a national project initially developed by individuals in the Rocky Mountain Region of the U.S. Forest Service in Colorado. In 1993 the Arthur Carhart National Wilderness Training Center revised the Colorado curriculum and materials for national distribution to all agencies in the National Wilderness Preservation System.

The goal of this project is to develop an awareness of the Wilderness resource and its significance to our society. The target audience is students in kindergarten through high school. Although the emphasis is on Wilderness, the land ethics principles can be applied across a continuum including Wilderness, developed parks, school grounds, and one's own backyard.

The Wilderness Land Ethics Box has been endorsed by the U.S. Forest Service as a potential management tool for reducing human impact in Wilderness and all other natural areas. In 1994 a Wilderness Box Team was formed on the Pisgah Ranger District in Pisgah National Forest near Brevard, North Carolina. The team's goals were to (1) rewrite the Western (Region 2) lessons for Southeastern application and (2) develop a strategy for integrating the revised curriculum into Southeastern elementary and middle school classrooms.

This report summarizes the team's three-phase strategy and offers recommendations for site managers and field personnel interested in implementing the curriculum in their locales.

STRATEGY

Phase One: Introduce the Box to Schools

Include an Educational Consultant on the team. Although Wilderness Box Team members Sue E. Lyons and Pat Lancaster (USFS recreation technicians) had experience doing Wilderness education and Leave No Trace programs for elementary schools and civic groups, they recognized the need for an educator who had contacts within the educational community and experience developing programs for schools. Through a partnership with the Cradle of Forestry in America Interpretive Association, Mary Arnaudin was hired on a part time basis. While currently a college biology instructor, Mary's experience included two seasons as an interpreter in Pisgah National Forest campgrounds, development of programs for school children at the Cradle of Forestry, and teaching science with children in kindergarten through eighth grade. This background enabled her to act as an effective liaison between the agency and the schools.

Adapt the Curriculum to Meet the Needs of School Teachers/Administrators

This step was the key to ensuring that the Box was used, not shelved. The following suggestions from various Transylvania County teachers and administrators were obtained from one on one discussions with Mary:

•Correlate each Wilderness Land Ethics

lesson to the North Carolina Standard Course of Study (social studies, science, communication skills, and healthful living objectives.) With so many demands on teachers and other programs on the market, any new materials/curricula must help them accomplish what they are already required to do.

•Rewrite the Western lessons for application to the Southeast and/or North Carolina.

•Specify each lesson for a specific grade level to avoid repetition of activities for students and reduce the amount of material the teacher must sort out.

•Provide all materials needed for the lessons in the Box and deliver it to the school. Teachers will be more likely to use the Box if it is delivered to them or if the school has its own.

•Offer continuing education credits for a workshop on how to use the materials.

•Offer a field trip as the culmination to the classroom study of Wilderness and Land Ethics.

•Develop an interdisciplinary unit for middle school teachers to teach as a team.

Although the implementation of these teacher/administrator suggestions resulted in a curriculum designed to meet the instructional objectives for North Carolina schools, most of the lessons and field activities may be used throughout the Southeast. Correlation to the state objectives has been a major selling point for integrating the Box into the schools since teachers see the curriculum as a fun way to convey what they already have to teach.

The request for a field trip component led the team to consider a partnership with the wilderness education department at Brevard College. The college's outdoor leadership instructors eagerly entered the partnership since it provided a practicum in outdoor education for their students. Both the team and a middle school teacher met with the college students to prepare them for leading a Leave No Trace Skills field trip for two eighth grade classes.

Think Small: Run a "Mini Pilot Program" with Revised Curriculum

Since the curriculum correlated most closely with grades 2, 5, and 8, Mary introduced the program to her daughter's second grade teacher (28 students) and a friend who taught two eighth grade classes (50 students). Both teachers were eager to try some of the lessons, use the Box, and go on the field trip. Each teacher met with Mary to learn essential Wilderness concepts and get oriented to the curriculum.

During the "mini pilot program" Mary observed several of the activities conducted by the teachers, led the second graders in an outdoor lesson, and tried to clarify Wilderness concepts which were confusing to the teachers. Pat visited the eighth grade classes to share about a career in resource management and to discuss Wilderness concepts and issues.

Get Feedback from Teachers and Students

Both teachers were very enthusiastic about how easily the curriculum and materials fit into their existing lesson plans due to its correlation with the Standard Course of Study. Teachers and eighth graders completed evaluations which helped us decide what to continue or change. Below are their recommendations.

•Offer a workshop for continuing education credit to give teachers a better background on Wilderness and other public lands.

•Provide access to the Box throughout the year. In order to reduce the cost for schools, eliminate materials which were not used and offer the option of purchasing either an elementary or a middle school Box instead of a complete Box.

•Continue to include a visit from an agency representative for eighth grade classes to summarize the unit, clarify Wilderness concepts, and expose students to career opportunities in resource management.

•Continue to offer a field trip as the culmination of the classroom work.

Phase Two: Run a Pilot Program Partner with Local School System for Teacher Workshop

In the spring of 1995 Pat, Mary, and a teacher introduced the curriculum supervisor of Transylvania County Schools to the Box and shared the teachers' experience with it. The enthusiasm of the teacher and a copy of the lessons correlated with the Standard Course of Study sold the administrator on the program. The administrator agreed to announce the October workshop to all school personnel and process the participants' continuing education credits.

Pat and Mary promoted the workshop by giving ten minute presentations during teacher meetings at the county elementary and middle schools. A copy of the agenda and a registration form was given to interested teachers (Appendix). Although many teachers expressed

interest, most felt too overwhelmed with their work to commit to an optional ten hour workshop. Seven teachers, a Brevard College outdoor leadership instructor and one of his students, and the environmental education coordinator from the North Carolina USFS Supervisor's Office registered. All teachers who registered had either observed Mary doing a lesson with their class or had been encouraged to come by a teacher in the mini pilot program. Three teachers dropped out the week of the workshop due to last minute conflicts, reducing the group to seven participants.

Give the Workshop

The ten hour workshop was conducted by the team, beginning on a Friday evening for an introduction to Wilderness. Sue and Pat presented Wilderness concepts, issues, and Leave No Trace skills while Mary showed how the lessons could be integrated into the Standard Course of Study.

Saturday's activities were to be held at a camp, but when the weather forecast promised a cold, rainy Saturday we decided to move to the Pisgah Ranger Station. Since several outdoor activities had to be deleted, the agenda was adjusted by scheduling a follow-up meeting three months later, when all the teachers would have completed their turn with the Box. Saturday's bad weather enabled us to stumble upon a most valuable component of the workshop: the sharing/evaluation session. Meeting after everyone had an opportunity to use the Box added accountability for participants, allowed teachers to exchange ideas, and gave the team insights for improving the curriculum and workshop. We know of no other program that has this follow up session to find out how the program is being used.

The evaluations of the workshop were very positive. The teachers really enjoyed learning Leave No Trace and tree identification skills. Suggestions for improvement were to add more outdoor activities and to lead them in just those Wilderness Box activities specific to their own grade level. Several commented that our workshop was unique because it left them feeling refreshed instead of drained. They were very impressed by our attempts to help them do their job.

Although the teachers received a thorough presentation on designated wilderness, agency personnel were concerned that the Wilderness emphasis may leave classes with the impression that trees should never be cut. This concern was also expressed by a local timber lobbyist and our U.S. Congressman Charles Taylor. In response to such concerns, the workshop now includes a section in which teachers learn that Wilderness is only one of the many resources the Forest Service manages for the public's benefit. Placing Wilderness as an equal resource alongside timber, wildlife, recreation, water, grasslands, minerals, and soils enables people to appreciate the need for both preservation and wise use. Elementary activities "Making A Homestead" and "Wilderness Flannel Board Story" can be used to help students realize that their quality of life and survival depend on the extraction and preservation of trees.

Teachers reported that the curriculum was a big hit with their students (150 students). Younger students enjoyed activities about animals and their dependence on natural areas. Older students used lots of communication and critical thinking skills to sort out Wilderness concepts and resource issues. All students were able to grasp an appreciation of Wilderness as evidenced from writing assignments, role plays and discussions. Even students with learning and attention disabilities were able to focus and excel with this curriculum. The major highlights of the study for all were the field experiences, puppets, and animal tracks.

Phase Three: Continue to Support and Expand Established Program

Form Partnerships to Fund Workshop and Boxes Encouraged by the success of the pilot program, the team again approached the county school supervisor to seek support for a workshop in 1996. Having witnessed the teachers' enthusiasm for the program, the supervisor offered to increase the county's role by providing the publicity, registration, facility, refreshments, and continuing education credits. Funding for the workshop would come through an Eisenhower Grant and include the purchase of Wilderness Land Ethic Boxes for each school sending five teachers. The Cradle of Forestry in America Interpretive Association agreed to assemble and deliver boxes to the schools.

The 1996 two day (14 hour) summer workshop will be held at a centrally located middle school that has a nature trail. The one hour follow-up meeting will be held in December. Extra credit will be given for those who wish to take a field trip to a nearby Wilderness and/or provide written

documentation of their classroom experiences with the Box.

The county supervisor's offer to purchase Boxes for schools sending at least five teachers to the workshop helped increase the number of workshop participants. However, even with this "hook" the announcement for the workshop was lost at several schools and the team had to schedule presentations at teacher meetings to bring it to everyone's attention. Competition from two required workshops for reading and technology reduced the pool of possible participants. Again, personal contacts with the team and teachers who had used the Box were necessary to generate interest in the program.

Plan to Maintain Support of Trained Teachers

By the fall of 1996, there should be at least twenty Transylvania County teachers qualified to use the Wilderness Land Ethics Box. The extent to which they use it depends on the amount of support the agency is willing to give. Merely giving teacher workshops does not ensure that teachers will actually use the curriculum. Adding the follow-up component to the workshop increases the likelihood of its use, but even more support may be necessary before teachers make the effort to incorporate the Box lessons into their tried and true lesson plans.

However, once they incorporate the Box, they are likely to continue to use it. Scheduling a class field trip as the culmination to their use of the Box is a sure way to get the curriculum into the teacher's lesson plan book. Every teacher who went on a field trip spent at least two weeks of class time with the curriculum. Middle school classes also scheduled a visit with Pat to learn about his job and local Wilderness issues.

While teachers are capable of teaching the basic lessons, they often want continued contact with agency personnel for field trips and classroom visits. This same desire for year-long contact has been expressed by California teachers. Although this extra contact may be time consuming, it assures that the curriculum is scheduled into the teachers' plans and gives agency personnel opportunities to clarify Wilderness concepts/issues and make informal evaluations of the program's effectiveness. Continued contact also cultivates teacher advocates for the Box and enhances the agency's public service image.

The Pisgah Wilderness Box team hopes to maintain contact with the trained teachers by coordinating the Brevard College-led field trips and being available for classroom visits. They have also considered the possibility of publishing a bulletin as a means for workshop alumni to share how they use the curriculum. The bulletin may also include information about interpretive programs and recreational opportunities in the Pisgah National Forest.

CONCLUSIONS

Integrating the Wilderness Land Ethic Box into elementary and middle schools and ensuring its continued use will take a major commitment by the managing agencies. Both teacher and student response to the North Carolina pilot program convinced the Pisgah Wilderness Box team that the commitment is worth making if your agency truly wants to help school children develop an awareness of the Wilderness resource and its significance to our society.

Based on the North Carolina pilot program, the Pisgah Wilderness Box team offers the following advice for agencies wanting to integrate the Box into schools:

1. Form an effective Box team.
2. Show teachers how the curriculum can help them do their job.
3. Provide quality control by offering thorough teacher workshops.
4. Maintain support of teachers after workshops.

SUMMARY

Since 1994a USFS Wilderness Box team in North Carolina has been piloting a strategy for integrating the Wilderness Land Ethic Box curriculum into Southeastern elementary and middle schools. Six teachers and approximately 250 students have participated in the program.

In response to teacher input, the team developed a curriculum applicable to the Southeast, a supplement specific to North Carolina habitats and instructional objectives, a teacher workshop format, and a field trip component. Partnerships were established to offer field trips, co-host workshops, and purchase boxes for schools. Key factors for integrating the Box into schools were an effective team, teacher input, thorough workshops, and continued support of teachers after the workshops.

ACKNOWLEDGEMENTS

The Pisgah Wilderness Box Team would like to thank the following teachers for their

commitment to teaching and the Wilderness resource: Molly Tartt, Renee Hannen, Chris Dodson, Chris Yaxley, Betty Padrick, Kim Huntsinger, Sona Lyda, Kathy Haehnel, John Dodson, Beth Fisher, Clyde Carter, and Liz Fuller. The team also wishes to recognize Michael Gryson (Pisgah District Recreation Staff Officer), Larry Phillips (Regional Wilderness Specialist), Art Rowe (Pisgah District Ranger) and Harry Hafer (Director, Cradle of Forestry in America Interpretive Association) for their unwavering support and encouragement.

[1]Current address: North Carolina Extension Service, Transylvania County, NC

APPENDIX

"Call of the Wild" Land Ethic/Wilderness Box Teacher Workshop

Purpose

To help teachers enable students to recognize the need for the preservation, conservation, and wise use of our natural resources. The practice of this land ethic is applied across a range of situations: from Congressionally designated Wilderness areas, to backcountry regions, recreational forests, developed parks, school grounds, and backyards.

The Program

The Box is a national program which originated in Colorado to help students appreciate and take care of natural lands.

All activities in the Box have been correlated with NC State Curriculum Objectives in the areas of science, communication skills, social studies, and healthful living at the 2nd, 5th, and 8th grades. An understanding of the value and care of natural areas will be established in the second grade and expanded in the fifth and eighth grades.

Several activities in the 8th grade work promote the use of conflict resolution skills. Most of the lessons are "hands on" and can be implemented in cooperative learning groups.

The Box has been pilot-tested in Transylvania County in the 2nd, 5th, and 8th grades. All teachers and principals involved have been very enthusiastic about their experience and want to see the program expanded. Brevard College outdoor education majors helped lead a field trip for the pilot program and will be a partner in the Box program from now on. Transylvania County Schools was the first system to use this curriculum in the Southeast, resulting in our county being recognized as a national leader in Land Ethic/Wilderness Education.

Objectives

At the completion of the course, participants shall:

1. Recognize the need for the preservation, conservation, and wise use of our natural resources.
2. Be able to explain the values of wild lands and the philosophy of the National Wilderness Preservation System. Be familiar with the locations of NC Wilderness.
3. Understand the role of the U. S. Forest Service in managing public lands for timber, watersheds, wildlife, soil, mining, grazing, recreation, and Wilderness.
4. Know "Leave No Trace" ethics which may be applied to any lands.
5. Develop a plan for implementing the Land Ethic/Wilderness Box curriculum in the classroom.

Come join the pack for

"Call of the Wild" Teacher Workshop October 13 &14

Participants: All teachers & assistants K-8. Materials closely tied to curriculum objectives for 2nd, 5th, and 8th grade.

Leaders: Pat Lancaster- US Forest Service
Sue Elderkin Lyons- US Forest Service
Mary Arnaudin- environmental educator for pre-K through college level

Date: October 13 and 14, 1995. Friday 5:30-9:00; Saturday 8:30 am-7:00 pm. (total of 10 hrs. workshop time) Friday and Saturday dinner included; bring bag lunch on Saturday—drinks and snacks provided.

Location: Friday: The Forest Place on corner of Broad Street and Jordan
Saturday: a local camp or retreat center

Credit: One hour continuing education unit for participating in 10 hours of workshop.

Agenda

Friday evening: 5:30-9:00

5:30-5:45 Welcome and "What is Wilderness?" (personal reflection)
5:45-6:15 Dinner
6:15-6:45 Flannel board activity
6:45-8:15 "Wild by Law" video, break, and discussion of NC Wilderness areas
8:15-9:00 U.S. Forest Service role in management of Wilderness, timber, water, soils, recreation, and wildlife. Review of Land Ethic/Wilderness Ed

Saturday: 8:30-7:00

8:30-9:30 Magic School Bus activity.
Explore the Box/teacher guide and decide which activity to lead.
Planning Session for small group-led activities.
(snack/break time taken as needed)

9:30-11:00 Use of instructional materials in the great outdoors
Choices:
1. map/compass skills
2. use of field guides (insects, tracks, trees) and fanny packs to investigate mountain ecosystems
3. use of backcountry Skills Trail to teach personal stewardship of natural areas

11:00-11:30 Break and prepare for leading lessons.
11:30-12:30 Lessons led by 2 small groups (30 min. each)
12:30-1:30 Lunch and break; Skills Trail stations on display.
1:30-3:00 Lessons led by 3 small groups (30 min. each)
3:00-4:30 Report of pilot program and Field trips offered by Brevard College students and US Forest Service.
Group discussion about how to implement the curriculum.
Small groups by grade level develop own plan to use program.
4:30-5:00 Break
5:00-6:00 Leave No Trace Cookout
6:00-6:30 Leave No Trace Campfire; Share what you are taking away from the workshop and what you will be giving back.
6:30-7:00 Final comments/questions; post test; evaluations, good-byes.

Come join the pack for

"Call of the Wild"

A Teacher Workshop: Adjusted Schedule
October 13 &14

Participants: Teachers & assistants K-8, college instructors, U.S. Forest Service. Materials closely tied to curriculum objectives for 2nd, 5th, and 8th grade.

Leaders: Pat Lancaster- US Forest Service
Sue Elderkin Lyons- US Forest Service
Mary Arnaudin- environmental educator for pre-K through college level

Date: October 13 and 14, 1995. Friday 5:30-9:00; Saturday 8:30 am-7:00 pm. (total of 10 hrs. workshop time) Friday and Saturday dinner included; bring bag lunch on Saturday–drinks and snacks provided.

Location: Friday: The Forest Place on corner of Broad Street and Jordan
Saturday: Ranger Station conference room and porch

Credit: One hour continuing education unit for participating in 10 hours of workshop.

Friday evening: 5:30-9:00

5:30-5:45	Welcome (howl) and "What is Wilderness?" (personal reflection)
5:45-6:15	Dinner
6:15-6:45	Flannel board activity including which activities are allowed and why.
6:45-8:00	Explanation of W vs. w. Read the Act (sec. 2a & c; sec. 4c). Point out Values and Benefits (middle, p. 3-294-296). Forest Service role in the management of timber, water, soils, recreation, wildlife , and Wilderness.
8:00-8:50	Wild by Law video.
8:50-9:00	Specifics on local Wilderness Areas

Saturday: 10:00-2:00

10:00-10:30	Gather: snacks, hot drinks. Magic School Bus activity and discussion.
10:30-10:45	Explanation of the Land Ethic which applies not just to Wilderness, but to a spectrum of natural areas.
10:45-12:00	Introduction to the generic curriculum and changes made to create a Southeastern box correlated to NC standard course of study. Participants explore the box contents.
12:00-1:30	Leave No Trace Meal (modeling of pack a pack, cooking, clean-up). Tree Key activity done while waiting for water to boil.
1:30-2:00	Discussion of what Wilderness now means to each participant. Set times for checking out the Box and field trips led by Brevard College students. Decide on final meeting date when participants will share their experiences with the Box, critique the curriculum, and clarify concepts.

(Next meeting set for Jan. 24 at 3:30 - 5:00 at the Forest Place).

Registration Form

Please complete this form and give it to your principal by Sept. 11

Name _____

Address_____

Phone_____

School _____

Grade Level _____

Preference of sessions dealing with use of instructional materials in the great outdoors (Please give the order of your interest)

_____ map/compass skills

_____ use of field guides and fanny packs to investigate mountain ecosystems

_____ use of backcountry Skills Trail to teach personal stewardship of natural areas.

Please share your experience in:

Environmental Education-

Backcountry Skills-

Wilderness-

What do you expect to obtain from this workshop?

Great Smoky Mountains Institute at Tremont: Connecting People and Nature

Ken Voorhis, Director, Great Smoky Mountains Institute at Tremont, Great Smoky Mountains National Park

Abstract: Great Smoky Mountains Institute at Tremont is a residential environmental education center located within Great Smoky Mountains National Park. Created as a non-profit organization in 1969, the Institute is now under the operation of the Great Smoky Mountains Natural History Association and provides nearly 5,000 people per year with an in-depth view of Great Smoky Mountains National Park, its natural and cultural resources, and the issues that it faces. Funding is provided primarily through user fees charged to participants. Through study, investigation and mere exposure to the natural world, fifth through twelfth grade students who come to Tremont with their teachers for three to five days, grow to understand their part in the web of life and begin to recognize the importance of the decisions that they make.
Keywords: environmental education, Great Smoky Mountains National Park, residential,

Great Smoky Mountains National Park is a special place for many reasons. Within its borders, natural diversity has been preserved as much as is possible in today's world. It is an island of wilderness on a planet where wilderness is becoming rare. The beauty and diversity of the Smokies is a reminder to its visitors of the importance of wild places and of people's connection to the natural world.

Great Smoky Mountains National Park and other protected areas are becoming increasingly important as places where people come to re-establish their connection to nature. Our parks serve as sacred places for retreat and recreation, or as many of us view it, re-creation. In addition to preserving natural resources and biodiversity, they are proving to be important indicators of the health of our planet.

As people retreat to our nation's natural areas, those of us who manage those areas have an opportunity and a responsibility to educate those people about the importance of our natural areas and what they are telling us about the health of our planet. Scientists in Great Smoky Mountains National Park are dealing with global issues as they monitor and study such things as acid rain, ozone pollution, or exotic species. Those issues need to be interpreted to the millions of people who visit our parks and value what those parks are preserving. Our Parks are the classrooms where we need to become re-educated, re-connected, re-committed to caring for our planet.

Great Smoky Mountains Institute at Tremont was established with these purposes in mind. Courses, workshops and conferences are offered throughout the year that give participants an in depth view of Great Smoky Mountains National Park, its natural and cultural resources, and the issues that it faces. Through study, investigation and mere exposure to the natural world, participants can grow to understand their part in the web of life and recognize the importance of the decisions that they make. Our location within Great Smoky Mountains National Park provides an ideal setting for such purposes.

With a complete residential facility, programs at the Institute are designed so that the whole experience of living in the Park for a few days is related to reflection about our relationship to our natural world. Meals, dorm life, and social interaction are included in this process as participants are challenged to consider all aspects of their living and how it affects the world around them. Classes are not limited to natural history, but include other subjects that help participants experience the natural and cultural resources of Great Smoky Mountains National Park. Sessions involving

creative writing, drawing, or problem solving are as important as a class on stream ecology or Native Americans.

To many people the Great Smokies is a very special place. They are interested in continuing to preserve it and other special places for the future. They desire that others may hold the same reverence for these places as they do. Our natural connection to nature does exist and that connection continues to draw more and more visitors to our Parks each year. Our job is to bring the appropriate message to those who come seeking. Those who hear the message will respond.

a more efficient means to reach the public with our message. First came a name change for the Sand Dune Nature Center. It became the Michigan Sand Dune Visitor Center. This subtle name change made the facility more appealing to the tour bus operators and increased attendance of the general public. The Michigan Sand Dune Visitor Center became the first of seven natural resource visitor centers in the state. Next, we decided to organize special events that appeal to the general public. The Trillium Festival was started at Hoffmaster State Park the weekend before the Tulip Festival in Holland, Michigan, just 20 miles south of the Park. This gave the tour bus operators the opportunity to take in two festivals on the same trip. Festivals were also started at Hartwick Pines State Park: Old Time Days, Black Iron Festival, and Wood Shaving Days. These festivals brought in nontraditional park users and gave us a chance to give quality interpretive programs to the nontraditional park users. We emphasized quality in all exhibits and programs, and gradually support returned for the program.

Vision 2020

In 1991 a citizens' advisory committee was established to address the problems of the parks and develop a strategic plan for the park system. This committee was composed of citizens and a broad cross section of professionals representing many organizations that had a stake in the park system. Through the strategic planning process and public meeting input, thousands of citizens were made aware of the financial plight and the deteriorating physical condition of the park system. The final plan called Vision 2020 addressed the problems of the parks and established goals for the future.

Stable Funding Source For Park Operations

The main recommendation of the plan was to establish a stable funding source to operate the parks. This was accomplished with the passing of Proposal "P" in November 1994. This constitutional amendment established a State Park Endowment Fund and provided for the funding of the fund through oil and gas revenues, until a principle cap of $800 million, adjusted upward for inflation, was reached. It also authorized the establishment of a State Parks Foundation to raise funds for the park system. A companion act in the legislature froze general fund support at the 1993–94 levels, adjusted for inflation, to prevent the replacement of general fund support with the endowment fund revenues. It also allowed the endowment fund to provide a $5 million increase in the current budget for operations annually. With a stable funding source, Parks could now plan for the future.

Interpretation/Education

Interpretation and education in the park areas were also a main concern of the Vision 2020 plan. With the added funding from Proposal "P," funds were set aside to hire 13 permanent interpreters, institute seasonal programs during the summer season in parks where interpreters were not assigned, and increase our educational programming. Funds were also made available to upgrade equipment and program materials at the natural resource visitor centers. Proposal "P" funds were not the only funding source used to expand the interpretive programs. Grants of all kinds and environmental settlement funds from industries have also been used to expand our interpretive and environmental education efforts.

Parks contracted out the seasonal interpretive program, called the Adventure Ranger program. The successful contractor recruits, trains, and oversees the summer programs in 40 parks. The employees, who are recruited and trained as Adventure Rangers, are then put on as seasonal employees in the parks for the summer. Like all new programs, there have been some problems, but the overall success of the program far outweighs any of the problems. This is the third year of the program, and it has saved countless man hours for the parks staff in recruiting, training, and oversight of the program. This also frees up the professional interpreters to oversee stewardship projects and to work on interpretive developments such as interpretive trails, signs and displays in the parks, along with supervising their own seasonal programs in the management units where assigned.

Stewardship

Michigan State Parks have a long history of setting aside areas for natural areas. Master plans preserved historic sites, wilderness areas, wetlands, old growth forests, sand dune areas, and scenic sites. Many of these areas that were set aside were ignored, or as they say, "let nature take its course." In times of limited budgets, it was more important to sell motor vehicle and camp permits, mow the lawns, and clean rest rooms, because these were the things that generated funds to operate the system.

As we all know, just setting areas aside does

not always mean the area will be preserved for its intended purpose. Prairie areas were taken over by woody plants; exotic plants invaded areas competing with native species. Unauthorized use of horses, mountain bikes, and other recreational vehicles were opening up the dunes to erosion. Little time or money was available to enact management plans or even do the needed research necessary to develop these plans.

Vision 2020 recognized this need and with new funding, stewardship programs are now underway. In this year alone, $250,000 has been allocated to 18 projects, seven for research or monitoring populations, three for natural areas management, six for control and rehabilitation of natural areas, and two grants—one for cultural resource projects and one for the Natural Features Inventory Program. These and future projects will help to preserve these valuable natural and cultural resources.

Outreach Program & Special Events

Staff was also hired to actively solicit program opportunities with the nontraditional park visitors. These employees present programs on the parks and what they have to offer, encouraging groups to use the parks. Even if the groups do not actually visit the parks, they at least should acquire an understanding of the purpose of the parks and what the state is managing for future generations. Another employee actively solicits and coordinates special events. This job consists of contacting businesses to promote use of park facilities for corporate picnics, special water shows, sports tournaments, camper shows, etc. Most of these types of events take place during the shoulder seasons or on weekdays when they do not interfere with regular park use, making better use of the park facilities.

Summary

Most visitors come to the parks for the recreational resources they provide. For many visitors, enjoyment of the parks is enhanced by the opportunity to learn about the structure and function, as well as the historical and present–day significance of park features. Since the Parks and Recreation Division is mandated to provide for the enjoyment of park resources, interpretive programs which offer insight into the histories of significant natural and historical park features provide an important means of enhancing the recreational value of the parks.

Each park also presents a window on the regional ecosystem complex in which it is found. Through this window, visitors can be helped to recognize important features of the natural environment and the evidences of human history so often embedded in it. Building an appreciation of natural and historical features within the parks should translate into increased sensitivity to the larger environment with its fascinating complexities and contemporary problems. Therefore, park visitors should also become more enlightened voters and more sensitive users of the resources contained within our National and State Park Systems.

Michigan State Parks are meeting the challenges of the 20th Century and are laying the foundation for the 21st Century through innovative interpretive programs and reaching out to all Michigan citizens.

Urban Populations as an Impact on Wilderness: A Study of Values in the Los Angeles Basin

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Abstract Most residents of the United States live in urban areas, and many wilderness users come from large cities (U.S. Census, 1990; Cole & Watson, 1995). The study presented here was designed to assess the wilderness values, and effective communication mediums of residents of one urban area, Los Angeles, California. Preliminary results of a survey of Los Angeles basin residents revealed a great deal of support for wilderness. The ethnically and economically diverse respondents recognized a need for protection of wilderness, the recreational value of wilderness, and the need for wilderness to remain under public management. To promote communication between urban residents and wilderness managers, managers should employ the mediums currently used and preferred by urbanites. The respondents in Los Angeles indicated mediums they preferred and/or used including, friends and family, brochures, guidebooks, maps and newspapers. To access the word of mouth or "friends and family" network, wilderness managers need to contact established groups in urban areas. According to respondents, the most popular groups were religious, neighborhood, and school organizations.
Keywords: urban populations, wilderness values, communication

INTRODUCTION

Wilderness managers and recreationists often discuss impacts of urban populations on wilderness in terms of biological impacts or influences on the wilderness experience. Biological impacts may include soil compaction, air pollution, damage to vegetation or infringement on—wildlife, while effects on the wilderness experience may include crowding, noise, or airplane over-flights. An additional type of impact to the wilderness may exist. Values and opinions of urban people can have consequences for wilderness. Given a climate of changing environmental legislation, urban encroachment on wilderness areas, and the constantly climbing demand for natural resource-based recreation, levels of support for wilderness within the diverse public need to be addressed. A lack of communication between wilderness managing agencies and diverse urban publics produces a dearth of understanding of urbanites' values and makes wilderness information inaccessible to a large part of the U.S. population.

This study was designed to assess the wilderness values and communication methods of an urban, ethnically diverse sample. Based on previous research that suggested people of diverse ethnic/racial backgrounds have similar environmental values and attitudes as Anglos (Jones & Carter, 1995; Mohai, 1990; Parker, 1996), we proposed that individuals from varied ethnic and economic backgrounds would support wilderness. Analysis of the wilderness values of the large and diverse urban population in the Los Angeles basin could serve as a foundation for understanding other urban populations.

METHODS

A mailed survey was designed to assess the wilderness values and communication mediums of residents of the L. A. Basin. Orange and Los Angeles Counties (population 11,273,720) provided a diverse population of individuals from Hispanic, Asian, African American and Anglo backgrounds (U.S. Census, 1990).

Sample

Survey Sampling Inc. drew a stratified random sample of 1080 people. Stratification was based on median household income and ethnic characteristics of census tracts in the two counties (Table 1).

Table 1. Sampling Design, Number of Respondents for Each Census Tract Selection

Median Household Income of Census Tract	>50% Hispanic in Census Tract	>50% African America in Census Tract	>50% Anglo in Census Tract
75,000 or more	60*	60	60
50,000 to 74,999	60	60	60
25,000 to 49,999	60	60	60
10,000 to 24,999	90	90	90
0 to 9,999	90	90	90

Number of households sampled*

Although the study was a mailed survey, individuals were drawn from current telephone listings, because telephone calls were used to remind people to send in their questionnaires. Procedures designed to encourage higher response rates from hard-to-reach populations were used, including incentives to participate (a raffle for respondents for 3—$50 gift certificates), an informal letter requesting their participation, and a telephone reminder.

Instrument

Wilderness values were tested through a series of 8 Likert scale items measuring respondents' views of wilderness as a place to protect wildlife, a contributor to the quality of the United States, an economic benefit, and a provider of recreational opportunities. Further, wilderness value items attempted to measure the desire of respondents to protect and preserve wilderness areas. Items were scaled on a '1' to '5' basis, with '1' indicating strong disagreement with wilderness values and '5' indicating strong agreement with wilderness values. Four of the items were reverse coded because these items were written so that disagreement with the statement indicated wilderness protection. For example, Item 2 "Wilderness is not necessary to protect wildlife" is coded so that strong disagreement equals '5.' Whereas, Item 1 "Wilderness contributes to the quality of the United States" is coded so that strong agreement equals '5' and strong disagreement equals '1'.

Methods of communication used and desired were measured through a series of seven and eight items respectively. Respondents were asked where they usually get information regarding places they might like to visit or activities that they might like to participate in, and mediums through which they would like to receive information. To further understand avenues available for information dissemination, respondents were asked to indicate from a list what types of group memberships they held.

RESULTS

The results presented in this paper represent preliminary data from the survey. The analysis is based on 99 returned questionnaires. Despite our efforts to obtain higher response rates, questionnaires are being returned at a very low rate. Remedies to this problem are currently being sought. A profile of respondents shows a great deal of diversity at this point.

In the results section, analysis of wilderness values of the respondents is followed by communication methods used and desired. Finally, an overview of the types of organizations to which respondents belong is given. Tukey's test for Honestly Significant Difference was conducted on value items for ethnic and income categories.

Profile of Respondents

Respondents reflect the diversity found in the L.A. Basin (Table 2). Approximately half of the respondents are Anglo. African Americans and Asians are represented near their respective levels in L.A. and Orange Counties. However, at this time the number of Hispanic respondents (16.2%) is lower than the representation in the population (37.7% in Los Angeles County and 23.4% in Orange County).

Table 2. Percentage of Respondents in Selected Groups

Ethnicity	Respondents
Anglo	48.5%
African American	16.2%
Asian American / Pacific Islander	9.1%
Hispanic	17.2%
Native American	1.0%
Other	8.1%

Respondents' income levels reflect the broad range of incomes found in the population—(Fig-

1). Education levels of respondents were higher than those found in the population (Fig. 2). The higher levels of education of respondents may reflect a selective response due to understanding of the survey process by more educated people. Furthermore, traditionally individuals with higher levels of education have more interest in environmental issues (Jones & Dunlap 1990), thus individuals with more interest in the environment may have been more likely to respond to the survey.

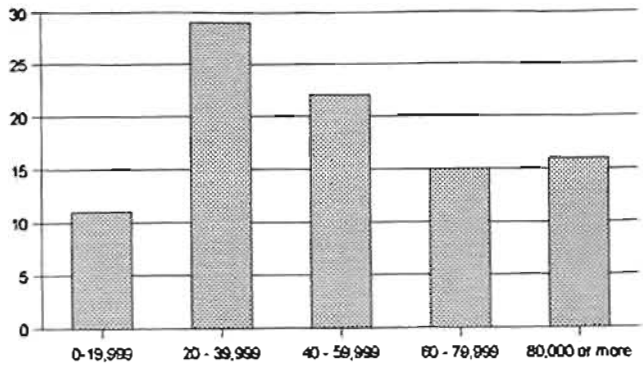

Fig. 1. Frequency Distribution of Annual Household Income of Respondents

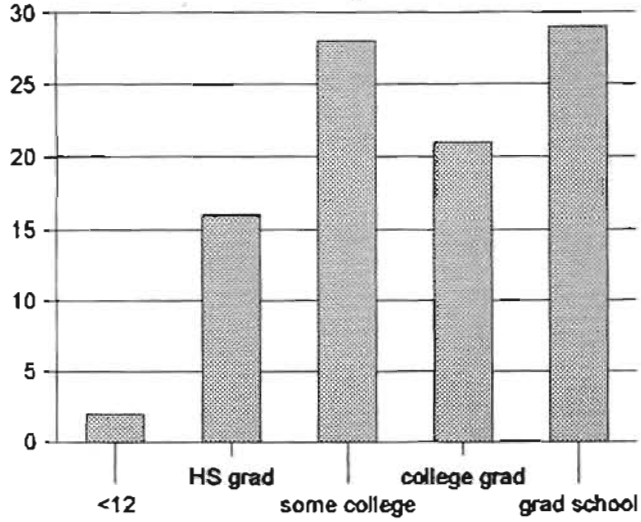

Fig. 2. Frequency Distribution of Respondents' Years of Formal Education

Average age of respondents was 49 (sd=15.9, range 15 to 80). Fifty-five percent of respondents were male, 45% were female.

Wilderness Values

Respondents showed a great deal of support for wilderness through their answers to the eight wilderness value items (Table 3). Six items had a mean score over '4' (Range 1 to 5). Two items scored below '4:' the necessity of wilderness for protecting wildlife (mean=3.19), and wilderness as factor in economic improvement (mean=3.56).

Wilderness enthusiasts and writers rarely concentrate on the valuation of wilderness in terms of economic benefits. Therefore, it is not particularly surprising that this item would have a lower mean score than others. However, the lower score for protection of wildlife does not coincide with much written about wilderness. In fact, it doesn't coincide with what respondents wrote about the importance of wilderness in an open-ended section of the questionnaire. In this section, 39 % of respondents indicated that wildlife was one of the reasons wilderness is important. Thus, the incongruence may be a result of question wording. This item, "Wilderness is not necessary to protect wildlife," was worded negatively and reverse coded so that the respondent had to disagree with the negative item to show support for wilderness. This may have caused confusion for respondents.

Table 3. Mean Wilderness Values of Respondents

Item	Mean
Wilderness contributes to the quality of the U.S.	Mean=4.65 Sd=.65
Wilderness is not necessary to protect wildlife.*	Mean=3.19 Sd=1.50
Wilderness improves the economy.	Mean=3.56 Sd=.98
Wilderness provides recreation opportunities.	Mean=4.55 Sd=.63
Wilderness should be sold to private business.*	Mean=4.43 Sd=.77
Some areas of the United States should be set aside to prevent development by people.	Mean=4.51 Sd=.96
Protection of land from human impact is not necessary.*	Mean=4.35 Sd=.96
There is very little value in undeveloped land.*	Mean=4.22 Sd=1.09

Individual item range 1 to 5: 5=Strongly Agree, 4=Agree, 3=Neutral, 2=Disagree, 1=Strongly Disagree
*Reverse Coded, 1=Strongly Agree, 2=Agree, 3=Neutral, 4=Disagree, 5=Strongly Disagree

Scores were aggregated for these eight items to create a wilderness value scale (Cronbach's

alpha = .68). Mean score for the respondents was 33.6 (range 8 to 40, 95% confidence interval 32.7 to 34.4, t=76.0, p=.000). Tukey's HSD test revealed no statistically significant differences between ethnic or income groups at the .05 level.

Table 4. Wilderness Value Scale Scores* by Ethnicity

Ethnicity	Mean	n
Anglo	33.6	n=46
African American	34.3	n=16
Asian American	32.0	n=9
Hispanic	33.4	n=15

*Range 8 to 40

Table 5. Wilderness Value Scale* Scores by Income

Income	Mean	n
0 -19,999	33.9	n=9
20,000 to 39,999	33.5	n=28
40,000 to 59,999	33.5	n-22
60,000 to 79,999	34.5	n=15
80,000 or more	33.1	n=15

*Range 8 to 40

Given the high levels of support for wilderness shown in these preliminary results, it is possible that communication efforts of wilderness managers need to concentrate on putting wilderness values into action instead of concentrating on wilderness values. Whatever the communication message, the results presented here provide clues as to effective mediums for communication between wilderness managers and urban populations.

Communication Mediums

Respondents were asked to indicate communication methods they use to gain information about activities (Table 6). As is usually the case, information from friends and family (word of mouth) was the most popular medium. The least used medium was radio.

Table 6. Communication Mediums Used by Respondents to Obtain Information on Activities or Trips

Medium Used	Percent
Friends/Family	82.8%
Brochures	74.7%
Guidebooks	62.6%
Newspaper	61.6%
Television	59.5%
Groups - currently a member of	40.5%
Radio	31.3%

In addition to selecting what medium is used, respondents selected the medium by which they would like to receive information. Respondents were most interested in brochures, and at least interested in radio (Table 7).

Table 7. Respondent Preference for Communication Medium

Mediums Desired	Percent
Brochure	84.8%
Maps	75.8%
Personal contact with someone who works in the wilderness	58.6%
Road signs	49.5%
Television	46.5%
Trail signs	46.5%
Visit from some who works in the wilderness your group	44.4%
Radio	35.4%

One way to provide wilderness information to people is through existing groups in their neighborhoods. This may be an efficient way to provide information to people not normally contacted by wilderness managers such as ethnic minorities, people who don't visit the wilderness, and low income groups (Magill, 1995). The most prominent groups with this potential were religious organizations (40.7%) (Table 8). Only a small number of people were involved in local environmental groups (9.3%), or national environmental groups (8.1%).

Table 8. Group Membership of Respondents

Groups	Percent
Religious	39.4%
Block or Neighborhood Organization	28.3%
School Organization	25.3%
Trade Organization	15.2%
Local Environmental Group	8.1%
National Environmental Group	10.1%

CONCLUSIONS

The purpose of this study was to explore the wilderness values of urban people of diverse ethnic backgrounds, and to identify potential communication mediums wilderness managers and enthusiasts could use to communicate with them. The conclusions drawn from this study are constrained by the response rate to the survey. This prevents generalizability to the L. A. Basin or to other urban populations.

Communication between wilderness

managers and urban people, such as those who responded to this survey from the Los Angeles basin, can be facilitated by using their existing or preferred communication methods. Wilderness managers should concentrate on mediums such as brochures, guidebooks, newspapers and personal contact. Distribution of information can take place through established groups within the city, including religious, neighborhood and/or school groups.

Although the number of respondents to the study is low, the ethnically mixed respondents' wilderness values were strong. These results support our theory that people from diverse ethnic backgrounds from a range of income groups value wilderness. Furthermore, this supports environmental attitude research that suggests environmentalism is a value that reaches across ethnic lines, (Mohai, 1990; Parker, 1996; Jones & Carter, 1995) and challenges the idea that wilderness is an elitist interest of only Anglo, affluent, outdoor recreationists.

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Saving An "Unwild" Wilderness Through Interpretation

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Abstract: Many wilderness areas in the eastern United States face significant challenges due to overuse, past human occupancy, user conflict, and other issues that threaten the very character for which they were designated. Through a combination of citizen input and a unique partnership with Indiana University, the Hoosier National Forest was able to protect an abused wilderness using interpretation as a cost effective tool.

Keywords: wilderness, wilderness education, wilderness management, degraded wilderness

Wilderness is...

Wilderness is defined by federal law as "...an area where the earth and its community of life are untrammeled by man, where man himself is a visitor who does not remain." Such an area is to be a place where natural forces are dominant and one may find solitude. This concept is supported by challenging visitors to cope with nature on its own terms. Modern conveniences such as developed facilities, use of mechanical or motorized equipment, and roads are generally prohibited.

This wilderness character may be somewhat easier to achieve with wildernesses in the western United States due to the remoteness, size, and original pristine condition of those areas. In contrast, eastern wildernesses are sometimes located near large metropolitan areas with severe overuse problems and evidence of past land abuses. Such factors often prevent the wildernesses from providing the primitive character for which they were intended. Through a combination of public involvement and a unique partnership with Indiana University, the Hoosier National Forest was able to protect such an abused wilderness using interpretation.

The Challenge

The Charles C. Deam Wilderness located in the Hoosier National Forest in south-central Indiana was suffering from the challenges mentioned above. A small wilderness of only 13,000 acres, the Deam is the only wilderness in Indiana. This is particularly significant due to the fact that the state of Indiana has only 3% of its total land base in public ownership. Further, the area is located on the state's most popular reservoir, and is within a one to two hour drive of several large metropolitan areas with good highway access. The net result is a perfect recipe for too many people wanting to use too little land. These factors combined to make the Deam Wilderness rank 15th in the nation in visitor days per acre according to Hendee, Stankey, and Lucas (1990) in *Wilderness Management.*

Additional conflicts and challenges included steep slopes and fragile soils used heavily by horse riders, a long history of user conflict, trail density far in excess of wilderness standards, active cemeteries within wilderness boundaries, and a county road that bisected this two parcel wilderness. Previous attempts to solve these problems through traditional means of public involvement yielded little result. Furthermore, it was discovered that the average user had no idea that the area was a wilderness or even what a wilderness was. The resulting impact was taking its toll.

What to Do ?

An extensive public involvement process was initiated ultimately resulting in an amendment to the Forest Land and Resource Management Plan. All aspects of management were addressed, and an interdisciplinary plan was adopted. Programs such as law enforcement, cultural resources, endangered species, interpretation, etc. were considered in

concert with one another.

One major issue that emerged during the public involvement and planning process was the need to provide a definitive wilderness education message to the nearby community and users. The idea was to use interpretation in addressing as many management problems as possible. Through an inventory of issues and problems raised by user groups, the Forest Service was able to identify those concerns that could be addressed through wilderness education and interpretation.

This approach was significant because rather than the agency "guessing" about what the interpretive focus should be, the public involvement process provided a needs list based on users experiences and observations. Employing a user based perspective rather than agency perception was considered to be a more accurate method of determining the most appropriate messages.

Implementation

The next step was to implement the effort. That posed yet another challenge as the Forest Service was suffering severe staffing and budget shortages. However, located just a few miles from the Deam Wilderness is Indiana University, with an active Department of Recreation and Park Administration. Through ongoing networking, the Forest Service discovered that the university was interested in becoming involved in some aspect of interpretive research and was pursuing grants in that regard. The university in turn became aware of the Forest Service's need for someone to administer this new wilderness education program, and the opportunity for a partnership became obvious.

Both organizations entered into a Challenge Cost Agreement for the purpose of furthering the protection of the Deam Wilderness through wilderness education and interpretation. Under this arrangement the Forest Service provided financial reimbursement to the University in return for the services of a graduate student/wilderness education specialist. The specialist worked part time, administering a community based program in the off season and a field based program the rest of the year. The specialist also worked part time in conjunction with the university's nature center. Both organizations provided assistance to the individual in the form of training, clerical resources, etc. The result was a mutually beneficial partnership whereby the Forest Service obtained a wilderness education specialist in a cost effective manner, the university obtained a means to conduct research, and the student gained valuable work experience.

The Research

An important aspect of the partnership between the Forest Service and Indiana University was the effort to evaluate the effect interpretation has had on visitors' knowledge, attitude, and/or behavior toward the local wilderness. Indiana University developed a process to make this evaluation and is currently analyzing data collected as part of that process. The results of this research will aid the Forest Service in deciding what types of interpretive approaches can best promote responsible behavior toward the wilderness.

In Summary

The Charles C. Deam Wilderness is starting to regain some of the "wild" for which it was designated. Wilderness education is serving as a significant contributor along with the many other management tools being used to protect this special resource. Visitors are becoming aware of what a wilderness is, and that the Charles C. Deam area is included in this special designation. They are also becoming aware that use of this area requires special behavior, and that there is a reason for the new rules and regulations now in effect. After many years of conflict, misperceptions, and lack of awareness, users are beginning to adopt a wilderness ethic. As a key element of the overall management effort, interpretation has made a difference in how people perceive and use this special environment.

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You Can't Talk to the Trees: Providing Resource Managers with Training in Interpretation, Education and Other Communication Skills

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"I talk to the trees, but they don't listen to me..."

Do you remember the song that Clint Eastwood sang in the movie "Paint Your Wagon"? Lonesome for people, he was bemoaning that the environmental elements—the trees and stars—would not communicate with him. It seems he was of a different psychological make-up than many people who choose to enter natural resource management professions—wildlife biologists, foresters, and wilderness managers. As so often seems to be the case, many people choose such professions because they are intrigued with the resources and, as many prospective students state, they simply like being out of doors. That statement more often than not is accompanied by a statement of preference for working with the resources rather than people. Similar sentiments are expressed by professionals in the field. Yet many of those professionals have discovered that they spend 80-90% of their time dealing with people or "people issues" and only a small portion of their time working directly with the resources (see Fig. 1). By the very nature of dealing with people, skill in oral and written communication is crucial to success. But that statement is quite broad and generic. Therefore, to provide focus and clarification, this paper will explore the range of responsibilities of wilderness and natural area resource managers, changes in resource management strategies, and the types of communication skills needed for various resource management contexts.

Wilderness, Natural Areas and People

While the concept of wilderness is generic (though perceived variably by different people), designated wilderness areas are, to varying degrees, artificial constructs, with physical areas bounded by lines often identified more by political factors than by ecosystem factors and, at least in the eastern United States, bisected by roads or other structures that may not technically be part of the designated wilderness, but which effectively intrude on the integrity of natural systems. Once labeled as wilderness, perceptually embellished with all the attendant images of "pristine" and "solitude" and "untrammeled," they become magnets for people. These people value a wide array of wilderness characteristics and qualities, some of which involve opportunities for recreation. Consequently, in managing the wilderness resource, managers also must manage the people who recreate within wilderness areas. Some users are experienced and knowledgeable in wilderness reality and use--potential dangers, climatic and ecosystem characteristics, minimum impact practices, and others. Yet many users are quite ignorant of these characteristics and appropriate behaviors, thereby posing challenges to managers with regard to resource impacts, user safety, and visitor conflicts. Finding appropriate and effective ways to communicate with, educate and encourage resource-protective behavior of visitors becomes a necessary activity if managers prefer not to "lock out" recreational users or solely to use direct management techniques such as law enforcement.

The need for educating wilderness and natural area users is not new. Paul Petzoldt, a leading advocate for wilderness education for several decades, stated his vision and rationale for wilderness education in a video interview with Ken Verdoia (1994). His mission, regardless of whether working with Outward

Bound, National Outdoor Leadership School, Boy Scouts of America, or the Wilderness Education Association, was "to help mankind get in synch with nature...while there was still time." In reflecting on the urgency for implementation of wilderness education in the late 1960s, he stated,

> ...and now the Wilderness Bill was being talked about—vociferously...I knew that the Wilderness Bill, even when passed, was not the answer—because people had to be educated to go out to the outdoors—and still protect its environmental beauty, its ecosystem. And they had to be taught that, because we didn't know how to do that; it wasn't in our old time ethics. We had to develop a new ethic and we had to develop how to do that. And I knew there was a fallacy for people to think that when the Wilderness Bill was passed, if they loved the outdoors, they could go out there and not harm it. And so when they went out there, they started to harm it—even those that loved the outdoors, and we developed that expression 'they're loving it to death,' which they're doing today, and we've got to get them, uh, leaders trained or educated. We have to educate people to go to various places. They all want to go to the same place! We've got a lot of changing to do...
>
> [Continuing, in response to the questions, "Are you an environmentalist?"] 'Environmentalist' has so many meanings. It's like love—[We need] the right kind of environmental (I hate to use the word, right?) but on the kind of environmental education that will let us use our wild outdoors and our parks and our official wilderness areas and everything else with little or no harm to the beauty or the ecosystem.

While identifying education as an important part of wilderness management is not new, there seems to be renewed interest in use of education to manage wilderness and wilderness users. Citing results presented during the Fourth International Outdoor Recreation and Tourism Trends Symposium in 1995, Vander Stoep and Roggenbuck (in press) summarize a 1994 assessment by Barns and Krumpe (1995) on current issues in wilderness management that compares results with those of a similar study conducted in 1983.

> While 'educating nontraditional publics on wilderness values' was ranked fourth in each study, it received stronger support in 1994. Additionally, several other education-related issues were ranked considerably higher than in 1983 ('Leave No Trace' training ranked 6th vs. 16th; miscellaneous education ranked 18th vs. 30th). Several other issues identified in 1994 were not even mentioned in 1983, including wilderness education in schools, information sharing 'all the way down the line' and between agencies, increased use of partnerships, reaching users who do not seek out information, and public education in ecology and natural resources. A few issues identified each year, ranked fairly low both years but more highly in 1983, included public participation (ranked 35th vs. 21st), educating outfitters and other authorized users to ethics and minimum impact use (ranked 56th vs. 47th), and funding for wilderness education (ranked 69th vs. 55th). Barnes and Krumpe (1995) state that the 'top two issues in 1994 concerned with education...both show significant increases in their percentage of the maximum possible scores over 1983. Education, of 'nontraditional' (off-site or nonrecreational) users as well as 'traditional' users (on-site recreationists), was an important component of wilderness stewardship in 1983. It is even more so in 1994. This trend is underscored by the emergence of two issues in 1994 that did not surface in 1983: 'Wilderness education in schools (K-12)' and 'Lack of biocentric philosophies in general public.'

Further supporting this trend is that the importance of information and education is evident in more natural resource management arenas than just wilderness. In an op/ed piece regarding changes in forestry education, Rebecca Staebler, editor of the Journal of Forestry, states, "Less understood, perhaps, is the integration of social science and communication arts into forestry curricula...it is appropriate and necessary, therefore, to learn how to communicate and interact with the public and other professionals" (1996, p. 3). Fisher (1996, p. 7) reiterates this need when he acknowledges that foresters sometimes have been unable to do their jobs "because they lack education, interpersonal skills, or talent." Additionally, he states, "We now understand that our graduates must be firmly and broadly grounded in the biological, physical, computational, analytical, economic and political sciences, as well as the humanities and the art of communication" (Fisher, 1996, p. 5).

The need for communication skills in wilderness and natural area management, however, is not limited to education. Varied stakeholders, ranging from those with strong preservationist beliefs to those who believe wilderness areas should be "released" for development, mining, oil production, grazing and other uses are voicing their opinions. Individuals and interest groups, even if not direct users of wilderness, can exert pressure on

managers, managing agencies, and legislators. Again, it is critical that managers have an array of effective communication strategies and skills to work with these people. Thus, traditional ideas about the use of interpretation and education as strategies to inform and educate people about wilderness and natural areas should be expanded to include broader communication skills, to incorporate: communication in formal, nonformal and informal settings; planned and spontaneous communication; communication with repeat and one-time visitors; communication with users and non-users; on-site and outreach communication; and communication strategies for planning and partnering.

These multiple opportunities and arenas for plying communication skills can be challenging to managers. In a recent presentation and discussion with university employees, a Michigan Department of Natural Resources (DNR) forester stated that "resource monitoring and data analysis is easy...management of the trees and resources is easy...the BIG problem is with the application and dealing with the public and their reactions to the application." Later, the same forester stated his belief that much of this potentially negative reaction can result from "people not really knowing what they want." It is possible that this often is because many people are not knowledgeable of the multiple variables, interactions and impacts of various management strategies. Also, people tend to assess many things based heavily on perceived or real impacts to them personally, particularly if they are unfamiliar with elements of the larger system or of values and perceptions of others. Thus, the communication challenge expands.

The aforementioned DNR forester's perceptions allude to the need for effective communication with various stakeholders. However, planned communication and opportunities for public input do not always solve all problems. During the same discussion, a forester with the U.S. Forest Service stated that, even though they are "using public input much more, even with a vote you get something like 52% to 48%. So 48% are always displeased...and they're the noisy ones." His comments express some of the frustrations encountered by resource managers attempting to implement public input processes, one of the components of a planned management communication strategy. These frustrations, however, do not negate the potential benefits of positive communication; perhaps they indicate that additional training is needed in developing comprehensive communication strategies that are long term, not restricted to single issues, and that link managers and stakeholders from early planning stages of specific projects or policy decisions and through daily operations.

Designated wildernesses are not the only natural resource areas whose managers' tool kit should contain an array of communication techniques to use, in combination with other strategies, to manage the resources. This symposium broadened the scope beyond management issues associated specifically with wilderness to include other natural resource management areas. Part of the rationale was because designated wilderness is minimal in the eastern United States, with much of it considerably smaller and different in character than most western wilderness areas, and part was because other non-designated areas may contain some wilderness or primitive area characteristics. Therefore, this paper addresses the importance of communication in resource management across numerous types of natural resource areas. Additionally, the eastern United States is much more densely populated than most areas of the west, with millions of people living within a few hours driving time from wilderness and natural resource areas, and with many more potential visitors per acre than for most western areas. This increases potential impact on the resources, the diversity of user preferences and uses, the potential for conflict, and the number of people and other uses adjacent to wilderness and natural area boundaries. Thus, maintaining positive communication with these numerous people and interest groups takes on additional urgency.

No longer can managers withdraw, much like a turtle, within the boundaries of the resource area and focus only on issues entirely within those bounds (recognizing, of course, that many impacts and issues extend beyond physical boundaries). Visitors as well as other stakeholders will not permit it. Often these various stakeholder groups are at odds with each other. As an example, Voyageurs National Park managers currently are involved in a debate with locals about whether or not to increase snowmobile and other motorized use within the park. Some locals want to greatly expand such access; others want to maintain some sort of balance between recreation use and other wilderness qualities (La Pierre, 1996). Similar

issues are faced by managers of most park and wilderness areas, necessitating that managers be able to talk with and listen to all stakeholders. Unfortunately, many managers are minimally trained in effective communication skills, particularly when controversy is part of the picture. Yet, more and more, they are finding it necessary to interact with these diverse, often antagonistic stakeholders.

Even private owners of large natural resource areas are finding the need for and benefits from interacting with potential stakeholders, as evidenced in a recent article in the *Journal of Forestry* titled "Enhancing Forest Management through Public Involvement: An Industrial Landowner's Experience" (Redelsheimer, 1996). Corporate land managers also are soliciting public input regarding their land management as evidenced by efforts of Southern California Edison (SCE), a hydropower company whose forestlands are surrounded by National Forest land with numerous inholdings and adjacent summer cottages. In developing a revised management and harvest plan, SCE decided to consider the opinions of users who, while not actual "owners," considered themselves owners by virtue of their traditional use of the land and who had concerns about the aesthetics of the land. "Recreational activities enjoyed by these 'owners' include hunting, fishing, hiking, boating, and sightseeing. Local residents and cabin owners also expect boat docks, protection from wildfire, special access, permission to cut firewood, and other 'historical' privileges" (Mount, 1996, p. 22). Three activities engaged in by SCE to involve its neighbors included 1) community involvement by talking with all stakeholders in the community, 2) education about natural forest systems and human interactions with forests, and 3) promoting public participation in the SCE's forest thinning operations. All three involve effective communication skills.

Why the Need for Change in Management to Include Communication?

Traditional resource management, while brimming with expertise in silviculture, wildlife biology, hydrology, dendrology, aquatic toxicology, geology, and many other science and technical fields, is no longer sufficient within current social, economic and political contexts. Managers, while respected for their specialized skills and knowledge, are no longer automatically assumed to be the "experts" whose decisions are always "right," especially as perceived by others. Additionally, their values, perspectives and priorities may not match those of non-managers. It is often the case, however, that this traditional perspective is passed along to current students of resource management. An example from the forestry field acknowledges that "students may understand how to grow and measure trees and forests, yet have little concern for the importance of these activities to people. Instead, foresters appear to act in self-imposed isolation, believing that we know what's best for society without ever asking" (Egan, 1996, p. 10). Therefore, education of current and future managers must change as the management environment changes. Several factors contribute to this change in the management environment and might be categorized loosely as: external impacts, internal management issues, and stakeholder factors.

External impacts

Budget constraints, particularly in the public sector, make it attractive to seek support (financial and other resources, technical assistance, etc.) from or develop partnerships with other groups. Such efforts require mutual understanding and respect of the others' priorities, values and perspectives. Communication is essential to establishing these relationships.

Management of natural resources requires implementation of a consistent management strategy over the long term. Drastically changing management practices every two or four years does not work well with resources that take years to grow or, when damaged, to recover. In this age of rapidly changing political priorities and attitudes, facilitated by "instant media communication" and carefully planned sound bytes, managers face an enormous challenge to implement and monitor long-term management strategies. To counter the potential for wildly swinging political and social opinion, long-term relationships and continuous education about resource management strategies and issues with varied stakeholders is critical to long-term understanding and support of those practices. Again, education and general communication are critical components of the process.

One-time education of stakeholders (visitors, adjacent landowners or others) is not sufficient, particularly with changes in the cultural and ethnic demographic profile of United States

residents and with increases of international visitors to wildernesses and other natural areas. The most obvious challenge to effective communication is differences in languages. However, cultural differences also can be expressed through different perceptions of what wilderness is, its benefits, appropriate and inappropriate behavior toward and within the resource areas, and even whether wilderness is a "good thing" to have and protect. With such cultural diversity (including differences between rural- and urban-acculturated people), managers are faced with a challenge of target marketing and diversifying their presentation of relevant information. Additionally, demographics of wilderness users have changed (Cook and Borrie, 1995). Wilderness visitors tend to be older; a higher percentage of women, both individually and in groups, are using wilderness; other non-traditional users such as minorities, especially Hispanics and Asians, and persons with disabilities are visiting wilderness areas more often; the education level of wilderness visitors has increased; and more users seem to be repeat users of wilderness areas across the country.

The apparent increase in the litigious nature of many in western society increases the potential for people, especially within the context of organized groups such as the Wise Use Movement, PETA, the Wilderness Society and Sierra Club, to file lawsuits from both sides of the philosophical fence against specific agency actions or policies. Legal counsel will always be necessary, but perhaps, with early and continuous communication with and involvement of diverse stakeholders in major policy and management decisions, the incidence and severity of legal challenge can be minimized.

Geographic shifts in the population bring people with differing resource management values and opinions closer together. For example, population growth in the Rocky Mountain region, whose long-time population held traditional land use views, is exploding. Much of this growth is from urbanites moving west. Many of the new residents have higher income and education levels than long-time residents. New residents also strongly support environmental organizations and recreational use on public lands (Davis, 1995). This brings into contact and conflict two groups with competing land use values. Resource managers then receive input from both sides, must communicate equitably with both groups, and often find themselves in a mediating role as they develop resource management policies and practices. Without skill in communication and mediation, interactions can be disastrous. Even an interpreter in Washington state, whose job is based on skillful communication, expresses the challenges of working with people having seemingly divergent views. How do you present an educational program when one visitor describes forests as "...a place of beauty and solitude where I like to escape for the weekend to hike and enjoy nature. It's a shame that people think we should cut down all those big old trees for economic gain" and another visitor retorts, "My family is in the logging business, and the forest means jobs to me. I'm disturbed by environmentalists who want to lock up valuable timber resources!"? (Tall, 1995, p. 3). In addition to demonstrating personal communication skill, the interpreter must find ways to improve the communication skills (including listening) of program participants.

A couple of other external factors impacting resource managers' communication are related more to challenges of delivery than to triggering the need for more extensive, planned communication. These are changes in transportation and media technology. Modern modes of transportation make it exceedingly easy for millions of people to access wilderness and natural areas, particularly in the front country. With people able to access easily, and with the numerous, uncontrolled access points to wilderness areas, managers are faced with a major challenge of how and where to communicate with users. Additionally, continual development of new transportation modes and "toys" (mountain bikes, personal watercraft, snowmobiles, hang gliders, over-sand vehicles, and many others) plus the linking of transportation modes (such as helicopters and skis for heliskiing) create new ways for people to access and use wilderness, thereby increasing potential for additional resource impacts and challenges for contacting users.

Technology advances in communication systems, such as cellular phones and the world wide web, create challenges as well as opportunities for reaching targeted audiences, but also can affect visitors' attitudes about how they use wilderness areas. An example, recently read in a short magazine article (citation elusive), described a woman who, unprepared for the terrain and weather, decided to hike alone up a

mountain trail. Near the top, she simply got tired and used her cellular phone to call for emergency rescue assistance. Such examples illustrate an unrealistic perception of wilderness that somehow they are exciting, "safe" places to play or seek thrills but where "someone else" maintains the responsibility, much like the wild river rides and other adventure experiences at theme parks—thrills with no real danger. Such attitudes and an assumption of easy access to rescuers create a special challenge to wilderness managers about educating potential users of the realities and dangers of wilderness, and of personal responsibility needed for wilderness use.

Internal Management Issues

The current approach to resource management focuses on "ecosystem management," "integrated resource systems," and other processes that emphasize integration and holistic approaches to resource management, which means incorporating economic and social issues with all the natural elements of ecosystems. While there has been much discussion and no widely accepted, explicit definition or identification of the elements of ecosystem management, there is general agreement about its holistic nature. Such a management approach necessitates communication among divisions and specialists in different areas. Additionally, the more general movement in western society to streamlined and decentralized management, to flattened bureaucracies and team management, and toward collaboration and partnering has impacted resource management. These less hierarchical approaches rely on clear and open communication within and between organizations. Personnel needs are more likely to include multi-task specialists (as opposed to narrowly focused specialists) and, at the very least, require a working knowledge of the "language" of various specialty areas among a broad range of employees. If management is to indeed be integrated and systems-based, the language used in the information system also must be integrated and shared.

Stakeholder factors

The United States population is becoming increasingly urban, which has implications for what and how wilderness and natural area managers communicate with them. Regardless of whether these urbanites are philosophically supportive, antagonistic or neutral about wilderness, it is likely that many of them have limited knowledge about the ecosystems or about how to survive and behave in them.

Because much of the population growth is in suburban areas, bedroom communities (many of them former rural community centers) and on "ranchette" and "weekend/recreational farms" (many of them former agriculture or ranch lands), and because vacation and second home properties are increasing in many parts of the country, many urban people are living or vacationing near or interspersed within parcels of wilderness and natural areas. This increase in contact often brings an increase in conflict between natural resources and the "country" urbanites. An example is an increase in reported altercations between wild animals (e.g., mountain lions, elk, bear, deer) and humans. Sometimes the human complaint is damage to vegetables or flowers, sometimes it is mauling or killing of pets, children or adults by wild animals whose habitat has been disrupted. Again, education about natural systems is important to managing human perceptions and behavior.

The population is becoming more diverse, as discussed previously. Due to extensive immigration and the growth of traditional minorities, as well as extensive international visitation, visitors and residents do not have a common philosophical background or experiences with wilderness and natural areas. Such differences create additional challenges in communicating facts, resource management philosophies, policies and regulations, and recommended behaviors to people in ways that are relevant to each person. Additionally, it makes it more difficult to solicit representative public input for decision making.

Special interest groups are becoming increasingly organized and sophisticated in their own communication and legal strategies. They are more politically savvy and strategic in their plans than in previous decades, and many of them are well funded. These qualities facilitate effective use of legal experts and the media to present and possible support their various causes. Media coverage is instantaneous and camera lenses can zoom in on small groups; therefore, small, vocal protest groups can appear quite large and influential with appropriate use of media. It is incumbent, then, on managers to be just as effective as the special interest groups in communicating through the media, being

politically astute, and taking a proactive approach in soliciting ideas and opinions of stakeholder groups prior to media and legal confrontation.

Implications of Positive and Negative Communication

Communication is something that occurs in an ongoing manner...simply because we are human and because communication is how people interact with each. However, communication is not simply "talking." Nor is it just the stuff that gets in print. Communication incorporates a broad array of elements—including, but not limited to, language; topical context; tone; innuendo; physical context; facial expression and body language; emotive cues via color, sound, style and music; spatial arrangement; temporal elements—all combined in information bundles and transmitted through some channel to others. Sometimes the bundles are decoded and interpreted as the sender intended; other times they are perceived as something entirely different from the intended message. Sometimes the messages are planned and consciously delivered, with specific objectives in mind; other times they are spontaneous or even unconscious. Therefore, if resources managers are to use this process in a way to enhance their work, the process should be conscious, carefully planned and integrated (both in content and delivery style to targeted audiences), and thoughtfully delivered. Additionally, the process should allow for feedback from and interaction with stakeholders, thus facilitating open, two-way communication.

If communication, both as part of standard operating procedure and through targeted information campaigns, is done well, it can contribute to the following positive results:

- build trust between managing agencies and targeted constituents;
- enhance the agencies' image (positive public relations);
- develop a well informed constituency over the long term;
- reduce conflict;
- provide effective marketing;
- increase support (financial, moral, political);
- enhance the quality of service; and
- increase assistive public input.

If, on the other hand, communication is done poorly or without thought—either through content, tone or omission—it can contribute to the following negative results:

- negative general operations and poor morale within the managing agency;
- dissatisfaction of visitors and other stakeholders, which sometimes can lead to antagonism;
- isolation or ostracizing of some stakeholders;
- misunderstanding of agency mission, goals, decisions and actions;
- distrust or other negative images of agency;
- vandalism or other destructive behavior;
- confusion by visitors and stakeholders;
- loss of support (financial, moral, political);
- missed opportunities for partnering with constituents; and
- legal challenge or political blockage of actions.

Results of positive and negative communication are just as relevant and applicable to small organizations and natural areas (such as development of a new nature center and preserve on a former homestead that neighbors traditionally have used as sort of a "private" preserve and now feel threatened by the influx of so many "others" to use the site) as they are for a large agency trying to establish or manage a large wilderness or resource area (such as the National Oceanic and Atmospheric Association, NOAA, attempting to develop a new marine sanctuary, which is perceived to potentially threaten or restrict traditional uses such as commercial and recreational fishing, unregulated diving, boating and other activities).

Roles of Communication in Wilderness and Natural Area Management

Thus far this paper has shown a need for communication skills by wilderness and natural area managers, has discussed the factors influencing this need, and has presented potential benefits of positive communication as well as negative effects of ineffective or inappropriate communication. What are the various roles or uses that a planned, integrated communication strategy can play in management of wilderness and natural areas? These roles include both traditional and nontraditional purposes and techniques.

Enhance visitor experience

One role of communication is generally to enhance visitors' experience with the wilderness or natural area. That objective can be met

through a variety of information and education, including information about the area's physical characteristics, types of terrain and climatic conditions to be expected during the visit, helpful hints for improving the experience and reducing the potential for accidents or injury, and interesting information about the resource itself. The challenges are to tell an integrated story, to make the information easily accessible and understandable, to make the information relevant to a wide variety of people from diverse cultures, and to assure that the information is attended to by visitors.

Provide guidance and safety suggestions

As included above, part of the information managers might want to disseminate includes safety guidelines, directions, logistical help (where to park, how to get permits, where to camp), rules and regulations, etc. While this information may partly enhance the visitor experience, it also helps deal with several management issues such as promoting visitor safety and reducing the need for visitor rescues or other assistance.

Educate the public about the resources and resource issues

Part of the purpose of education is to answer visitor questions about wilderness and natural areas. Any "ranger" probably could regale an audience with tales of seemingly goofy questions asked by visitors, but which are honest questions based on knowledge and experiences relevant to the individuals—many of whom have no exposure to natural resources. A May 1995 issue of Outside Magazine presented a list of such questions submitted by park rangers from across the country. Questions included resource-ignorant questions such as "What time do you feed the bears? How often do you mow the tundra? Are the baby alligators for sale? What time do you turn on Yosemite Falls? Does Old Faithful erupt at night? So what is this [cave]? Just a hole in the ground?" Such questions may seem ridiculous to a resource-educated person, but they illustrate a real lack of knowledge among the "general public." In addition to educating users and non-users about the resource elements, it is important to educate them about interrelationships between the resources, the relationships with and relevance of resources for people, the impacts that people have on the resources directly and indirectly, and resource management issues. Without this base of knowledge, it is unlikely that some of the other objectives or roles can be attained.

In addition to educating people about the natural resources, it is important to educate them about the historical context and use of the resources. While people often try to dissociate natural areas, particularly wilderness areas, from human use, almost no areas are untouched by human use through history or are unimpacted by current human activity, even if only indirectly through air and water pollution, climatic change, and habitat disruption. Particularly in the eastern United States, wilderness areas have a human history, both pre- and post-white settlement. Quite often it was the resources themselves that attracted human use, either to support direct survival from the resources or to support some type of industrial development. These interactions are crucial to full understanding of the resources and how and why humans are influenced by and, in turn, impact the resources.

Education about the resources need not be restricted to visitors. Many people may never visit a designated wilderness, but understanding the resource and its values, including benefits to humans, help make the resources relevant to them. Thus, outreach education should receive just as much attention as on-site education.

Promote resource stewardship

One of the goals of environmental education is to promote resource stewardship through informed decisions in the voting booths and through personal behavior (Hungerford and Volk, 1990). Environmental education includes providing people with skills in problem solving, critical thinking, and participation in decision making. These goals are not possible without first providing the knowledge base, but messages should go beyond factual information as people are ready for the additional education. The goal is to develop environmentally literate constituents with the ability and desire to take personal and political action to enhance resource stewardship. This goal applies both to personal behavior engaged in while visiting wilderness and natural areas as well as personal actions and involvement at home and in local communities.

Facilitate political support and involvement, create a positive public image.

As people become more resource literate and aware of their role in decision making and the

avenues through which to have input, they can become involved actively in policy making regarding wilderness and natural resources. From the managers' perspective, such involvement is more positive (and less threatening legally) if engaged in during planning and pre-decision-making stages rather than only after decisions are made, which often triggers negative reaction from some public sectors. This means that, in order to build public and political support, managers must move beyond their traditional geographic and political boundaries to build working relationships with stakeholders and openly solicit input with the honest intent of considering it. A well developed communication and action strategy are integral to such outreach activities. These two-way communication efforts should build some level of trust, an open working relationship, sources of political support for resource managers, and generally positive public relations for the agency.

Facilitate public input

For many years public resource managers have been required to conduct public hearings on major new policies and regulations. However, many of these hearings have been entirely post facto, with little opportunity for people to really affect the policies. Often they have done more to draw battle lines or strengthen positions of antagonists and provide a pulpit for protest. Often they are poorly advertised and poorly attended. When well attended, often the participants represent specific interest groups and are not representative of the "public" as a whole. Consequently, efforts have been made in numerous locales to develop alternative forums for public input that are more conducive to representative input and occur earlier in policy planning and development. General communication skills as well as meeting facilitation skills and the ability to handle hostile audiences are critical in effective public input processes.

Develop alternative sources for funds and other support

Because public funds for wilderness and resource management probably never will be sufficient to support the full range of management actions, research and visitor services, alternatives must be sought. One strategy involves partnering--between agencies, between agencies and local businesses or organizations, or between agencies and "friends" groups. Such partnerships are reliant upon continuous and effective communication for their success. Additionally, use fees, product sales and other types of marketing may provide additional sources of dollars to help support wilderness management. Again, communicating the reason for fees and developing effective marketing strategies and sales products (e.g., books, videos) rely on communication techniques. While managers might not be the ones to develop products, they should have an understanding of and provide input about the needs, preferences and expectations of potential clients as well as be able to articulate the issues and messages important from the managers' viewpoint.

Facilitate professional functionality in a highly mediated world

The information superhighway is simply the immediate electronic interaction between people. Each day the number of users increases. Also each day the amount of "stuff" on the highway increases. Advertisements that used to be aired primarily on radio and television and printed in magazines and newspapers now show up on buses, on restroom doors, on parking meters, on the backs of sales receipts, on floors, on cereal boxes and anywhere else that marketers can think of. Consequently, people are bombarded constantly with information from multiple sources, regardless of whether or not they actively seek the information. Therefore, if resource managers are to be effective in communicating their messages, they must understand how people screen and process information, and how and where certain types of information are likely to be most effective. Additionally, they must stay current with the variety of media channels available and used by various target markets. Relying solely on staff with the label of "public relations specialist" limits the effectiveness of the cadre of resource managers within any organization.

The Management Puzzle

Don't wilderness and natural area managers already have enough to do? Already they are involved with resource monitoring and management, viewshed management, enforcement activities, land use decisions, budget allocation, facility and building management, visitor safety, and a host of other activities. Shouldn't they be left alone to

accomplish those tasks? Why should they have to "add on" skills and activities in communication? Simply because a planned program of objective-guided internal and external communication can facilitate many of these other tasks, particularly those that involve visitors and other stakeholders. While none of this is really new, it is questionable whether agencies and educational institutions are adequately training wilderness and other natural area professionals to be effective communicators. Yet over and over again surveys indicate that a major employment criteria (across most professions) is skill in oral and written communication. So what should we be teaching wilderness and other resource managers about interpretation, education and communication in general?

Recommendations for Communications Curricula and Training for Wilderness, Natural Area and Other Natural Resource Management Professionals

By its very nature, communication is a broad field. While education and interpretation are focused applications of communication strategies as applied in resource management contexts, they should not be the sole focus of communication skills. To be effective communicators, resource managers should have a broad understanding of communication concepts and principles, should be versed in the specifics of education and interpretation, should have the ability to plan and apply integrated communication strategies to achieve specifically defined goals and objectives, and should have the technical skills (oral, written, and technology) to develop and implement effective messages. Summarized below are the individual concepts and skills within each of these broad categories that are recommended for inclusion in a comprehensive communication training program for wilderness and natural area managers (expanded from Vander Stoep, 1995).

Communications Concepts and Principles

- Communication model (message sender, receiver, message, channel, feedback loop; encoding and decoding; sources of interference);
- Information systems (understanding how and where people seek and receive information, who within a group gathers and processes information, who and how decisions are made based on information, preferred sources of information, how information is used, how various components of information are integrated by users, and barriers to information effectiveness);
- Influence of personal verbal and non-verbal "language" (including intonation, verbal pacing, gestures, body language, facial expressions, inflection, pitch, volume, presentation style);
- Influence of color, spatial arrangement, environmental conditions both on print and in verbal communication;
- Persuasion theory (for details about the influence of numerous variables [e.g., attitudes, values, knowledge, social group, awareness of consequences, acceptance of personal responsibility for actions and results, norms, social influence] see Manfredo, 1994 and Vander Stoep and Roggenbuck, in press);
- Principles of interpretation;
- Environmental education goals and curriculum development;
- Learning styles (the ways people process information and learn differently; influences of visual perception, auditory perception, kinesthetic perception, emotion and participation or involvement in learning);
- Cognitive, physical and social development (as children grow and develop, they move through stages of cognitive and physical abilities and the role of social influences shift as they develop; these factors affect how they process information and learn);
- Identifying target markets and their characteristics (skills in market analysis, identification of relevant sociodemographic, psychographic and cultural factors that may influence what and how people perceive and interpret information provided by resource managers);
- Influence of media in society.

Planning and Application

- Planning, timing and implementing media campaigns (targeted to specific audiences);
- Types of public process and appropriate use (e.g., public workshops, public hearings, charettes, focus groups, nominal group process, computer-aided group decision-making workshops, blue ribbon committees, advisory committees, surveys, delphi process);
- Meeting and public hearing facilitation (how to plan, implement and facilitate effective public input sessions as well as internal organization meetings);
- Dealing with hostile audiences (ability to handle antagonistic individuals or vocal groups in ways to reduce tension, assure clarity of

messages, and reduce intimidation of other participants);

• Working with the media (developing long-term working relationships, knowing target audiences of each media outlet, developing the ability to give interviews, writing news releases);

• Public relations (overall planning for long-term internal and external positive public relations; dealing with crises through planned public relations);

• Principles of effective partnership development and nurturing.

Technical Skills

• Writing for different types of audiences;

• Oral presentation skills (appropriate to varied target audiences)--speeches, interpretive programs, education programs, nonformal or spontaneous communication, interviews;

• Planning and producing audio and visual media (e.g., videos, slides, transparencies, audio tapes);

• Computer skills in word processing and graphic design;

• Writing for informational and interpretive print media (e.g., news releases, brochures, newsletters, memos, letters to supportive or antagonistic stakeholders);

• Using internet, World Wide Web, CD ROMs and other electronic communications systems; developing effective homepages;

• Planning, implementing, conducting interpretive programs;

• Designing and constructing signs, bulletin boards, wayside exhibits, trailhead signs and kiosks.

After developing specific skills, managers should be given opportunities to develop (individually and in teams) integrated information systems that incorporate relevant media and messages that match clearly identified target audiences and help meet specific goals and objectives of the managing agency, both in general and specific to the site.

While this paper is not intended to be inclusive, it does present a range of reasons, applications and skills related to communication that can assist wilderness and natural area managers achieve some of their management goals. While any curriculum and training program always seems "full" and, therefore, difficult to insert additional topics, communication skills are fundamental to effective management in the current public management arena. Whether training and education in these skills are in separate courses and workshops or integrated with other management courses, their inclusion should be strongly considered. Numerous resource materials are available for any of the topics identified in the list of recommended training topics. Many of them are even published within resource management literature.

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Why Communication Skills? Quotes from Recent Resource Management Papers

A third policy issue concerns the nature of the dialogue that will be used to engage the public in decisions about congestion and crowding. Public land management agencies have traditionally followed a rational-comprehensive planning process. However, such planning approaches generally are appropriate only in situations where management goals are uncontested and cause-effect relationships are known. The lack of research on frontcountry visitors...suggests that few resource administrators enjoy this combination of circumstances. Thus, managers are challenged to design collaborative research, planning, and public dialogue processes that produce greater understanding and resolution of congestion and crowding issues.

Lime, McCool & Galvin. 1995. In: Proceedings, Fourth International Outdoor Recreation and Tourism Trends Symposium. p. 93.

As a result of...changes in the agency and professional environments, the following changes have occurred in the delivery of professional development programs...First, increasing numbers of "out of field" employees are participating in training programs; for example, timber specialists in the USDA Forest Service and BLM are receiving training in outdoor recreation management...[P]rofessional development programs in certain areas are expanding...[in] customer service... [T]here is renewed support for using interpretation as a management tool, and for workforce training to assure that interpretation is delivered effectively.... (panel of resource managers)

[M]anagers cannot simply rely on technical knowledge; they must understand the social and political forces operating in and upon their working worlds... [H]uman resources management has assumed much greater importance, in response to increased office automation, the need for teamwork, and concern with customer service delivery. (Hallett, BLM)

Re: Education v. Training: [W]e face the dilemma of trying to produce a "skilled generalist." At the same time as technical demands increase, agency needs for broader capacities grow. Among other [education and training needs are]: interdisciplinary skills, communication skills, facilitation and consensus-building skills, language competency, reading skills, and strategic planning skills.

Wellman. 1995. In: Proceedings, Fourth International Outdoor Recreation and Tourism Trends Symposium. pp. 456-458.

Tourism is an important industry to many communities located on the edge of wilderness areas. Both the public and private sectors play a critical role in the success of this industry in those communities. However, the private and public sectors rarely sit down to develop a common agenda that helps protect the wilderness and helps develop appropriate wilderness tourism....resource agencies should be active participants in [the public participation] process alongside of local residents, business people, and local leaders. This was a useful technique for establishing or maintaining good communications.

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Selecting Human Experience Indicators for Wilderness: Different Approaches Provide Different Results

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Abstract: The Limits of Acceptable Change planning process calls for the selection of key indicators of the wilderness resource and wilderness experiences. Wilderness planners and managers have in the past used three primary approaches to select indicators of wilderness experiences: focus groups or working groups representing key interest groups and management, interdisciplinary teams of specialists, or surveys of visitors to the wilderness. Each process strives for agreement about the significance of potential indicators. At Juniper Prairie Wilderness, in Florida, on-site qualitative interviews and experience sampling methods were used to identify the major dimensions of the visitor experience. A better understanding of the experience resulted, and potential indicators are naturally suggested.
Keywords: indicators, Limits of Acceptable Change, recreation, wilderness visitors, qualitative research

INTRODUCTION

The Limits of Acceptable Change (LAC) system for wilderness planning (Stankey, Cole, Lucas, Petersen and Frisell (1985) has been widely applied in the United States. One of the most critical, and difficult, steps in the LAC process is the selection of indicators. In fact, McCoy, Krumpe and Allen (1995) concluded from a nationwide evaluation of LAC, that the biggest drawback to implementing the LAC process was a clear understanding of how to develop indicators and standards.

Watson and Cole (1992) were more specific when they concluded that the three primary difficulties managers were having in selecting indicators were 1) difficulty in defining indicators in specific and quantitative terms, 2) difficulty in selecting among known indicators because of lack of understanding about which indicators are most significant, and 3) difficulty in selecting indicators due to the lack of reliable monitoring methods. While managers still face all of these difficulties, this discussion is focused on methods used to make decisions about the significance of indicators, difficulty number 2.

METHODS OF DETERMINING SIGNIFICANCE OF INDICATORS

In reality, it is known that often managers simply adopt indicators that have been selected for application in other LAC efforts. In this case there is an assumption of significance, but this assumption is sometimes questioned and confirmed or denied by planning team members. Sometimes the significance of indicators is not questioned until great effort has been invested in inventorying, monitoring and analyzing information about an indicator.

There are three primary ways that decisions about indicator significance have been made in LAC applications in the past. Each approach has associated benefits and drawbacks. Increasingly they are being combined due to the understanding that each provides somewhat different results.

Working Groups

McCoy et al. (1995) estimated that 43% of

all LAC planning activities were jointly conducted by a planning team consisting of agency and citizen participants. The level of involvement by citizens has been a positive factor in building constituent support for selection of indicators and other decisions that are made by the planning team. One of the major challenges to continuing use of work groups in LAC decision making is the Federal Advisory Committee Act (5 U.S.C. App. 1) which is interpreted by the Forest Service to restrict use of task forces in agency decision making. McCoy et al. (1995) concluded, however, that while the Federal Advisory Committee Act is a barrier to utilizing a public work group, it is not a barrier to implementing LAC. One limitation to the emphasis in the past on work groups is the default participation by primarily local interests, even though some of those participating are representatives of larger membership organizations. Primary membership has been local and regional in residency. With wilderness visitors often coming from distant origins, increasing numbers of second homes located in rural areas adjacent to National Forests, and wilderness being part of a National Wilderness Preservation System, some think that local input provides only one limited perspective. There are many examples of uses of public working groups, such as at the Bob Marshall Wilderness Complex in Montana, the Selway-Bitterroot Wilderness in Montana and Idaho, and the Black Creek and Leaf Wildernesses in Mississippi.

Public Response to Agency Proposals

Partially, but not completely, in response to Federal Advisory Committee Act limitations, planning teams are being developed which rely solely on agency personnel. These teams are usually interdisciplinary to obtain diversity in perspectives on wilderness issues. These teams often obtain public response to proposed actions during the planning process. When determining significance of indicators, these interdisciplinary teams are likely to ask the public, through open public meetings or response to mailed materials, to comment on the issues the team perceives as important and eventually on the significance of proposed indicators. One problem with this approach is that the public is mostly responsive, not participatory, in generating original ideas. The ownership is not as extensive as with the work groups. McCoy et al. (1995) estimated that the number of LAC groups who use this approach exceeds the number who have used work groups. The Interdisciplinary Planning Team for the Frank Church—River of No Return Wilderness has used this process as input to indicator significance, as have many other areas. While the process is different from working groups, the constituency is not different. The responding public conforms pretty much to the public included in work groups. Local and regional organized interests are most involved in providing responses.

Visitor Surveys

In several areas, scientists or managers have sought information from the visiting public to ascertain the significance of potential indicators. Most notably, at the Cohutta Wilderness in Georgia, Upland Island Wilderness in Texas, and Caney Creek Wilderness in Arkansas, visitors were asked how important they considered each of a list of potential indicators (Watson, Williams, Roggenbuck and Daigle 1992; Williams, Roggenbuck, Patterson and Watson 1992; Roggenbuck, Williams and Watson 1993). This approach focuses on the actual visitors during the year of the study, quite different than focusing on local organized interests. This approach, however, obtains this indication of significance only for items that the researchers thought of as potential indicators. This list usually comes from those adopted at other places and from the individual researcher's knowledge of the wilderness philosophical literature, as well as items that may arise during pilot testing and discussion of issues with local managers and visitors. Only offering a pool of items developed by the researcher may strongly influence the set of items deemed to be significant. One other limitation has been that in the past, most of these studies have involved contact with the visitors at the wilderness exit and later mailing of a survey exploring the significance of potential indicators. More timely consideration of the influences on quality of trips for visitors would be more desirable.

JUNIPER PRAIRIE WILDERNESS STUDIES

Research by Borrie (in press) and Patterson et al. (1996) was aimed at improving the third approach described above. With the overall goal of developing a monitoring system that would provide feedback on visitor use management decisions, the first step was to generate a list of potential indicators. To do this, management and a science team agreed that greater understanding of the experience visitors were achieving was

needed. Two primary studies were conducted. In both studies, pre-judgment of the significance of commonly used human experience indicators was avoided.

In the study by Borrie, a sample of visitors was interviewed at the place where they depart on their canoe trip into Juniper Prairie Wilderness (either at the actual boat dock or at the time of canoe rental). He gathered some basic information about the group at that time, and he asked if they would be willing to answer a set of questions as they floated Juniper Run. If they agreed, Borrie explained that they would be prompted to complete the set of questions at a random time during their visit by a pre-programmed beeper that they would take on their trip. The beeper could go off as many as three times during a trip, though more likely only twice. The data is intended to provide information about the experience as it unfolds. The data also represent a sampling of the entire experience, not a reflection after the fact, or at some time later at home, as more traditional wilderness surveys have done.

The questions were a combination of closed-ended and open-ended items. In a closed-ended manner, visitors were asked to rate how much they were focusing on 1) their own thoughts, 2) other people, 3) personal feelings and emotions, 4) the natural environment, and 5) the task they were carrying out at the time, each time the beeper cued them. They also evaluated their feelings about 38 items, each intended to measure some aspect of the experience they were obtaining at that specific time. The long-term interest in this study is to understand how these feelings and point of focus changed over the length of a wilderness visit. In the short term, it provided some insight into the current experiences visitors are achieving.

Also, as part of the study by Borrie, each time the visitor was prompted, he or she was asked in an open-ended manner to list the features of the wilderness liked most and least. They were instructed to think about these likes and dislikes for the time since they last completed the survey form. In this study, 137 people participated, producing a total of 280 experience samples (number of surveys completed in response to the beeper signals).

Patterson's qualitative group interviews were completely focused on letting the visitor report about significant events and influences during the float along Juniper Run. Patterson conducted in-depth, open-ended interviews with 30 groups as they exited Juniper Prairie Wilderness from the canoe run. Patterson had a general set of questions he asked about the visit, varying a little in response to answers he received, in order to probe the visitor experience. He tape recorded the responses he received, transcribing and summarizing them at a later time. The questions asked were intended not to be leading, though he sometimes asked about specific items such as viewing wildlife or dealing with overhanging branches after the visitor had mentioned them in some way. Some basic questions included the following:

- Could you describe what your visit was like today?
- How would you describe this place to a friend thinking about visiting?
- Is there anything special about this place that you think makes it different from other natural places you have visited?
- Do you think of this place as wilderness?

Probe: What characteristics are wilderness-like?

- What characteristics are inconsistent with wilderness?
- What did you think about the other visitors you saw on the river today?
- Was there anything about the visit that decreased your enjoyment of this place?
- Was there anything in particular about the visit that increased your enjoyment of this place?
- What was the meaning of this visit to you personally?

The study offers in-depth understanding of the wilderness experience immediately after it concludes. This is in contrast to more typical studies of wilderness visitors that either ask for responses to closed-ended questions at a later time or to closed-ended questions administered at the beginning or ending of the visit. The sample is not intended to be representative of all visitors, it was limited in the number of days sampled. Rather, it provides an in-depth examination of how real visitors respond to their visits at this wilderness.

RESULTS

From examination of the results of the two studies, we identified 4 important dimensions of the experience at Juniper Prairie Wilderness: 1) interaction with nature, 2) challenge/ primitive/ way finding, 3) interaction with people, 4)

timelessness.

For each dimension some supporting data will be presented along with some potential indicators.

Interaction with Nature

The Wilderness Act suggests that wilderness should be enjoyed as wilderness, and the Act describes wilderness as a place where natural conditions are maintained. Consistent with other more quantitative studies in the South and other regions that suggest people come to wilderness to experience nature, the experience sampling method found the highest focus score to be on "the natural environment around you." The average score was 6.5 on a scale of 0 to 9. In comparison, the average score on other people around you was only 3.78 on the same scale. On weekdays (lower use days on Juniper Run) 57% of the people who participated indicated that they liked various aspects of nature, with 66% liking aspects of the natural environment on high use days (week-end days). Two particularly strong elements of this dimension were the visitors' comments about dealing with overhanging trees along Juniper Run and positive wildlife sightings. During low use times 48% reported positive experiences with wildlife, while 39% reported positive wildlife experiences during high use periods. From the qualitative surveys 21 of 30 groups gave considerable attention to the trees overhanging the Run, 11 mentioned alligators, and several mentioned spiders, bugs and snakes. Naturalness, overhangs, and wildlife were component aspects of the experience people were most commonly obtaining at Juniper Run.

Some of the potential indicators, judged only by significance criteria, include: 1) number of trees overhanging the river per unit distance, 2) visitor perceptions of the number of overhangs per unit distance, 3) proportion of visitors who mention the overhangs as part of the experience, 4) the proportion of visitors who report positive wildlife interactions, 5) the proportion of visitors who see an acceptable amount of wildlife, 6) the proportion of visitors who see an expected amount of wildlife, 7) the proportion of visitors who saw a preferred amount of wildlife.

Challenge/Primitive/Wayfinding

The average score for amount of focus on "the task at hand" was 5.31 on a scale of 0 to 9. It was the second highest average score for the overall set of questions about what they were focusing on at the times they were prompted. Every group interviewed at the end of their trips mentioned some aspect of challenge being a part of their experience. Six of the 30 groups suggested it was the major factor that defined the experience and 12 suggested it helped define the experience. Some considered the challenge in a negative fashion, in relation to muscle strain, not sure of the correct route, or losing things in the water. Some, however, considered the challenge of survival, figuring out the correct route, or negotiating obstacles in the Run to be very positive. Generally, the stories people told of their trips demonstrated their recognition of situations very different from those in routine daily lives.

Potential indicators of this challenge/primitive experience/ wayfinding aspect of the trip include the following: 1) proportion of people reporting they had an opportunity to overcome obstacles, 2) proportion of visitors who reported at least one occasion when the way was not clear, 3) proportion of visitors who had to make a decision about the way to go, 4) proportion of people complaining about lack of convenience.

Interactions with People

The third highest score on the focus measure of the experience sampling study was on "other people around you." While the mean is down to 3.78 on the scale of 0 to 9, the qualitative portions of the studies support this dimension as an identifiable component of the overall experience for most people. Very seldom were the number of encounters with other groups mentioned as an important aspect of the experience, though it is the most common indicator used in LAC applications in wilderness. The visitors were not expressing specific concern about seeing numbers of people. More often the sounds of others on the Run was the focus of comments. During low use times 24% mentioned disliking noise of other groups, and 29% during high use times. During low use times, only 5% disliked too many people and 19% disliked too many people during high use times. For items they liked, 33% mentioned quietness during low use times and 30% during high use times. People in 21 of the 30 groups interviewed at the exit point indicated they were able to experience times on the Run when they felt they were alone.

Potential indicators identified include the

following: 1) proportion of visitors who report they had opportunities to feel alone during the trip, 2) proportion of canoes that violate some minimum desired distance between canoes, 3) percent of time other groups are in sight or sound while traveling, 4) number of boats passing a measurement point per unit time.

Timelessness

The lowest score of these four identifiable dimensions on the focus measure was "your own thoughts" with a mean response of 2.85 on a scale of 0 to 9, although the focus was significantly higher on this item at low use times. For things people liked, 33% of the visitors reported liking opportunities to relax and enjoy peacefulness during low use times and 32% during high use times. While there was not a lot of indication that this was the focus of the trip from the experience sampling study, the qualitative interviews indicated about 1/3 enjoyed this aspect of the experience and a substantial proportion indicated lack of this desirable aspect of the experience due to concern about making it to the take-out point at an appointed time to catch the return shuttle. They had been informed of the schedule at the time of departure and they were concerned about meeting that schedule. During the interviews it became noticeable that there was a sharp contrast between floating the last section of the Run and the instant re-entry to society at the take-out point. There was little time for decompression, to reflect on the things they had seen and experienced. There was a definite impact upon visitors of very different orientation to the resource when the wilderness canoers intercepted the local people wading, playing volleyball, sitting in their airboats, and sunbathing. It was a very confusing time that inhibited realization of the benefits of a timelessness experience.

Potential indicators include the following: 1) proportion of visitors who feel rushed, 2) proportion of visitors who reported having sufficient time to reflect on their wilderness experience, 3) proportion of visitors exceeding 4 hours to finish the trip.

DISCUSSION

Managers of the Juniper Prairie Wilderness were concerned about whether the appropriate number of visitors were being allowed to float the Run each day. Crowding was the primary issue that managers perceived and desired feedback from research. Research approached the situation more generally to understand the experience visitors were receiving and specifically sought to determine how these experiences varied in relation to total use levels on the Run in order to respond to managers about appropriate numbers of users.

Generally, we are looking for indicators that we feel confident represent some critical factor (Stankey et al. 1985), or category of concern. In this case, the identifiable dimensions of the experience are the factors. We do not have to measure all aspects of each dimension. The key would be seeing which of these things we can measure, feeling confident it represents a significant aspect of the experience, and we agree that it is part of the experience we want to provide visitors. The inclusion of tree overhangs as a potential indicator is not because dealing with overhangs is always positive, but because it is basic to what people currently experience at Juniper Prairie. Management needs to decide if this aspect of "interaction with nature" is the objective of management of this place.

Some of the differences between high and low use periods give us insight into the relationships between these dimensions and allowed use levels on Juniper Run. Interaction with overhanging branches becomes a more negative aspect of the experience when use levels are higher. This proximity to nature is less negative and simply more a part of the experience at Juniper Prairie when use levels are lowest.

The amount of traffic also affected the ability of visitors to achieve feelings of challenge and wayfinding. To feel the challenge of the environment, to experience wayfinding decisions, the visitor cannot have someone else in a canoe just ahead to follow through the wilderness. The comments people made usually included mention of the significance of not being able to depend on others to lead them. Also, it is believed that the Wilderness Act does suggest the importance of opportunities to demonstrate primitive skills such as these visitors are describing.

It is interesting that a high percentage of groups indicated they did have an opportunity for low interaction levels with other people at some time during the trip. As wilderness managers, there is need to find ways to assure this mandated (by the Wilderness Act) solitude opportunity exists. On the other hand, solitude does not currently exist at all times during the trip, and it is probably unlikely it could, given

the indication that even noise of others signals their presence, not just their visibility.

There is currently a constraint on visitors to experience the timelessness element of wilderness travel at Juniper Prairie. There is some indication that the this lack of reflection and decompression is due in part to the scheduling of shuttle rides and the quagmire of interaction with non-wilderness users at the canoe landing. If this part of the experience is important to managers some changes in facility and concession management are possible and some potential indicators have been suggested to evaluate the success of such initiatives.

In conclusion, the wilderness experience at Juniper Prairie Wilderness (along the float trip down Juniper Run) can be described along four different dimensions. Each of these dimensions can be measured in some way. Several possibilities for measurement are presented here. At other wildernesses, we measure very little about the experience beyond crowding influences (encounters along trails or at campsites). In this case, we believe there are other aspects at least as important or more important than crowding, and the effects of management actions on these aspects of the experience should be monitored. If the number of visitors floating Juniper Run is manipulated, these measures will allow management to set objectives and monitor success at accomplishment. There are several things besides number of people floating Juniper Run per day that influence the achievement of a wilderness experience there.

The next step in application of this knowledge would be to develop a monitoring system. There are other criteria for good indicators that must be considered besides significance (Watson and Cole 1992). Each of these criteria must be considered in selecting a smaller pool of potential indicators. Then efforts to inventory and develop a system for periodic monitoring must be established.

Selection of indicators responsive to visitor experience protection is a current challenge at both wilderness and non-wilderness locations. The advantage of having these studies at Juniper Prairie is that managers have a much better base of knowledge about the experience provided there than is available for most places. The opportunity to forge ahead with testing of indicators and monitoring methods is unique, due to the knowledge already accumulated. There are many places where public land management agencies have very limited ability to address experience issues, yet face increasing pressure to justify current efforts to restrict use levels. Juniper Prairie is an example of those places.

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Management, Policy and Training

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Somehow, we must produce a single national effort to make land ethics a mandatory subject at our grade and high schools. Please note that I am not saying Wilderness Education, rather I am saying teach a national land ethic that would include wilderness. Perhaps the time is right to produce and introduce, via Internet, a continuing review of wilderness educational programs designed to reach, lets say, sixth graders. Tom Kovalicky

A Paradigm of Management Complexity: A Case Study of Mammoth Cave National Park

Ronald R. Switzer
Superintendent, Mammoth Cave National Park

Abstract: Although Mammoth Cave National Park is the eleventh most visited national park in the United States, and contains the longest known cave system in the world, it is more than a national park. Variously known as a National Park, a World Heritage Site, and an International Biosphere Reserve, it is an extremely diverse resource of inestimable, intrinsic worth and a paradigm of modern management complexity.
Keywords: archeological resources, biodiversity, biosphere reserve, cave, groundwater, karst aquifer, karst ecosystem, management complexity, partnerships, transition zone, world heritage site, UNESCO, zone of cooperation

MAMMOTH CAVES NATIONAL PARK

The primary management goal of Mammoth Cave National Park is to perpetuate the integrity and diversity of geologic features and life systems that are associated with aquatic and terrestrial environments in the caves and on the surface, because these have aesthetic, recreational, educational, and scientific value to humans. This case study focuses on the ecological, economic, social and political realities of managing a world class biological and geological resource. With cave and karst topography as a backdrop, the paper examines the role of science and research in dealing with external threats, sustainable use, and regional economics in park management.

INTRODUCTION

Although Mammoth Cave National Park hosts more than two million visitors each year, only a few in the public sector ever get a glimpse of how the resources, the infrastructure, or the needs of the visiting public are managed. They seldom hear that Mammoth Cave National Park is a diverse and complex estate that must be managed as a whole with well-planned consistency. It is a classic example of modern management complexity that requires a highly specialized management team and an extraordinary amount of social, economic, and scientific information for sound decision-making.

This case study highlights the significance of the resources and describes several park management issues and resolutions. It addresses the kinds of information that managers require to make resource management decisions and develop meaningful productive constituencies and partnerships.

SIGNIFICANCE OF MAMMOTH CAVE NATIONAL PARK

Mammoth Cave National Park encompasses 83 square miles. It is a World Heritage Site and the core area of a much larger International Biosphere Reserve of 177 square miles. While park lands are substantial, the real value of these lands is that they serve as a natural and cultural reference against which to compare the local and regional landscapes and social environments with larger-scale resource changes. The primary objective of the Mammoth Cave Area Biosphere Reserve is to achieve a sustainable, technological economy that is environmentally compatible with the karst ecosystem, allowing the workings of natural physical processes and protecting biodiversity. As a Park Manager, the use of scientific research, resource management, and regional economic development planning (as tools to govern the direction and rates of change) is necessary to the creation and exercise of responsible long-term stewardship.

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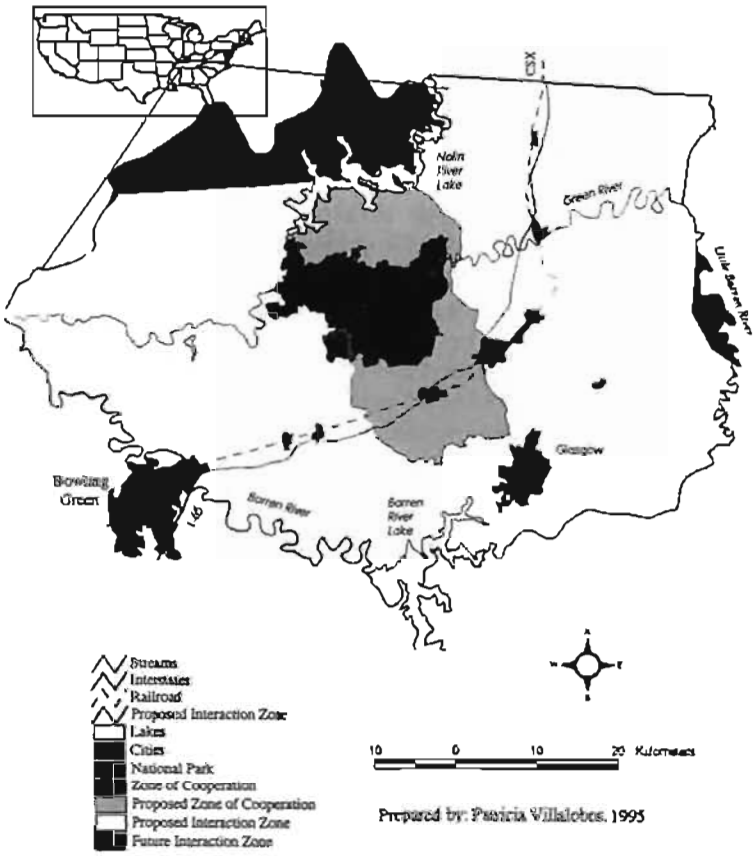
Mammoth Cave Biosphere Reserve Existing and Proposed Boundaries



The Karst System

The Mammoth Cave karst system is situated within a 450-foot thick layer of 300 million year old Mississippian limestone. The Green River, which constitutes the regional base-level stream, has been the major factor controlling development of the cave system. As the river episodically eroded its stream bed, the cave responded by creating lower passages to reach the new base level. This relationship, which continues today, has resulted in a vast three-dimensional network of cave passages with a surveyed extent of 345 miles. It is an exemplary karst landscape which contains the longest surveyed cave system in the world.

A significant management problem is protection of the Mammoth Cave karst aquifer surrounding the park. While other underground aquifers may possess diffuse flow, where contaminants slowly disperse in the form of a plume, the convergent flow of the Mammoth Cave karst aquifer will channel recharge and pollutants toward a common trunk conduit or spring. Flow through the Mammoth Cave karst aquifer can be very rapid, on the order of one to ten kilometers per day. Contaminants, such as pesticides and herbicides, entering the karst aquifer from mostly agricultural lands are rapidly transported, unaltered, through the conduit system. The aquifer is very dynamic. It responds nearly instantaneously to rainfall, often resulting in stage rises of several meters in just a few hours. Physical, chemical, and microbiological properties of the groundwater often change dramatically following rainfall events.

The size of the park's recharge area lying beyond park boundaries is approximately 80,000 acres. Of this amount, approximately 12,000 acres are row-cropped in corn and soybeans. These crops receive approximately eight tons of triazines and five tons of alachlor per year. Park research on the transport of herbicides provides one example of threats faced by the cave aquatic environment. Our studies show that triazine and alachlor-class herbicides, which require extended microbial contact for degradation, pass unaltered from the surface into the aquifer, and through the cave ecosystem. The magnitude of the problem is seen not only in the vulnerability of the aquifer, but also in the spatial extent of non-park recharge area and in the quantity of herbicides used on the lands. By documenting the fate, transport, and occurrence of target herbicides or other classes of pollutants, a conceptual model can be devised for communities and individuals that rely upon karstified aquifers for a potable water supply. Because the reduction of water pollution is vital to agriculture, industry, and domestic and park resources, park management has embraced several important projects within and outside the park.

Among these is the Mammoth Cave Area Special Water Quality Project. This is a multi-county, multi-agency effort, that is responsible for implementation and monitoring of agricultural "Best Management Practices" designed to reduce the amounts of pesticide residues, animal wastes, and sediment that enter subterranean systems. Although the systems in place reduce pollution, natural decomposition is still necessary to producing potable water. Species found in cave aquatic biological communities cannot rapidly decompose large quantities of organic materials because of their low metabolic rates and small populations. Therefore, it is important not to inadvertently

poison aquatic life with pesticides, overwhelm aquatic systems with excessive organic material, or bury these creatures in sediment.

A second project will be to connect the Mammoth Cave sewer system to a newly constructed regional sewage treatment system outside the park. The Caveland Sanitation Authority system receives the waste water of three communities and a number of small industrial and recreational facilities, ensuring proper treatment and greatly enhancing protection of groundwater.

In addition to these examples, hydrogeologic hazards along 12 miles of Interstate 65, and five miles of the Cumberland Parkway have been mapped with global positioning equipment. Map sets will soon be available to hazardous waste response teams to aid in the containment of petrochemical and organic compound spills and will provide point-source injection information.

Fauna

The combination of topographic variety, the karst landscape, and a temperate climate provides numerous ecological niches. The fauna of Mammoth Cave National Park consists of 130 cave adapted species including the endangered Kentucky Cave Shrimp, which is endemic to the area, and several hundred additional surface dwelling species.

As one of the most biologically diverse rivers in North America, the Green River supports an unusual variety of fish, including five endemic fishes and three species of cave fish. More than 50 species of mussels are found in the river, including seven that are endangered species and four that are candidates for listing. While water quality monitoring is an important part of our aquatic species maintenance program, there are also "biological pollutants" in park waters, otherwise known as exotic species. One highly mobile menace is the Zebra Mussel, which has spread into the Green River Reservoir above the park. Zebra Mussels prevent native species from filtering river water for food, and, consequently, they die. The basin has 64 kinds of indigenous freshwater mussels, but water quality problems, habitat loss, and the threat of invasion by Zebra Mussels make these mollusks the most endangered group of wildlife in the basin.

What difference does it makes if there are fewer kinds of mussels in the Green River Basin? From the immediate and practical standpoint, the water cleaning capacity of streams in the basin will be diminished. In the longer term, biological diversity contributes to the resiliency or survivability of ecosystems in times of stress. Significantly, our economic systems are parts of and ultimately dependent upon ecosystems. Neither agriculture nor tourism can flourish without intact, functioning ecosystems. Our economy must be compatible with the ecosystem so that our future economic options are preserved. As an example, there is an oil boom in Edmonson County in which the park is located. Park staff and state inspectors developed well casing procedures to protect nearby aquatic ecosystems from unintentional contamination by oil or brine while extracting the oil profitably.

While populations have declined regionally, there are 12 species of bats, including two endangered and three candidate species for which habitat is being carefully managed within the park for their recovery. Numerous artificial entrances were dynamited into the Mammoth Cave System before it became a national park. These entrances have significantly altered natural air flow and humidity levels, affecting microclimatic conditions at bat hibernation sites. Research is underway to determine optimum air flow for maintenance of bat colonies, using bat-friendly gates in natural entrances; and for man-made entrances, airtight doors are being installed to control these conditions.

Flora

Diverse vegetation in the park results from a mosaic of forest communities representative of the mixed mesophytic forest to the east and the oak/hickory forest to the west. In addition, a number of microenvironments support remnant plant communities. Northern Hemlock and other northern plants grow in the mists of ravines and cave entrances. Small, but biologically diverse wetland habitats are scattered around the park in areas with low soil percolation.

In all, 1,200 species of flowering plants have been confirmed in the park, and of these,, 21 are currently listed as endangered, threatened, or of special concern. Additionally, Mammoth Cave National Park is the home of one of two remaining old growth forests in the Commonwealth of Kentucky.

Of concern is the growing loss of floral diversity, especially in remnant prairie communities throughout the park. Habitat restoration, using prescribed burning, mechanical reduction of competing species, and

other techniques will commence as soon as the appropriate studies are conducted and plans are formulated over the next few years. In conjunction with these efforts will be mechanical removal of exotic conifers, kudzu, periwinkle, yucca, and silver poplar.

Cultural Resources

Mammoth Cave National Park has internationally significant cultural resources on the surface and in the cave including prehistoric sites and objects, and historic structures. The "time capsule" nature of the dry upper cave passages has preserved archeological evidence of early Native American exploration and mining. A 1990 survey of aboveground archeological resources identified 1,008 sites dating from the Paleo-Indian Period through the Middle Mississippian Period.

Aboveground resources include numerous Civilian Conservation Corps structures (ca. 1935) associated with the development of the park. Pre-park structures include many artificial cave entrances, the Floyd Collins Crystal Cave ticket office, associated house and cave entrance, three church buildings (ca. 1900), and more than 135 cemeteries, about 20 of which are multi-family or large community cemeteries. Maintenance of historic resources is time and funding intensive and is very much in the public eye, with local communities having direct social ties to most of these sites.

World Heritage Site

In 1981, the United Nations Educational Scientific and Cultural Organization (UNESCO) designated Mammoth Cave National Park as a World Heritage Site. In the declaration, the park was cited for its exceptional natural features, its habitats for endangered and threatened species, and its association with events and persons of world archeological and historic significance.

Mammoth Cave Area International Biosphere Reserve

The 52,830 acres of Mammoth Cave National Park are also the core area of an 80,000 acre International Biosphere Reserve dedicated in 1990 by UNESCO as part of the United States Man and the Biosphere Program (USMAB). The transition zone, or zone of cooperation, of the reserve is the groundwater recharge area of the Mammoth Cave system. Because the principle goals of the Biosphere Reserve are conservation of biodiversity and economic development on a scale that is sustainable over the long term, the principle monitoring and research themes of the Biosphere Reserve are groundwater hydrology, water quality, the effects of agricultural uses, the health of freshwater ecosystems, and atmospheric pollutants.

Activities of the Mammoth Cave Area Biosphere Reserve and the MAB program are locally coordinated by the Barren River Area Development District (BRADD). This quasi-governmental entity is comprised of local elected officials and community leaders. The BRADD coordinates local government policies, goals, plans and activities in a ten-county area. It does the same in the biosphere reserve in order to support area development within MAB program goals. It is the only Biosphere Reserve in the United States with a national park as its core that is coordinated by local, rather than federal, officials.

BRADD serves as a clearinghouse for potential cooperative projects between the park and its neighbors. Historically, the activities that have posed harm to the area's natural resources have also contributed to the loss of its cultural heritage. Tying together the protection of the natural environment with actions that will prevent further loss of cultural heritage will bring about greater viability for both. By including cultural resources, a broader understanding by local citizens and institutions of cultural landscape values will be achieved. In turn, it will promote an awareness that they are custodians of the landscape. It is believed that such an approach will result in more direct participation by area citizens in resource management decisions that affect their quality of life.

In February, 1996, the BRADD Board of Directors proposed to the United States Man and Biosphere Secretariat that the Mammoth Cave Area Biosphere Reserve be expanded from 80,000 acres to more than 500,000 acres to provide greater opportunities for ecological and economic sustainability. Local officials, in adopting the resolution to expand the biosphere, have recognized that the mutual and interactive nature of research, resource management, and sustainable development activities proposed and presently being conducted in the biosphere have directly benefited their constituents. For the most part, the expanded Biosphere is defined by hydrologic boundaries reflecting the primary natural resource issues for the area. The

proposed enlargement of the Biosphere is illustrated in Map A.

Cooperative Management of Mammoth Cave National Park

While the opportunity to better manage and protect park resources by working cooperatively beyond the present "geo-political" boundary is enhanced by the World Heritage and International Biosphere Reserve designations, the idea of protecting national park resources with an "ecosystem model" extending beyond a legislatively delineated park boundary is a relatively new management concept. Frank Talbot, former Chairman of the United States National Committee for the Man and the Biosphere Program, recently noted that "habitat loss and habitat fragmentation are the greatest killers of species—even more dangerous than pollution . . ." For years, I have said that I have no hope of managing a complete ecosystem because only remnants of it remain. Increasingly, the regional landscape has been fragmented into diverse units of land use. Lacking a large undisturbed land base, and having lost untold numbers of species through time, the best I can hope for is to understand what is left, and perhaps to manage a few ecosystem components wisely. Using the Man and the Biosphere model at Mammoth Cave, we may be able someday to manage these components in a regional context. In the process, it is good to remember that boundaries are permeable to the movements of propagules and migrations of populations. To a great extent, park boundaries are permeable to fluxes in the water regime and are susceptible to influxes of air and water-borne pollutants. And last, they are permeable to humans and the effects of public use. Modern park managers realize that the optimum management of a park's natural and cultural resources is largely dependent on the success of cooperative efforts between a park and its neighbors.

At Mammoth Cave, significant cultural resources important to the park and region lie outside park boundaries. While Mammoth Cave has been a renown visitor attraction since the first half of the 19th century, the "national parks in the East" movement sought to set aside this and other large tracts of land east of the Mississippi River as national parks. This effort patterned eastern parks after the more natural western parks, often devoid of extensive cultural landscape features. Despite enabling legislation which called for the park to be created for the same purposes specified in the 1916 Organic Act, most all of the log cabins, barns, country stores, and one-room schools were razed.

Visitor Use Management

With 2.5 million visitors to Mammoth Cave National Park each year, the cave estate is being over-used while the surface estate sees relatively light use. Sustainable management for future use may require setting carrying capacities for some areas, packaging experiences in the cave with experiences on the surface, and diverting some public use to other cave, natural resource, and educational opportunities outside the park.

Information Needs of Management

Perhaps now, more than at any time in history, natural and cultural resource managers must articulate clear management objectives, and more importantly, how they will integrate them with needs on surrounding lands. When developing these objectives, we must consider that political boundaries frequently do not contain all the biological or cultural variability necessary to resolve resource management issues.

Precise objective setting and accurate assessment of progress requires quality information. Even though managers care deeply about the resources they manage, too often they must function in a reactive mode with too little information. They must understand the key indicators of ecosystem condition and how to evaluate the effectiveness of management actions, and that ecosystems are spatially and temporally variable. Indeed, a given problem may have one set of spatial boundaries now, and quite another a decade from now.

As a park manager applying the ecosystem management concept, I try to remember four things when tackling resource issues in a particular geographic area. First, ecological systems are continually changing. It is all too easy for natural area managers who are not well grounded in science to harbor the misconception that ecosystems have a natural balance or static equilibrium. Structural and functional aspects of ecosystems are determined by dynamic variability. A management action once taken must be monitored to insure that the conditions the action was to correct are effective and continuing in order to prevent reversion to a previous condition.

Second, there may be substantial spatial

heterogeneity from a particular action. Impacts from a particular action may not be diluted over space, like ripples from a rock thrown into a pond. Some affected species, including people, may be near at hand; others quite distant.

Third, systems may exhibit several levels of stable behavior. Accompanying disturbances of human or non-human origin, ecosystems may evolve into systems different from any that existed before, and may stabilize at one of several levels.

Fourth, there is an organized connection between parts, but everything is connected to everything else. Each species in a biological system has a limited set of connections to other species. If these connections are not maintained, one or more species are at risk.

Ecosystem management also involves regulating internal structure and function to achieve socially desirable conditions. National park managers understand the NPS Organic Act of 1916 and the Wilderness Act of 1964, which require us to maintain "natural" conditions and to protect parks from adverse impacts. While "naturalness" is important because it is a desirable social goal, it probably is not as feasible an objective as envisioned by the 1963 Leopold Report, which recommended that national parks be restored to "the conditions which prevailed when the area was first visited by the white man." Maintaining and restoring natural processes is a far more attainable objective, though it too will be heavily influenced by activities occurring outside the parks. Because lands external to park boundaries are generally managed for purposes other than park values, mechanisms for blurring the effect of political boundaries, such as the Biosphere Reserve model which fosters public participation, are important tools for park managers.

At Mammoth Cave National Park, it is believed that changing land use patterns may ultimately be the most dramatic of the ecological issues. For the park, whatever goes on adjacent to the boundaries changes the regional landscape matrix. Taken together, regional natural and anthropogenic induced changes leave the park as a sort of "control" against which larger, more dynamic changes can be measured. Simulating effects of changes can best be accomplished by developing spatially explicit models using past and present information about park resources, and using regional climate and land use data.

SUMMARY

Although Mammoth Cave National Park has many things in common with other wilderness and natural areas in eastern North America, and is managed to preserve and enhance the natural qualities for which it was established, landscape changes, fragmented ecosystems, past human influences, population pressures, high visitation, agriculture, oil and gas exploration and development, timber marketing, and a plethora of other external threats and impacts make the management of this multi-dimensional resource extremely difficult.

Mammoth Cave is essentially two natural resource estates, surface and subsurface, at the core of a large sphere of influence and zone of cooperation. It is critical that management has the most current accurate scientific information for management planning to meet the sometimes instantaneous demands that are placed on the park, or to respond quickly to negative or catastrophic events affecting the resources. At the core of our program is a multi-level educational and stewardship effort that recognizes the park is a resource of inestimable worth to the people, and one that grows in value with the passage of time and the irreversible changes to the surrounding landscape. Managed well, Mammoth Cave National Park can provide a sustainable resource, a place for learning, for respite, and recreation, but this must be done in concert with park neighbors whom we affect by our actions/inactions, just as much as they affect the park. No manager should underestimate the power of public partisanship and good public information programs in managing any resource or group of resource users. The future lies in managing outside the boundaries, taking risks, getting involved, and having adequate information to meet the challenges of the future.

Literature Cited

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Ocoee River Whitewater Course for the 1996 Olympics

Paul J. Wright, Director, Ocoee River Project, Cherokee National Forest

Abstract: The Ocoee River Project concerns the design and development of the Cherokee National Forest's Ocoee Whitewater Center, site of the 1996 Olympic Canoe/Kayak Slalom competition. The development of this world-class facility is the product of an unprecedented public/private partnership, with the common goal of advancing the quality of life of the people of the Ocoee Region through development of resource-based tourism opportunities.

Keywords: rivers, partnership, tourism, 1996 Olympics, whitewater, Ocoee River Project, kayak slalom competition

BACKGROUND

In 1990 the City of Atlanta celebrated the generally unexpected honor of being selected as the host city for the 1996 Centennial Olympic Games. The end of their quest for the Olympic torch marked the beginning of another story—for buried within the bulk of Atlanta's bid document was one innocuous sentence: "If the International Olympic Committee chooses to include wildwater canoeing in the program, the organizing committee is prepared to stage the competition on the Ocoee River..."

Although canoe and kayak events had been included in the Olympic games since 1936, only in the 1972 summer games had "wildwater" or more specifically "slalom" canoe/kayak events been staged. Therefore, the popular activity known in the United States as "whitewater" paddling was a very risky proposition to include in the Atlanta bid. However, the Atlanta committee president, William Porter Payne, recognized the tremendous visual appeal and large potential audience for this sport, and managed to leave it in the bid as an "option" that could be exercised at the IOC's discretion.

As with many stories, this was one of those "good news/bad news" situations. The good news was that whitewater slalom had a chance to be included in the 1996 Olympics on Tennessee's Ocoee River. The bad news was that it would happen only if the event supporters found financial backing outside of the Atlanta committee.

Beginning in November of 1990, a core group of whitewater advocates known as the "Whitewater in Ninety-Six" (or "WIN") committee began lobbying public and private sector organizations for support. The State of Tennessee was interested, but also concerned about incurring unknown costs. During 1991, the State, USDA Forest Service, and Tennessee Valley Authority sponsored a feasibility study to explore the costs and benefits of hosting an Olympic event. The report was completed in January 1992. It concluded that Tennessee could anticipate nearly $68 million in total economic benefits between 1992 and 1997 from the whitewater events. It also concluded that the only viable location on the Ocoee River to stage the events was on a reach of river dewatered by TVA for hydro-electric power generation since 1941...on a site under the jurisdiction of the Cherokee National Forest.

The Partnership

The overwhelming benefits, especially in a region crippled by the collapse of century-old mining industry, were sufficiently compelling to bring the state and federal agencies with economic development mandates together.

The State of Tennessee agreed with the Atlanta Committee to provide all event operational needs. The Tennessee Valley Authority agreed to provide sufficient water releases for training and competition in 1995 and 1996, as well as technical hydrologic support. The USDA Forest Service agreed, as site owners, to provide permanent infrastructure for

long-term site use out of its existing national capital construction budget.

In February, 1992 the State of Tennessee, acting on behalf of the Atlanta Committee for the Olympic Games, formally proposed to the Forest Service to stage the Olympic whitewater slalom competitions on the Cherokee National Forest.

Environmental Assessment

The Forest Service responded to this proposal by announcing that an Environmental Impact Statement would be prepared to assess the bio-physical and socio-economic impacts of holding Olympic competition on the Ocoee River. A consulting firm was selected to assist with the EIS, and initial public meetings were held in September, 1992. The International Olympic Committee (IOC) had yet to determine if the competitions would be included in the 1996 agenda. That would not become finalized for several months.

Initial public scoping revealed a number of issues. Resource issues relating to hydrologic concerns, aquatic and terrestrial biology, geology, air quality, scenery and significant historic sites were raised. Social issues concerning transportation, recreation opportunities, and economic impacts also surfaced. The proposed whitewater venue is adjacent to the 4,666 acre Little Frog Wilderness, about two miles from the 7,993 acre Big Frog Wilderness, and less than fifty miles from the Class I airsheds of the Cohutta and Joyce Kilmer - Slickrock Wildernesses.

Furthermore the heavily-used reach of the Ocoee River immediately below the proposed Olympic site was already supporting more than 150,000 commercial rafting customers per year. U.S. Highway 64 running through the Ocoee Gorge is the nation's first National Forest Scenic Byway, carrying as much as one thousand vehicles per hour during peak summer weekend periods.

The development alternatives looked at a range of temporary and permanent facilities. The single biggest challenge was to adapt the conveyance area of the river bed to the amount of water that TVA calculated the headwater reservoir at Lake Blue Ridge in Georgia could sustain. Preliminary studies indicated that a 50% reduction in the existing 200' wide channel over the 1,700' length of the proposed course would be necessary. This, in turn, would increase the elevation of the baseline (100-year) flood by about 24".

During the course of the assessment, it was determined that the aquatic ecosystem of the river had been so profoundly disturbed by a century of mining runoff from upstream sources, that the river was still virtually sterile. Although water quality was acceptable for recreational use, biologists could not find so much as a bug living in the river, even though the tributary streams were brimming with life.

Further biological assessment also failed to discover any threatened or endangered plant or animal populations within or dependent upon the proposed project site.

The historic copper road which used to serve as the primary haul route from the mines in the copper basin to the railhead in Cleveland, Tennessee was deemed to be eligible for nomination to National Register of Historic Places. The last remaining segment of this historic road was immediately adjacent to the proposed project site. The State Historic Preservation Officer agreed that "adaptive re-use" of a short segment of the road next to the project site as an interpretive facility would be an appropriate mitigation measure.

Acid-bearing pyrites were known to be plentiful in the bedrock shale and sandstone of the river bed. Development proposals therefore relied on an "additive" process to modify the river channel, rather than excavation, to minimize disturbance of this material.

Construction and event operations were determined to create little more noise or air quality impact on the nearby Wilderness than the existing "background" traffic along Highway 64.

In March, 1994 the Cherokee National Forest Supervisor issued a Record of Decision, finding that it was within the public interest and the resource capability to develop the site for Olympic competition, but to minimize permanent facilities. Since no appeals to this decision were received, construction was authorized to begin in May, 1994—26 months before Olympic competition was scheduled.

The Ocoee Whitewater Center

The selected development alternative included enhancement of 1,700' of the existing river channel, installation of a bridge at each end of the competitive channel, and construction of a site administration building. The majority of the nearly 250,000 square-feet of event-related facilities would be temporary, and be provided

by others.

The first phase of work required gaining construction access to the remote left bank of the river without disrupting or damaging the river bed that would remain for competition. The expedient solution was to install a 60-ton capacity military "Bailey" bridge. A field engineering unit from Ft. Campbell, Kentucky completed the installation of the 150' span in July, 1994 as a training exercise.

What would prove to be the most challenging aspect of the project came next. Modification of the river channel began in October. The layout of the relocated banks or "levees" as they were known was based upon a design solution developed through the use of a massive physical model of the river site. The TVA had designed and built their largest river model ever—a 1:10 scale replica of the 1,700' channel—at the nearby Ocoee #1 dam below Parksville Lake. The model was over 300' long, providing the Forest Service design team the opportunity to test alternative flow patterns and hydraulic configurations in a very short period of time. The new bank locations and elevations were surveyed from the model and transcribed onto construction documents.

Over the next ten months, through floods, freezing weather and withering heat, more than 60,000 tons of massive quarried rock and field-collected native boulders were imported onto the site, and bonded to the river bedrock with a specially-formulated cement grout to focus the limited water flows on existing rock and ledge features in the river channel. The design philosophy was to accentuate the natural qualities of the river, rather than rely on creating hydraulic features from scratch.

Where nature simply had not provided the "perfect" river morphology, the design team called for artificial rock features. The Forest Service selected a contractor with substantial experience in creating museum-quality rock features in difficult environmental settings. These "faux" rocks, as they became known, were anchored with 1" steel bolts as much as ten feet into the river bedrock, and then built up with steel, nylon mesh, and high-strength concrete to the approximate size and shape specified by the course architect. Then, a high-strength finish coat was sculpted and stained to emulate the texture and color of the native rock. These final enhancements were not only the difference between an average river and an awesome river, they are also virtually indistinguishable from the natural features of the river bed.

In September, 1995, the inaugural racing event was held on the new course. The International Canoe Federation held the '95 World Cup Finals on the Ocoee, allowing world-class competitors their first look at the Olympic course. Everyone held their breath, since this really was a trial by fire. There was no other way to evaluate the "new" river's performance than to race on it. Before the weekend was over, the Ocoee Whitewater Center was being hailed as the "best slalom course in the world"!

Completion of the Whitewater Center still remained. Highway bank armoring to prevent flood damage took several more months, working through yet another winter season. A 336' pedestrian bridge was installed at the upper end of the channel. Landscaping was done with plants entirely native to the Ocoee gorge—more than 400 trees and shrubs, and 6,000 herbaceous plants were planted as a demonstration project on the use of native plants in landscape applications for the Natural Resource Conservation Service.

Finally, the site's nerve center—a 7,600 square-foot administration building—was built between November, 1995 and June, 1996. This structure is architecturally subordinate to the powerful river setting, nestled into a rocky bluff near the course start. Its massive stone and timber forms reflect the elements of the surrounding national forest, and suggest the kind of permanence that only nature can truly carve from the landscape. The building will not only house the offices and storage space necessary to continue to plan and operate events on the river, but it will also provide visitor information about tourism opportunities in the Ocoee Region. As a legacy to the sport, a family of exhibits will tell the story of paddlesport, and how paddlesport is dependent upon river stewardship.

Project Benefits

The USDA Forest Service agreed to enter into partnership with the State of Tennessee and the Tennessee Valley Authority for one common goal: promote the quality of life of the people of the Ocoee Region through sustainable, resource-based economic development.

In 1992, when the partner agencies agreed to proceed with this project, Polk County,

Tennessee—home of the Ocoee River—was a textbook case for a public works project. Their primary source of economic well-being had collapsed, taking them from one of Tennessee's most prosperous counties to one of its poorest in a single generation. Double-digit unemployment was chronic. Per capita income was 40% below the state average.

In just four years, river-based tourism has nearly doubled, new business starts have tripled, and unemployment has dropped from a high of 18% to around 5%. New tax revenues were coming in at such a rate that the county was actually able to reduce the property tax rate on its own residents. A spirit of economic optimism seemed to flow from the selection and development of the Ocoee River as an Olympic venue.

CONCLUSION

The Ocoee River Project, the development of the Cherokee National Forest's Ocoee Whitewater Center, is an example of breathing new life into a "dead resource." By strictly adhering to self-imposed environmental guidelines, the USDA Forest Service was able to adapt 1/3 mile of a river that supported no life, and precious little human use, into a naturalistic world-class center for land and water-based tourism, recreation and competition. Water that had formerly been valued at a few pennies per kilowatt-hour is now generating tens of thousands of dollars per day in economic benefits for the people and communities of the Ocoee Region.

As Gifford Pinchot, father of the Forest Service stated nearly a century ago: *The greatest good for the greatest number in the long run....*

Wilderness Access and the Americans with Disabilities Act

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Abstract: Equal opportunity for persons with disabilities to participate is required by the law. As the result Wilderness managers often encounter difficult decisions when faced with a request from a person with a disability: how to balance the individual's rights with the appropriate use of the Wilderness. The USDA Forest Service has developed the *Wilderness Access Decision Tool* to assist Wilderness managers in making consistent decisions regarding persons with disabilities and access to Wilderness. This paper provides an overview of that Tool.
Keywords: wilderness, access, persons with disabilities, accessibility, Wilderness Access Decision Tool, Americans with Disabilities Act, ADA

LEGAL REQUIREMENTS

There are two Federal laws which impact wilderness access:

1. Section 504 of the Rehabilitation Act of 1973 as amended in '78 and '92 requires the inclusion of persons with disabilities in all programs which we, as a Federal agency, either conducted directly—or "assist"—as through the granting of permits, etc. You see, the Federal agencies have been under the requirement to integrate all people with disabilities—and provide accessibility to our program and related facilities—for 23 years.

For clarification—the overriding legal authority for the Federal agencies is not the Americans with Disabilities Act of 1990. That is with one exception which we will get to.

2. The second Federal law is the Americans with Disabilities Act (the ADA) applies to all of those who were not already covered under Section 504. The ADA applies to state and local government services, public accommodations, public transportation and commercial establishments

As a result, we have developed areas to which we provide EASY accessibility. But people with disabilities also recreate beyond developed areas, getting into lots of remote areas by various means e.g. by cross country skiing, horseback, canoe, or hiking with canes, crutches, wheelchair or the assistance of others as needed; whatever it takes in order to pursue the type of recreation that person enjoys in the setting they prefer.

Both of these Federal laws require equal opportunity to participate in all programs—so long as any modification necessary for participation by the person with a disability—does not "fundamentally alter" the program or services offered to all people.

These laws also require that programs be offered in an integrated setting—not separate segregated programs for persons with disabilities.

A "program" can be defined as the reason a person visits an area. For example, at a visitor's center the "program" is gathering information, at a scenic overlook the "program" is viewing the scene. In wilderness, the program is usually solitude, with difficult access and self-reliance.

PERSONS WITH DISABILITIES IN WILDERNESS

So what about Wilderness? There is no question—people with disabilities must have an equal opportunity to participate in Wilderness areas. But there are also some clear mandates that in Wilderness—the preservation of the resource is pre-eminent.

Remember earlier—I said there was one

exception to Federal agency coverage under the ADA? Federally designated Wilderness is that exception. The one portion of the ADA which applies to the Federal agencies is Title V section 507(c). which states that:

1. In General—Congress reaffirms that nothing in the Wilderness Act is to be construed as prohibiting the use of a wheelchair in a Wilderness area by an individual whose disability requires use of a wheelchair and consistent with the Wilderness Act, no agency is required to provide any form of special treatment or accommodation or to construct any facilities or modify any conditions of lands within a Wilderness area to facilitate such use.

2. For the purposes of paragraph (1), the term wheelchair means a device designed solely for use by a mobility-impaired person for locomotion, that is suitable for use in an indoor pedestrian area.

I cannot emphasize that definition of a wheelchair strongly enough. Especially the wording suitable for use in an indoor pedestrian area. A number of National Forests have separately adopted that definition as their Forest's policy. And they print that definition/policy in their materials.

Now, back to Wilderness. Another component of Title V Section 507 of the ADA was a directive to the National Council on Disability to conduct a study on the ability of persons with disabilities to use and enjoy the National Wilderness Preservation System (NWPS). Many of you may have participated in that study. One of the major findings of that study was that Federal Wilderness managers needed training and assistance in making consistent decisions regarding use of auxiliary aids and other issues involving persons with disabilities in the NWPS.

Summary of Impact of Legal Requirements

The Federal Agencies are committed to serving all people—including persons with disabilities—and there are laws which require us to do so.

People with disabilities, even those who use motorized wheelchairs which are suitable for indoor use, are permitted to be wherever they want to be—even in the National Wilderness Preservation System (NWPS).

In Wilderness, the resource is pre-eminent and the use of Wilderness is considered to be a program to which no fundamental change is required for use by persons with disabilities.

WILDERNESS DECISION TOOL

In response to that need, this Wilderness Decision Tool was designed. Many of us from Federal agencies worked with Greg Lais of Wilderness Inquiry who was contracted by the USDA Forest Service to develop this Tool. This "Tool" is now being used by many Wilderness managers in the USDA Forest Service.

Definitions

Before we get into the Tool itself, we need to clarify some key definitions:

Assistive Device: a piece of equipment used by a person with a disability on a daily basis to help to accomplish one of life's functions or activities.

Example: A speech/communication board for a person who cannot speak, service dogs, canes, respirators, walkers, etc.

Disability: a person with a disability is one who has:

A. a physical or mental impairment that substantially limits one or more of the major life activities of that individual.

B. a record of such an impairment (e.g. a person who—in the past—had been treated for a mental illness).

C. is regarded as having such an impairment (e.g. a person with a facial deformity who is not otherwise disabled but is often treated differently because they look different).

The definitions under B and C. most often impact employment situations. "Major life activities" include working, walking, talking, seeing, hearing and independently caring for oneself (i.e. eating, dressing, etc.)

Universal Design: Universal Design is design which works well for everyone—rather than designing separate elements for use only by people with disabilities.

An example: is the entrance to a building that requires neither steps nor a ramp. Another example is the vault toilet structure (the SST) which is large enough for a wheelchair to turn around—but also works well for everyone else.

Wheelchair: A device designed solely for use by a mobility impaired person for locomotion that is suitable for indoor pedestrian use.

Wilderness: As a Congressional land allocation, Wilderness is considered to be a program not a facility. No fundamental change is required to be made to a program in order to accommodate a

person who has a disability.

Now with that background, think of yourself in the position of having to make a decision, regarding a request from a person with a disability who has a special need in order for them to be able to use a Wilderness area.

You need help. This is where the Wilderness Access Decision Tool comes in.

General Guidelines and Decision Questions

•Determine if the person making the request has a disability as defined by the ADA, (refer to previous definition of Disability).

•Determine if the request reflects a need directly related to that disability and the person's subsequent ability to safely utilize the National Wilderness Preservation System (NWPS), or if it is strictly a matter of convenience or comfort.

•Determine if granting the request will have a tangible effect on the natural resource. No law encourages or allows negative impacts on the NWPS.

•Determine if there are other means of meeting the request which have less impact on the Wilderness resource.

After reviewing these issues, determine which of the following four areas of the Tool is most appropriate to use to evaluate the request:

•Physical Modifications

•Assistive Devices

•Visitor Use Regulations and Policies

•Exceptions and Special Permits

We will review each of these four areas of the Tool.

PHYSICAL MODIFICATIONS

Wilderness preservation is the priority in the NWPS. There is no requirement to construct or modify any facilities or modify any conditions of the lands within a Wilderness area to facilitate use by a person with a disability. However, when a modification to preserve the resource is made, assess the situation for the potential to incorporate Universal Design principles.

If the change is requested by a person with a disability, and that change would damage or diminish the Wilderness resource values, it should not be considered. If the requested change enhances, maintains or does not change the Wilderness resource values, it should be considered.

If a modification is made to accommodate some form of visitor use, universal design should be considered to provide an appropriate level of accessibility that does not diminish the Wilderness resource values.

For example imagine that in trail construction you are deciding whether or not to install a footbridge. Should the foot bridge be a stringer only, or should it accommodate stock use? If the decision is made to accommodate stock use, then a bridge using universal design of 32" to 36" would also accommodate a person using crutches or a wheelchair. Another example is latrines. If a latrine or toilet is to be established for environmental reasons, an accessible primitive design can be used and placed in as accessible a location as possible.

Wilderness Access Decision Tool: Physical Modifications

Questions for Consideration:

1. If visitor use is a consideration in the decision to provide modification, what type of visitor use is the modification intended to accommodate; (e.g. stock, footpath, contained fire area, toileting, etc.)?

2. Does the current situation provide any form of access to persons with disabilities; (e.g. with assistance from friends or other currently allowed means?)?

Yes___ No___ Not Applicable___

3. Could principles of Universal Design be applied to this modification without negative impact to the Wilderness resource?

Yes___ No___ Not Applicable___

4. Will the proposed change or request enhance or maintain Wilderness resource values?

Yes___ No___ (If no, do not proceed)

Not Applicable___

Let's take an actual situation involving physical modifications through this section of the matrix.

Central issue: Should "improvements be made to Wilderness to facilitate use by people with disabilities? This situation is evaluated under the Physical Modifications section of the Tool.

Situation: Well meaning local citizens have urged the Forest Supervisor of the Modoc National Forest to construct a 3/4 mile "wheelchair trail" to a lake in South Warner Wilderness. These citizens want such a trail to comply with the Americans with Disabilities Act

Accessibility Guidelines (ADAAG). The current trail goes through a wooded area, with the standard 24" trail width for an easy hiker trail as referenced in the USDA Forest Service Trails Management Handbook (FSH 2309.18). The current trail has a couple of short pitches (greater than 15%) with approximately 160' gain in elevation from the trailhead to the lake. Current use of the trail is moderate (based on National criteria), however it is the most popular destination in that Wilderness—primarily for day use since it is so close to the trailhead.

Issues for consideration in this situation: Should the Forest Supervisor approve or deny this request? On what basis? What other alternatives exist? Review the preceding Physical Modifications section of the Wilderness Tool.

Recommended action: The action recommended would be to Deny the request to make the trail comply with ADAAG standards, however, work with citizens to meet their needs in other areas.

Explanation of decision: Complying with ADAAG standards would involve significant manipulation of the natural trail. Also past attempts at establishing designated "wheelchair trails" have failed because people who use wheelchairs usually do not want to be stereotyped or limited to such trails.

ASSISTIVE DEVICES

The Wilderness Act prohibits the use of mechanical devices, however as we said earlier—Section 507 of the ADA specifically allows the use of wheelchairs provided the wheelchair meets the definition of a wheelchair—that it is suitable for indoor pedestrian use. Assistive technology for persons with disabilities is evolving—and Wilderness managers are asked to keep the preservation of the resource and common sense in mind and in balance when evaluating assistive device use in the NWPS. This section of the Decision Tool is designed to help you find that balance point.

Wilderness Access Decision Tool: Assistive Devices

Questions for Consideration:

1. Is the device suitable for indoor pedestrian use; (i.e. use in an office, a home or a restaurant without noise, emissions or other unacceptable impacts to the indoor environment)?
Yes___ No___(If no, do not proceed)
Not Applicable___

2. If the piece of equipment is a wheelchair, is it designed solely for use by a mobility impaired person for locomotion?
Yes___ No___(If no, do not proceed)
Not Applicable___

3. If the piece of equipment is an accommodation for maintenance of basic life functions, (e.g. a respirator or an assistive speech device), Is it prescribed by a physician and designed solely for use by a person with a disability?
Yes___No___(If no, do not proceed)
Not Applicable___

4. Will the use of such a device negatively impact Wilderness resource values?
Yes___(If yes, do not proceed) No___
Not Applicable___

VISITOR USE REGULATIONS AND POLICIES

Agencies are not required to provide any modifications or special treatment in the NWPS to accommodate accessibility by persons with disabilities. However, agencies are encouraged to explore solutions for reasonable accommodations when not in conflict with the Wilderness Act. Such reasonable accommodation fits into good customer service. Federal land management agencies have developed many Wilderness policies, such as group size limitations that are not specifically addressed in the Wilderness Act. These policies have become necessary as Wilderness use has increased—however in some cases the policy may inadvertently inhibit use by persons with disabilities. It is important to review visitor use regulations and policies to insure that they do not inadvertently discriminate against persons with disabilities.

Wilderness Access Decision Tool: Visitor Use Regulations and Policies

Questions for consideration:

1. Do agency policies, (e.g. group size restrictions or criteria for obtaining entry permits), inhibit the ability of persons with disabilities to participate in the NWPS?
Yes___ No___ Not Applicable___

2. If yes, are these policies essential for Wilderness resource preservation?
Yes___No___Not Applicable___

3. If policies are not essential for Wilderness resource preservation, can they be

modified to accommodate a person with a disability without negatively impacting the Wilderness resource?
Yes___No___Not Applicable___

EXCEPTIONS AND SPECIAL PERMITS

Agencies are not required to provide any modifications or special treatment to accommodate accessibility by persons with disabilities. Exceptions and special requests must be carefully analyzed to ensure that they do not conflict with Wilderness values, that they provide benefits to persons with disabilities, and that they accomplish the goal with the minimal tool necessary.

Wilderness Access Decision Tool: Exceptions and Special Permits

Questions for consideration:

1. Does the special use request violate the provisions of the Wilderness Act or subsequent relevant legislation?
Yes___ (If yes, do not proceed) No___
Not Applicable___

2. Will the special use request establish a precedent that might negatively impact Wilderness values? Yes___ (If yes, do not proceed) No___ Not Applicable___

3. Does the individual or party making the request have an impairment in one or more of life's major functions as defined in the ADA (e.g. walking, talking, breathing, seeing, etc.)
Yes___ No___ (If no, do not proceed)
Not Applicable___

4. Does the special request provide the accommodation with the minimal tool or modification; (e.g. is there an alternative appliance, equipment or aid that has less impact on Wilderness resources)?
Yes___ No___ (If no, do not proceed)
Not Applicable___

5. Are there nearby, equivalent areas outside the NWPS where the request can be accommodated?

To obtain a complete copy of the *Wilderness Access Decision Tool*, which includes twelve case studies, contact Janet Zeller, USDA Forest Service, 719 Main Street, Laconia, NH 03246

Air Pollutant Monitoring at Fish And Wildlife Service Class I Air Quality Wilderness Areas

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Abstract: The U.S. Fish and Wildlife Service (FWS) administers 75 wilderness areas, 21 of which are designated Class I air quality areas and receive special protection under the Clean Air Act. Because of increasing concern regarding visibility impairment from air pollution in wilderness areas, the FWS conducts visibility monitoring at several Eastern Class I areas. Data from three of the FWS monitoring sites were examined. These data indicate that the sites are experiencing high concentrations of visibility-reducing particles. The concentration and composition of air pollutants at these FWS sites are consistent with patterns observed in the national IMPROVE (Interagency Monitoring of Protected Visual Environments) network. For instance, pollutant concentrations are generally higher at Eastern sites than at Western sites and, as a result, visibility is lower at Eastern sites. As the data record lengthens, attributing air pollution and visibility impairment at the wilderness areas to specific source types and regions will be more accurate.
Keywords: visibility, air pollution, wilderness, Class I area, air pollution monitoring

The U.S. Fish and Wildlife Service (FWS) has responsibility for managing 20.6 million acres in 75 wilderness areas. Special protection for these areas is mandated by the Wilderness Act:

> "... each agency administering any area designated as wilderness shall be responsible for preserving the wilderness character of the area..." (Public Law 88-577)

Of these FWS wilderness areas, 21 are designated Class I air quality areas under the Clean Air Act (Fig. 1). The law affords these Class I areas the greatest degree of air quality protection. Little deterioration of air quality in these areas is allowed. Visibility, in particular, is granted special protection under the Clean Air Act:

> "Congress...declares as a national goal the prevention of any future, and the remedying of any existing, impairment of visibility in mandatory class I Federal areas which impairment results from manmade air pollution." (Clean Air Act Section 169A)

Despite these mandates, visibility in many wilderness areas, including Class I areas, is being affected by human-caused air pollution. In its 1993 report, "Protecting Visibility in National Parks and Wilderness Areas," the National Research Council noted that scenic vistas in many national parks and wilderness areas are often diminished by haze. In the East, visibility impairment is particularly severe: The average visual range is less than 30 kilometers, or about one-fifth of the natural visual range (National Research Council 1993).

VISIBILITY IMPAIRMENT

Essential to the wilderness character of an area is good visibility—the ability to look out over great vistas to see shapes and colors with crystalline clarity. Visibility involves not only how far one can see (visual range), but also how well scenic landscape features can be seen and appreciated. Image contrast, color, and texture are also important aspects of visibility.

Air pollutants, including particles and gas molecules, cause visibility impairment. Some air pollutants come from natural sources such as forest fires; however, the largest contributors to reduced visibility are human-caused emissions.

especially sulfates and organic carbon. Sulfates result from sulfur dioxide emissions from fossil fuel-fired powerplants and smelting, oil extraction, and refining activities. Organic carbon compounds (e.g., hydrocarbons) are emitted by automobiles, oil and gas processing, and certain industries. Soot is emitted directly from prescribed fires, agricultural burning, and diesel engines. Other contributors to visibility impairment include nitrates and dust. Some pollutants transform in the atmosphere. For example, sulfates and nitrates often combine with ammonium ions to form ammonium sulfate and ammonium nitrate, respectively. These pollutants can remain in the atmosphere several days and be carried tens, hundreds, or thousands of kilometers downwind.

Most visibility impairment is caused by very small (i.e., "fine") air pollutant particles known as PM-2.5 (particles less than 2.5 microns in diameter). PM-2.5 includes particles about the size of the wavelength of visible light (0.4 to 0.7 micrometers) and, therefore, the ideal size to scatter or absorb light. This scattering and absorbing of light, called "light extinction," results in reduced visibility.

Particles vary in their light extinction efficiency, that is, their ability to scatter and absorb light. For example, sulfates have a high light extinction efficiency because of their shape and size. Because of this high efficiency and because they comprise a large portion of the fine particles in the atmosphere, sulfates are responsible for most of the light extinction and visibility impairment in many parts of the country. The light extinction efficiency of sulfates increases with increasing relative humidity because sulfates absorb moisture and expand. Therefore, a given amount of sulfate in a humid area (e.g., the East) causes more light extinction than the same amount of sulfate in a dry area (e.g., the West).

VISIBILITY MONITORING METHODS

The FWS conducts visibility monitoring in five national wildlife refuges that contain Class I areas: Brigantine, Cape Romain, Chassahowitzka, Moosehorn, and Okefenokee. These visibility monitoring sites are part of the national IMPROVE (Interagency Monitoring of Protected Visual Environments) network of approximately 40 sites operated by FWS, National Park Service (NPS), Forest Service, Bureau of Land Management, and other agencies. Each site is equipped with a sampler that collects fine particles by filtering a known volume of air over a 24-hour period twice a week. The filters are analyzed for parameters such as hydrogen, sulfur, soil elements, trace elements, nitrate, chloride, organic carbon, and soot. Estimates of concentrations of ammonium sulfate, ammonium nitrate, organic mass, light-absorbing carbon, and soil are derived from the above parameters. The light extinction caused by each pollutant is estimated by multiplying the concentration of the pollutant by its light extinction efficiency. The total light extinction at a site is the sum of the individual light extinctions caused by all pollutants.

Data from the samplers at Brigantine, Chassahowitzka, and Okefenokee were analyzed for the period March 1993 to February 1995 to determine fine particle components and concentrations and the resulting light extinction. The samplers at Cape Romain and Moosehorn did not begin operation until late 1994 and, therefore, were not included in this analysis. Data from a representative Western IMPROVE site, Canyonlands National Park, are provided to illustrate the significant differences in fine particle concentrations and light extinction between Eastern and Western sites.

RESULTS AND DISCUSSION

Fig. 2 shows the components and concentrations of fine particles at the three Eastern FWS sites and the Western NPS site. Fine particle concentrations are considerably higher at the Eastern sites, a pattern consistently observed in the national IMPROVE network (Sisler et al. 1993). Sulfate, in the form of ammonium sulfate, is the largest component of fine particles at each of the four sites. Organic carbon, nitrate (in the form of ammonium nitrate), soil, and soot are also significant components. Fine particle concentrations are highest at Brigantine.

Fig. 3 shows light extinction (expressed as the coefficient of extinction measured in inverse megameters, Mm^{-1}) at the four sites. Light extinction is dependent on several variables: the fine particle concentration, the light extinction efficiency of the fine particles, and the relative humidity at the site. Of these, fine particle concentration has the most influence on light extinction. As a result, light extinction is greater at the Eastern sites than at the Western site, and is greatest at Brigantine.

This agrees with the findings of Copeland et al. (Copeland 1995a,b,c), who analyzed data

Fig. 1. U.S. Fish and Wildlife Service Class I Areas. Atmosphere, Colorado State University, Fort Collins, Colorado.

from March 1993 to February 1994 from 42 IMPROVE sites (13 Eastern sites and 29 Western sites). Copeland found that the three FWS sites had high fine particle concentrations and high light extinctions. Okefenokee, Chassahowitzka, and Brigantine were ranked 35th, 36th, and 37th, respectively, in terms of light extinction and reduced visibility. That is, 34 sites had better visibility than the FWS sites, and only 5 sites (all Eastern sites) had worse visibility.

The contribution of ammonium sulfate to light extinction at the Eastern sites is illustrated in Fig. 4. Ammonium sulfate is the dominant component of fine mass and contributes 53 percent to light extinction at the Eastern sites. In contrast, at the Western site ammonium sulfate is a smaller portion of fine mass and contributes only 23 percent to light extinction.

CONCLUSIONS

Visibility impairment has been documented at three FWS sites in the East. At these sites, high concentrations of fine particles, particularly sulfates, result in high light extinction. Future monitoring will help establish long-term trends in visibility and identify sources of impairment at these areas.

SUMMARY

The FWS conducts visibility monitoring at five of its Eastern Class I wilderness areas. Data from three of these monitoring sites were examined to determine the concentrations and components of fine particle mass and the light extinction. Data from a Western NPS site provided a comparison. The Eastern FWS sites had significantly higher concentrations of fine particles and, therefore, higher light extinction, and poorer visibility, than the Western site. Of the Eastern sites, Brigantine had the highest fine particle concentrations and the highest light extinction. Fine sulfate particles, originating from sulfur dioxide emissions from powerplants, smelters, and other sources, were responsible for most of the light extinction at the Eastern sites.

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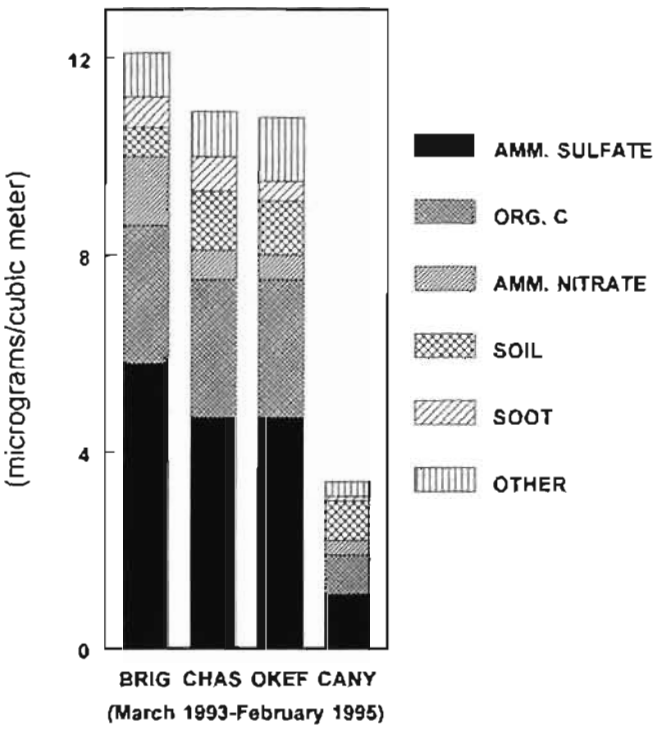

Fig. 2. Components of Fine Mass (micrograms per cubic meter) from Three Eastern FWS Sites and One Western NPS Site.

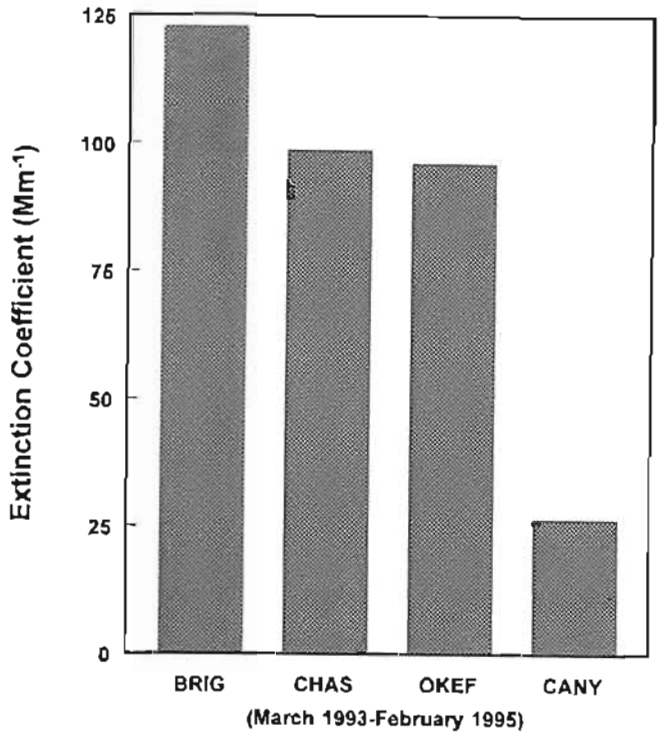

Fig. 3. Light Extinction (inverse megameters, Mm^{-1}) at Three Eastern FWS Sites and One Western NPS Site.

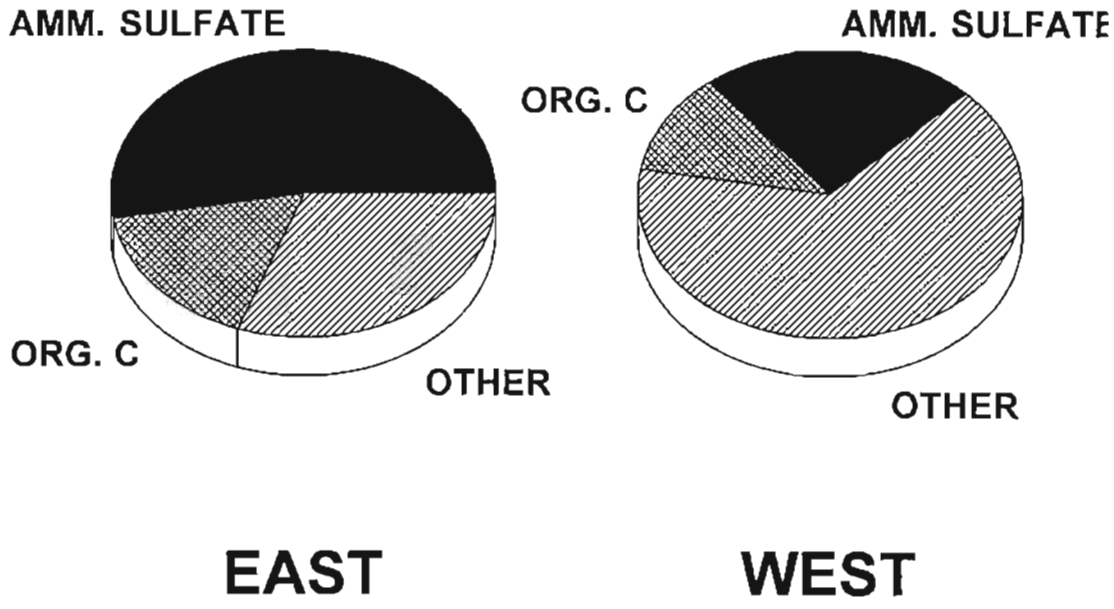

Fig. 4. Percent Contribution of Pollutants to Light Extinction: Eastern vs. Western United States.

Wilderness Values and Ethics

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I. WILDERNESS VALUES

The Value of Wilderness. All of us have heard and used these phrases, probably with a pretty good idea of what they mean. We may refer back to the Wilderness Act of 1964 and the values defined there—the primeval character, natural conditions, affected by the forces of nature, opportunities for primitive and unconfined type of recreation, and also ecological, geological, or other features of scientific, educational, scenic or historical value (Sec. 2). Or we may think of values in subsequent wilderness acts, or even the wilderness values Ed Zahniser shared with us today: patience, persistence, good will, zeal, and a sense of humor.

The concept of value is critical to the concept of wilderness. *In Wilderness Management*, Hendee and others point out how the Wilderness Act and the movement leading to it reflect a synthesis of diverse philosophical values which evolved over many years (pg. 7). McCloskey in 1966 notes:

> The evolution has blended many political, religious, and cultural meanings into deeply felt personal convictions...those who administer that law must look to these convictions to understand why the law exists.

In his book, *Wilderness and the American Mind*, Roderick Nash writes about the scarcity theory of value for wilderness—simply that it's valued because there isn't much of it. This could be especially true of eastern wilderness, since not even 5% of all the protected wilderness lies east of the 100th meridian, and almost half of that can be found in just two areas, Everglades National Park and the Boundary Waters Canoe Area. The 11 states from Maine to Maryland, where nearly one quarter of the nation's entire populations resides, includes only 2/10ths of 1% of the National Wilderness Preservation System.

Many discussions about wilderness are also discussions about values. We talk a lot about what wilderness is and isn't, should and shouldn't be, but not as much about what values are, aren't, possibly should be and how they affect our work as wilderness managers.

So for this session, we're going to deal with values, to understand how they form the web of support for the wilderness resource, and the effect they have on wilderness decision makers.

Values Defined

1. Values are the guiding principles in our lives; our moral navigational devices.

2. Values are the link between emotion and behavior; the connection between what we feel and what we do. Values instruct our feelings so we do not always have to pause and think before we act on them.

3. They are an enduring set of beliefs that inform us of what to do and what not to do. Values lead us to regard some goals or ends as more legitimate or correct and other goals as illegitimate or wrong. They also lead us to regard certain ways of reaching those goals or means as proper and appropriate and other ways as improper or inappropriate.

4. Values are deeply ingrained and are relatively unchangeable. We want to be respected. We want to accomplish meaningful things in our life that make a difference. We want to be recognized for our accomplishments and we want to be complimented for a job well done. This is true today. It was true yesterday, and it is likely to be true as long as people have feelings and are driven by a sense of accomplishment. (Goodstein et al. 1993).

Importance of Values

1. Credibility - When it comes to deciding whether someone is believable, people first

listen to the words; then they watch the actions. They listen to the talk and watch the walk. Then they measure the congruence. A judgement of "credible" is handed down when the two are consonant. If people don't see consistency, they conclude that the person is not really serious about the words or is an outright hypocrite.

2. Direction - You need to know where you are going if you expect others to willingly join you on the journey!

a. We operate at our best when we and our teams are guided by a clear and agreed-upon set of values. When we are sailing through the turbulent seas of change, the crew needs a vision of what lies beyond the horizon and must understand the standards by which performance will be judged.

b. Leaders who are not clear about what they believe in are likely to change their position with every fad or opinion poll. Without core beliefs, and with only shifting positions, would-be leaders are judged as inconsistent and derided for being "political" in their behavior. Then, the first milestone on the journey to leadership credibility is clarity of personal values.

3. Decision - Values help us determine what to do and what not to do. They are the deep-seated, pervasive standards that influence every aspect of our lives: our moral judgments, our responses to others, our commitments to personal and organization goals.

a. Values enable us to know in our own minds what to do and not to do. When values are clear, we do not have to rely upon direction from someone in authority. Values set the parameters for the hundreds of decisions we make every day.

b. The more volatile the environment, the greater the need for clear and abiding principles.

4. Efficiency and Power - Relationships characterized by cooperation (community) have higher levels of productivity and resource exchange (sharing) than competitive relationships. When there is community, leaders and employees assist each other by sharing resources and expertise, integrate different points of view and ideas to solve problems, discuss issues to reach mutually satisfying agreements, show initiative, consult with others and follow proper procedures (Kouzes and Posner, 1993, 1995).

Types of Values

1. Personal - Until you truly know yourself, strengths and weaknesses, know what you want to do and why you want to do it, you cannot succeed in any but the most superficial sense of the word. Ultimately, it is people and not organizations who bear the responsibility for decisions. Those individuals with the clearest personal values seem better prepared to make choices based on principles—including deciding whether the principles of the organization fit with their own personal principles.

2. Organizational - An organization's values provide the social context in and through which an organization performs its work. It guides the organization's members in decision making, in determining how time and energy are invested, in choosing which facts are examined with care and which are summarily rejected, in deciding which options are looked on favorably from the start and which types of people are selected to work for the organization, and in practically everything else that is done in the organization.

But does wilderness truly have an organization value, or four separate ones for each of the four wilderness management agencies? Let's take a look at the organizational values of the wilderness management agencies, as expressed in their mission statements.

1. NPS Mission - To conserve the scenery and the natural, historic objects, and the wildlife therein and to provide for the enjoyment of the same in such a manner and by such means as will leave them unimpaired for the enjoyment of future generations.

2. USFWS Mission - Conserve, enhance and protect fish and wildlife and their habitats for the continuing benefit of people through Federal programs relating to wild birds, endangered species, certain marine mammals, inland sport fisheries, and specific fishery and wildlife research activities.

3. FS Mission - Caring for the land and serving people. The mission is to achieve quality land management under the sustainable multiple-use management concept to meet the diverse needs of people.

4. BLM Mission - Manage, protect and improve public lands in a manner to serve the needs of the American people for all times. Management is based on the principles of multiple use and sustained yield of our Nation's resources within a framework of environmental responsibility and scientific technology. These resources include recreation; rangelands; timber; minerals; watersheds; fish and wildlife;

wilderness; air; and scenic, scientific and cultural values.

Are we really that far off? Can we identify the common threads intertwining these organizational values contain and how they work together for wilderness?

II. SOCIAL/POLITICAL STAKEHOLDERS

a. Take into account the presumed values of the various stakeholder groups and their respective resources, status, freedom of action, relationships and activities that may be impacted by shifts or changes in the organization's direction.

b. It will never be possible to satisfy all of them. Rather, interest should be assessed and considered in terms of the consequences of either meeting or not meeting them. Such an assessment will reduce the surprises that might otherwise impact you.

One strong expression of social/political value is of course the Wilderness Act. Does its guidance conflict with that of the respective wilderness managing agencies?

c. Wilderness Act—...it is hereby declared to be the policy of the Congress to secure for the American people of present and future generations the benefits of an enduring resource of wilderness. For this purpose there is hereby established a National Wilderness Preservation System to be composed of federally owned areas designated by Congress as "wilderness areas," and these shall be administered for the use and enjoyment of the American people in such manner as will leave them unimpaired for future use and enjoyment as wilderness...

Ethics are collective values. They are a body or system of moral principles or values. Ethical behavior is that which is in accordance with professional standards for right conduct or practice. Many organizations, professions, etc. have a "code of ethics" which members identify with and adhere to.

III. DECISION TRIANGLE

Values are the critical foundations for decision making. It could be said that decisions are values put to action. One way to look at the factors guiding our wilderness decisions is to consider a decision triangle based on 1) the resource, 2) law and policy (organizational values), and 3) the need to serve people (social values).

The goal of decision making then is to be within the triangle—do what is right for the resource, according to policy, and enacts the will of the people.

Probably a high percentage of the time we are there. But sometimes, maybe we are not. Behavior outside the triangle may be considered unethical, "wrong", and sometimes maybe even illegal. When decisions/actions fall outside this triangle, we see friction, and possibly a shift in the fundamental values that underlie it; we may with change, possibly even a revolution.

Where YOU fall within this triangle depends largely on your personal values. How about for Wilderness? Where do you stand? We have mentioned the social values expressed in the wilderness acts, and carried forth into organizational policy. We are the "experts" on the resource.

Have there been many shifts of the wilderness decision triangle? Where do you stand on wilderness issues?

IV. WILDERNESS VALUE QUESTIONS

(originally compiled by Sue Kozacek, Gila National Forest.)

Fish and Wildlife

1. Do you feel hunting is an appropriate activity in Wilderness?

2. Do you feel it is OK to stock native fish in lakes which historically have not had fish?

3. In an area that has established wildlife watering devices (guzzlers), do you feel is it appropriate to maintain these and leave them in Wilderness?

4. Are low level aerial game surveys acceptable to you in Wilderness?

Fire

5. Do you feel we should be protecting known Mexican Spotted Owl nests from prescribed natural fire (PNF)?

6. Is it acceptable to you to have Managed Ignited Fires (MIF) in a Wilderness area?

7. Do you feel it is appropriate to have technologically advanced data collecting stations in Wilderness to monitor temperature, moisture content, wind and other factors that would allow better information for PNF and MIF?

8. Do you feel we should be suppressing any fires in Wilderness?

9. Do you feel that there is a point when air quality is more important than allowing extended periods of PNF?

Cultural Resources

10. In your opinion is it OK to maintain historic cabins in Wilderness?

11. Is it OK to interpret in a widely available book, historic structures and cultural resources that are in Wilderness?

Range

12. Do you feel that cattle grazing is an appropriate use for Wilderness?

13. Do you feel grazing permittees should be allowed to use motorized equipment for maintaining water developments in Wilderness where these methods have been used historically? (for example, using a dozer to clean out a dirt stock tank in Wilderness?)

14. Do you feel it is appropriate in Wilderness to control predators that are killing a substantial number of livestock?

Health and Safety

15. Do you feel a hazard tree along a well-used trail should be cut to protect public safety?

16. Do you feel that cutting logs in trails to facilitate passage by pack strings is appropriate?

17. Do you feel we should be signing natural caves in Wilderness that pose safety hazards?

18. Do you feel it is appropriate for a visitor center desk to be giving users more information about hazards in Wilderness so we can lessen the potential of search and rescue operations?

19. Do you feel that signs should be placed at historic structures to warn people of the Hanta Virus potential?

20. Do you feel we should be rescuing a person with a broken leg (but not in a life threatening situation) in wilderness with a helicopter?

21. If available free to you, would you take a cellular phone into Wilderness with the thought that it would only be used to facilitate an emergency situation?

Recreational Uses

22. Do you feel it is OK to use llamas in Wilderness?

23. Do you feel that it is appropriate to leave some established rock bolt routes in Wilderness areas?

24. Does the value of having the number of users controlled by a permit system outweigh the value of unregulated use and freedom in Wilderness? (i.e.. do you believe permit systems should be used in Wilderness?)

25. Do you feel it is OK to allow people to collect crystals in Wilderness?

26. Do you feel it is OK to allow people to collect antlers in Wilderness?

27. Do you feel that recreation opportunities are the dominant value of Wilderness?

28. Do you feel it is OK to have trail signs in Wilderness?

29. Do you feel it is OK to put mileage on signs in the Wilderness?

30. Do you feel it is OK to bury decomposable garbage in Wilderness?

31. If you had a well-behaved dog, would you feel it is appropriate to take it with you in Wilderness?

32. In your own mind is it appropriate for outfitters to have business operations dependent on Wilderness?

33. Do you feel it is OK to film in Wilderness a movie about Wilderness values?

In order for the public to determine what we are trying to protect and manage in wilderness, there are a number of ethical and ecological questions that should be addressed in our wilderness planning documents. In general, these are not legal or scientific questions. They must be addressed by wilderness managers and the public at large rather than by only lawyers or scientists. Public understanding and support of both the questions and the answers is crucial to protecting Wilderness for present and future generations.

1. Is Wilderness only a commodity for human use and consumption? Are there intrinsic values in wilderness other than user/public concerns?

2. Are all components of the wilderness resource (i.e.. plant or animal species) equally important? That is, do some components have a lesser value?

3. Are components of the wilderness resource to be protected from human-caused change rather than harm or damage? Terms such as "damage" and "harm" are arbitrary and prejudicial where "human-caused change" is more value-neutral.

4. Is a Wilderness component (i.e.. plant or animal species) important even if the users of the wilderness are unaware of its existence?

5. Are all life forms in Wilderness equally important? For example, are micro-organisms equally important as elk or grizzly bears?

6. Should the goal in Wilderness management be to protect just resources with immediate aesthetic appeal (i.e., sparkling clean streams) or should the goal also be to protect unseen ecological processes (such as natural bio diversity and gene pools)?

7. Should the most sensitive components be protected, or just those of "average" or "normal" sensitivity? Sensitivity of a Wilderness component is generally determined by its inertia (resistance to change), its elasticity (how far it can be stretched from the natural condition without being permanently modified), and its resiliency (the number of times it can return to the natural condition after experiencing human-caused change).

8. Is each Wilderness component important for itself, or only for how it interacts with other components of the ecosystem? That is, are the individual parts of the ecosystems in Wilderness equally as important as the sum of the parts?

9. For Wilderness, are the biological components of the ecosystem (i.e., salamanders) more important than the physical components of the ecosystem (i.e., lake chemistry)? That is, does a functioning ecosystem consist of physical, chemical, and biological components interwoven in complex patterns?

10. Is the objective in Wilderness management to provide for user enjoyment or a natural user experience? Should the enjoyment of any or all parts of a Wilderness experience be purely a personal matter for the individual user to decide?

11. Should the goal in Wilderness management be to protect natural conditions rather than the conditions as first monitored? That is, if initial monitoring in a Wilderness identifies human-caused changes, should appropriate actions be taken to remedy them, in order for the affected ecosystem to move towards a more natural condition?

12. While it may not be possible to manage every Wilderness in a natural or near natural state, should each wilderness be managed in as pristine a condition as the specific (local) bio-physical, legal, scientific and social/political situation will allow; that is, should each Wilderness be managed in the most natural condition as the local situation will allow?

13. In selecting today's wilderness management actions, should we consider potential impacts to future generations as being less important than potential impacts to current users?

The answers to these questions will help wilderness managers and the public define the values, resources, and processes that should be managed in Wilderness.

V. CONCLUSION

Remember, actions speak louder than words. People pay more attention to the values we actually use than to those we say we believe in. No one actually sees the values themselves; they are intangible. What people see is the tangible evidence that we are true to our beliefs—our decisions, actions, allocations, attention, and use of time.

What value do you place on wilderness? on fire? on fire in wilderness? Have you completed your wilderness fire plan?

Setting an example is essentially doing what we say we will do. It begins with the clarification of personal values and an appreciation of constituents' values.

Few, if any, forces are as powerful as shared visions. People really do want to make commitments; and united in a common cause, calling, mission, purpose, or vision, they can get extraordinary things accomplished.

"To secure for the American people, an enduring resource of wilderness." What shared vision could be more clear?

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Fire Suppression Commensurate with Wilderness Stewardship

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Abstract: Implementation of fire management challenges both the manager and firefighter to evaluate fire suppression actions in line with wilderness resource values. Wilderness managers need to take a proactive role by providing direction to implement fire suppression tactics that will avoid unnecessary adverse impacts or wilderness resource damage, and then make themselves available at the time of the wildfire to ensure that the direction is implemented. Individuals involved with fire suppression activities need to be knowledgeable and skillful in applying these tactics. Based on actual accounts and experiences, the author highlights examples and techniques that have been accomplished and can be used in the future to perform the fire suppression job, yet achieve a high level of wilderness stewardship.
Keywords: Fire suppression, fireline, wilderness stewardship, wilderness resource

INTRODUCTION

The change in the mid-70's from fire control to fire management challenged wilderness and fire managers to have a new perspective of fire. The natural role of fire was recognized, and led to several implementation plans allowing this natural process to operate and be a major influence with the vegetative landscape of the wilderness. However, not every ignition will meet the predetermined conditions, and some will be declared as a "wildfire." Therefore management of fire suppression is just as important to the fire program for the wilderness resource as the development of plans allowing fire to be managed as a natural process.

It is essential that the wilderness manager and firefighter select and implement fire suppression tactics that accomplish the job of halting fire spread (when necessary), yet leaves minimal or no adverse environmental impact on the wilderness resource. Unfortunately, many suppression tactics practiced in the past have resulted in major adverse visual imprints or damage upon the wilderness landscape. From surveys of several wilderness wildfire in more recent years, it is apparent that this is still occurring. In many situations, damage caused by our human activities (actions) during fire suppression is longer-lasting than the effects of the fire itself. As land stewards, this is what we need to avoid.

Discussion

A brief evaluation and discussion of various activities that can occur during fire suppression is in order.

Firelining

The basic intent of a fireline is to halt additional fire spread. However, it appears firelining has become synonymous with needing to construct! The conventional 18-24 inch or wider, exposed mineral soil type line made by hand tools or machine is not always necessary. Halting fire spread can be done by a variety of tactics: aerial retardant drops, helibucket water drops, water spray, or a combination of burning-out from an existing recreation or animal trail, or a "wetline," with follow-up patrol, may serve as the appropriate firelining tactic. Nature has provided several firelines, too: streams, rocky or bare areas, meadows, wetlands, old burns, and even a change in vegetation can halt fire spread.

Tree Cutting

Why does a burning snag or tree that poses no threat toward causing additional fire need to be cut? There is no question that firefighter

safety is critical. But the first question to is whether or not firefighters need to be working in the area near a burning tree/snag in the first place. If it's not a threat of additional fire spread, why are people around it? If it is not necessary for firefighters to be in the area around a burning tree or snag, then is it a "safety hazard?" Why not leave it to burn out on its own or fall over naturally? So why cut it?

Even if the fire kills the tree, it is important to keep in mind that a dead standing tree is a resource. Besides the habitat it serves, it is a component of a natural-appearing forest landscape.

Some burnt trees/snags are cut because they are termed "hazard trees" for the visitor/user. However, after observing this practice on several fires, it is apparent we need to evaluate what constitutes a "hazard tree." On several occasions this activity resulted in more trees cut than necessary. In summary, instructions need to be very specific in defining what is a "hazard tree."

Helispot Construction

Helispot construction can cause a double impact—the impact of an abrupt or unnatural appearing openings on the landscape, and the impact associated with the cut faces of several tree boles and stumps. Are we emphasizing the following questions at the planning phase? What will be the primary function of the helispot (crew shuttle or logistic support)? If for crew shuttle, what is the minimum size opening necessary for the safe operation of the size of helicopter intended? Was serious consideration given to using some natural openings a quarter or half mile away instead? Certainly crews have not forgotten how to walk! If for logistic support only, why not use long line remote hook in lieu of constructed helispots? Pilots are very skilled at this task. Consequently, no cutting-related impacts would occur at all.

Ideally an aerial reconnaissance over the areas/fire perimeter where helispots are desired with the responsible Agency Administrator and/or Resource Advisor, Air Operations Manager, and the Helitack Foreman, who will be responsible for any on-the-ground construction, could increase understanding between the manager's intended suppression objectives and end-result expectations of resource impact.

If helispot construction is necessary, some measures have been identified that would cause less impact on the land, as well as lessen the task of fire suppression rehabilitation. These measure are: directional falling, limb and buck only as necessary for safe, practical operation, breaking limbs instead of sawing, and flush cutting stumps near ground level.

Fire Camp and Personal Conduct

Firefighters should follow the same "No Trace Camping Standards" as is expected of the recreation visitor:

-Select impact-resistant sites.
-Avoid cutting of vegetation or tree boughs or bedding or camping sites.
-Avoid any trenching for bedding sites.
-Avoid constructing several campfire sites.
-Limit travel routes to and from camp.

Rehabilitation of Fire Suppression Impacts

When fire suppression impacts do occur, they cannot be ignored. We always have had the responsibility to be accountable for our actions. The major objective of the rehabilitation activity is to mitigate or eliminate environmental or wilderness resource impacts caused by the fire suppression effort and restore the area to as natural conditions as possible. Policy in the Forest Service Wilderness Manual (FSM 2324.23) states, "rehabilitate areas disturbed during the fire suppression activity to as natural a condition as possible." Other agencies have similar policies.

Before starting the rehabilitation task, walk through an adjacent, untouched area and observe the appearance, arrangement, and diversity of a naturally evolved landscape. Let your imagination be your guide. Use what you have observed from the natural landscape to guide restoration efforts. Be creative!

Land Stewardship During Fire Suppression—Making it Happen

Increased awareness, understanding, and implementation of a "lighter-hand-on-the-land" attitude can be achieved through a conscientious, assertive effort. This attitude has also been termed "Minimal Impact Suppression Tactics". This effort involves all operational and management levels--Agency Administrators, Regional and District level Specialists, Resource Managers, specialized suppression crews, and the individual firefighter.

It is not just a training or lack of awareness problem that can be corrected by including the

topic in training sessions for the firefighter or crews. It needs to have management emphasis. It needs to be discussed in management workshops, conferences, and one-to-one contacts. It needs to be emphasized during the manager's initial direction to the Incident Commander or suppression crew. It needs to be a performance element discussed and evaluated before everyone leaves the fire incident. Without this emphasis all along the way, from Agency Administrator to the firefighter, implementation of minimum/no adverse impacting suppression activities will not happen.

Recommendations

1. Agency Administrators ensure that management direction regarding suppression tactics is developed, and provided in agency implementation documents.

2. Agency Administrators emphasize that the topic of appropriate suppression response and tactics is discussed and evaluated at least annually during administrators' meetings, as well as the various fire management sessions.

3. Agency/Unit Training Officers review and edit the various fire training packages/material as to contents/statements that could result in unnecessary environmental impacts.

4. Agency/Units pre-select individuals to serve in the position of "Resource Advisor" prior to the fire session. Consider such criteria as: (a) broad resource background, (b) knowledge of the area's pertinent resources/management objectives, (c) awareness of and ability to communicate the concept of MIST, (f) awareness of role and responsibility of a Resource Advisor, and (e) assertiveness.

5. Agency Administrators emphasize that suppression tactics be discussed during briefing the Incident Commander (or crews), and be included in their "Delegation of Authority" document. Address this topic during the evaluation performance of the Incident Team (or crews) at the exit review.

6. Agency Administrators or Resource Advisors ensure that suppression tactics and impacts be evaluated in the Fire Situation Analysis or Escaped Fire Situation Analysis, assessed in the Fire Behavior Analyst Forecast, and referenced in the daily Incident Action Plan.

Summary

Yes, it can happen! It can work! It is possible to suppress a wildfire while caring for the land and protecting wilderness resource values. It has been proven, such as occurred on the Kitchen Creek Wildfire in the Frank Church River of No Return Wilderness, Salmon National Forest, Idaho, a few years ago in both wildfire situations. It has also occurred with the 1996 Park Meadow Wildfire in the Three Sisters Wilderness, Deschutes National Forest, In Oregon, in which a U. S. Army Artillery Battalion was a majority of the firefighters. But it is also obvious some major steps occurred that made it possible. Without those steps (Management direction, excellent Resource Advisors, Incident Team commitment, Monitoring, and Feedback), the Kitchen Creek Wildfire would have been just another unacceptable memorial of inappropriate, poorly planned suppression efforts.

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Wilderness Planning: A Case Study in Dispute Resolution

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Abstract: Local landowners and environmental groups have historically disputed with the USDA National Forest Service in Texas over wilderness management issues such as wild and prescribed fire and management of the southern pine beetle (*Dendroctonus frontalis*). To help diffuse polarization and open lines of communication between agency personnel and the general public, the theory of transactive planning was applied with the LAC process on two wilderness areas. Data collection consisted of: 1) participant observation; 2) issue-evaluation surveys; 3) process-evaluation surveys; and 4) exit interviews. Results indicate the planning process aids in dispute resolution by reducing antagonistic relationships and fostering public consensus in land use planning.
Keywords: conflict, consensus, dialogue, dispute resolution, limits of acceptable change; mutual learning, public participation, and transactive planning

INTRODUCTION

In September 1992, the USDA Forest Service in Texas contracted a challenge cost-share agreement with Stephen F. Austin State University to develop a Limits of Acceptable Change (LAC) wilderness planning document for Upland Island and Turkey Hill Wilderness Areas on the Angelina Ranger District in East Texas. As a conceptual procedure, the LAC process evaluates the wilderness, determines acceptable conditions and then prescribes actions to protect or achieve those conditions (Stankey et. al. 1985).

Participants in the LAC process included USDA Forest Service personnel, Texas State Parks personnel, members of the Sierra Club, Texas Committee on Natural Resources (a local environmental advocacy group), the Native Plant Society, and local landowners. To participate in this study required a commitment to meet on a regular basis, discuss issues, and give input to the project manager (M.H. Legg). The group involved in the final evaluation consisted of 12 members including the project manager and the facilitator/coordinator (M. Rebori Tull).

Participant consensus was required for all recommendations of the planning group. Consensus was defined as creating and implementing a decision that all members of the group could support (Krumpe 1992). Consensus incorporated four levels: 1) Can easily support the action; 2) Can support the action but it may not be a preference; 3) Can support the action if minor changes are made; and 4) Cannot support the action unless major changes are made. Participants agreed consensus meant no one in the group expressing a level four concern.

One study objective included evaluating the LAC Process as it relates to the theory of transactive planning and to determine if this style of planning reduces disputes in adversarial relationships. The study uniquely allowed Forest Service personnel the opportunity to participate in the process along with citizens since the agency was neither project manager nor facilitator.

BACKGROUND

Historically, environmental groups and local landowners in the region have disputed with the USDA Forest Service over wilderness management issues such as wild and prescribed fire and suppression techniques for southern pine beetle (*Dendroctonus frontalis*). Prior to

Upland Island and Turkey Hill wilderness designation in 1984, many environmentalists perceived the USDA Forest Service as timber harvesters and not as wilderness advocates. To help reduce the expanding polarization between agency personnel and the public, the theory of transactive planning was applied in an attempt to open lines of communication between citizens and agency personnel.

Transactive Planning, as developed by John Friedmann, is defined as "the process by which scientific and experiential knowledge is joined to action through an unbroken sequence of interpersonal relations" (Friedmann 1973). Barriers to effective communication exist among citizens, whose knowledge draws primarily on personal experience in the wilderness, and natural resource professionals who primarily draw from scientific and technical knowledge about the wilderness. In order to bridge this chasm of communication between the citizen and agency, "... a continuing series of personal and primarily verbal transactions between them is needed, through which processed knowledge is fused with personal knowledge and both are fused with action" (Friedmann 1973).

CONFLICTS AND DISPUTES

The difference between conflicts and disputes needs distinction with respect to this case study. Disputes involve "differences of interest", conflicts involve "non-negotiable human needs"(Burton and Dukes 1990). Unfortunately not all issues easily categorize into a dispute or a conflict. When dealing with cultural, social, or individual values (such as wilderness) values tend to fall between dispute and conflict. Values often change over time according to changes in personal adaptations and growth. However, as Burton and Dukes point out, the most strongly held values may also tie into personal identity and ought to be treated as needs, thus constituting a non-negotiable interest or conflict.

Burgess and Burgess in 1994 drew greater distinction between conflict and dispute:

> Environmental *conflict* refers to long-term divisions between groups with different beliefs about the proper relationship between human society and the natural environment. ...*Conflicts* between these groups are played out in a seemingly endless series of incremental *disputes* concerning the enactment of specific policies (Burgess and Burgess 1994).

Therefore, in this case study, conflict refers to the historically divisive relationship between agency personnel and the general public. The dispute centers around the differences in planning participants' ideas regarding wilderness management and policy guidelines.

METHODS

Data collection included: 1) participant observation; 2) issue-evaluation surveys; 3) process-evaluation surveys; and 4) exit interviews.

Participant Observation

Relationship interactions and group dynamics among planning members were recorded in a journal. The participant observation method enables the observer to get to know participants as individuals and can lead to a break-down of the "us-verses-them" syndrome making this methodology well suited to determine dispute resolution. As participant observer, coordinator, and facilitator, we had to maintain neutrality in all meetings of the participants throughout the LAC process.

Issue-Evaluation Survey

The issue-evaluation survey measured change in importance of conflicting issues among the planning participants as the LAC process progressed toward a draft management plan. A 5-point Likert scale ranked issue-evaluation surveys to weigh respondents' level of importance: Not Important = 1.0; Very Slightly Important = 2.0; Slightly Important = 3.0; Moderately Important = 4.0; and Very Important = 5.0.

Participants listed land use or policy conflicts (disputes) of concern to them, or those they viewed as affecting the planning process. Comparisons were made of issue changes, rank changes, and the addition or deletion of issues. Assessed data determined whether disputes increased, decreased, or ceased as the process evolved. Issue surveys measured both individual change and overall group change in relation to ranked disputes. Surveys were administered 3 times for Upland Island and twice for Turkey Hill.

Process-Evaluation Survey

Process-evaluation surveys (McLaughlin 1977, Stokes 1982, and Ashor 1985) assessed the effectiveness of the planning process, tested

for the elements of transactive planning, and measured participants' attitudes about the planning process. Questions on the process-evaluation survey reflected social indicators to measure "hard-to-quantify" aspects of the planning process itself (such as frustration, trust, legitimacy, responsiveness, etc.).

A 5-point Likert scale weighed respondents' level of agreement: Strongly Agree = 1.0; Agree = 2.0; Neither Agree nor Disagree = 3.0; Disagree = 4.0; and Strongly Disagree = 5.0. Therefore, the lower the number the higher the agreement score.

A Mann-Whitney rank sum test at the $p > 0.05$ level tested for statistical differences on overall process-evaluation scores between agency personnel and citizens. Administered process-evaluations occurred 5 times during the contract period. Responses were analyzed for changes based on both raw number differences and statistically significant changes. Survey responses were also compared against interview elucidations.

Exit Interviews

The exit interview measured participants' experience with the planning process and was conducted one-on-one with the researcher. A tape recorder documented each response and an interview guide consisting of ten open-ended questions formed the semi-structured interview. This type of qualitative research provided new information and insights into individual frustration, distrust, and conflict. The interview was conducted at the end of the Upland Island LAC since the same individuals participated in both processes.

RESULTS AND DISCUSSION

Participant Observation Results

Previous planning efforts often resulted in polarizing interests and widening the communication gap between citizens and USDA Forest Service personnel. The innovative LAC process included the public as part of a team with agency personnel. Although time consuming, this style of planning strived to establish informed consent among a group of individuals with various interests. As a result, public and agency personnel worked together for common solutions.

The most noticeable effect involved witnessing the development of positive working relationships. The LAC process and transactive style of planning provided the means for open lines of communication to evolve. This evolution enabled citizens to become acquainted with agency personnel and view them as individuals. Agency personnel began talking to and listening to individuals with whom they had not interacted positively in the past. As new relationships emerged, citizens gained respect for the District Ranger and understood his support of wilderness. Agency personnel also gained respect for citizens and understood their commitment to wilderness values. Hence, both groups began meeting on common ground.

Issue-Evaluation Results

Originally the Upland Island Wilderness LAC process generated 31 total issues. At the end of the Upland Island LAC process, members identified 13 issues. Originally the Turkey Hill Wilderness LAC process generated 46 issues and ended the process identifying 25. A decrease in overall issues occurred at the end of both LAC processes.

A variety of circumstances caused a decrease in listed issues. Some initial issues fell outside the process scope, (e.g., "[USDA Forest Service] should not be under the USDA", etc.) A majority of issues (77 percent) reached resolution through group discussion, (e.g., "human influence/intrusion", "exotic species in the wilderness", "group size", "amount of designated trails", etc.) As some issues dropped in importance (i.e. raw score rank), other issues emerged. New issues reflected current group discussion as participants' knowledge of wilderness management grew. Fire remained a prominent issue throughout both LAC processes, however its focus evolved. Initially fire concerned "should we" and progressed to "how do we", "what regime, intensity and frequency?", etc.

Three new issues appeared in the final Upland Island issue survey as the highest ranking issues affecting the planning process below fire. These new issues directly resulted from dialogue and mutual learning. The four highest-ranked issues at the end of the Upland Island LAC Process included: 1) Fire; 2) Ecological/Species Diversity; 3) Human Impacts/Use; and 4) Protecting/Restoring Natural Processes.

At the end of the Turkey Hill LAC, the 3 highest-ranked issues consisted of new issues that emerged from discussion and included: 1)

Education (about the importance and purpose of wilderness to both the public and managing agency); 2) Monitoring (to determine if our LAC plan is on track);and 3) Budgets (to fulfill issues 1 and 2). These issues also resulted from dialogue and mutual learning.

Process-Evaluation Results

The initial Upland Island evaluation (14 July 1993) recorded a statistical difference for overall rank sum scores between agency and non-agency (citizen) responses (Table 1). Statistical differences indicate the two groups had different perceptions regarding the planning process. Higher citizen scores reflect less support for the process while lower agency scores reflect more support for the process overall. Subsequent process-evaluations for Upland Island and Turkey Hill processes detected no statistical difference in responses between the two groups.

The most controversial issue among participants pertained to wild and prescribed fire. After participants reached informed consensus on the statement "fire is a natural process", the focus of fire as an issue shifted. Planning members now asked themselves, "how do we return a natural process to wilderness?" This issue became the nexus for the remaining issues.

The second and subsequent testing periods found no statistical difference between agency and non-agency scores (Table 1). In fact, as the process continued, citizen scores grew more supportive of the process overall. Agency scores continued to support the process, however not as strongly as initially recorded.

Table 1. Comparing Overall Rank Sum Scores For Process-evaluations Between Agency and Non Agency Participants for Upland Island (UIW) and Turkey Hill wildernesses

	UIW 1 07/14/93	UIW 2 09/23/93	THW 1 12/15/93	THW 2 04/05/94
Agency	213.8a	241.5a	241.5a	254.0a
Non-Agency	283.6b	226.5a	223.5a	211.0a

Comparison of scores apply between study groups.
Scores with the same letter are not statistically different ($p < 0.05$).

Table 2. Average Agreement Scores For Administered Process-evaluations.

	Upland Island LAC Process				Turkey Hill LAC Process			
	Agency		Non-Agency		Agency		Non Agency	
	7/14/93	9/23/93	7/14/93	9/23/93	1/24/94	4/5/94	1/24/94	4/5/94
Mutual Learning	1.50	2.00	2.00	1.75	2.00	2.00	1.75	1.75
Authentic	2.00	2.00	2.40	2.25	2.00	2.00	1.75	2.00
Integrate People	1.00	2.00	2.00	1.75	2.00	2.00	2.00	1.75
Respect Differing Views	2.25	2.00	2.20	2.00	2.00	2.00	2.25	2.00
Incorporate Input	1.75	2.00	2.00	2.25	2.50	2.00	2.50	2.50
Conflict Acceptance	1.75	1.50	2.00	1.75	2.00	2.00	1.50	2.25
Satisfied Compromise	2.30	2.50	2.40	2.25	2.00	2.00	2.25	2.25
Concerns Expressed	1.50	1.50	2.00	2.00	1.50	2.00	1.75	1.75

As documented in earlier works (McLaughlin 1977, Stokes 1982, Ashor 1985), the elements of transactive planning (dialogue, mutual learning, and societal action) also proved evident in this case study as demonstrated through participant observations and process-evaluation surveys. Overall average agreement scores indicate elements of transactive planning and social indicators to reflect process attributes representative throughout the LAC process. Table 2 provides a comparison of overall average agreement scores reflecting social indicators represented in the process and respondents' level of agreement.

Exit Interview Results

In assessing whether or not this style of planning resolves disputes among adversarial groups all participants responded "yes", especially regarding the dispute over fire:

> Of course it is, and I think it has to go beyond this, there has to be an educational program or educational information that can be available within these [environmental] groups and to the general public, we [natural resource professionals] have to do a better job of selling the importance of these issues. Apparently it is not common knowledge even among these conservation groups and environmental groups, I'm really surprised of their lack of knowledge or understanding of the basic [natural] processes.
>
> It [the process] really opens it up, I think it was a very good clearing house, to get everything out on the table, usually you have people arguing and yelling and screaming at each other.

When evaluating public frustration toward the USDA Forest Service, some citizen participants expressed that their frustration prior to the process resulted from administrative constraints and policies. Other participants cited frustration based on previous actions by the land managing agency, especially wilderness policy for the suppression of southern pine beetle.

Although southern pine beetle management fell outside the LAC scope (due to the Final Environmental Impact Statement for the Suppression of Southern Pine Beetle) (FEIS-SPB 1987) discussion still ensued because the issue frustrated so many participants.

Forest Service personnel felt frustrated toward citizens, adjacent landowners, and industry regarding the southern pine beetle issue. Another agency frustration related to proper wilderness funding and the ability to maintain an employee in the wilderness either full or part time. Obviously some frustration still remains, but the opportunity to convey their concerns aided in reducing the *level of frustration.*

A common feature of disputes within conflictual relationships involves the "us-verses-them" attitude. This process succeeded in breaking that syndrome. As one participant expressed in the interview:

> I think that we've gotten to know each other better and to know each other as individuals and not just the environmentalist or the terrible agency person. There are a lot of points we agree completely on as individuals and that sort of discussion has come out at the meetings.

Relationships among this group of participants began to restructure as a result of the lines of communication opening up. Although only a first step, this process produced a monumental first step. Overcoming attitudes of mistrust does not happen overnight.

> ...[I]t takes a long, long, time, it takes a long-established relationship, and that just doesn't happen within a few months, within a few meetings, which is really all we have had. It takes much longer, but this is the first step I think, and we have made quite a bit of progress I would say.

CONCLUSION

The LAC style of planning coupled with the theory of transactive planning succeeded in resolving disputes within the process scope. New working relationships began to evolve, not based on previous assumptions or stereotypes, but rather ones grounded in the authenticity of its members.

This case study laid the foundation for informed public consent in land use planning. The overall purpose in this style of planning works to arrive at a level of understanding where all participants reach an agreeable decision.

Previous studies regarding transactive planning and the LAC process proved beneficial (Stokes 1982, Ashor 1985). Unfortunately, the Federal Advisory Committee Act (PL 92-463) recently ceased most LAC processes due to citizen participants being viewed as a task force advising a federal agency (Stokes pers. comm.). Under PL 92-463 a federal agency must financially compensate individual members of a citizen task force. The benefit of using a voluntary citizen task force results in the overall community development that evolves from the process, not in the financial compensation of their time and effort. A community engaged in a mutual learning forum becomes a community capable of using disputes creatively to solve its problems, and consequently develops skills at guiding its own direction.

the interested public and agencies to meet and discuss relevant issues builds informed consent. Without such a foundation for relationships to evolve, disputes may become intractable and thus never get resolved through dialogue and mutual learning.

Public involvement strategies need to go beyond traditional frames of planning to prevent decisions consisting of short-sighted and reactionary-based answers. A facilitator offers one avenue of prevention. A facilitator neutral to the issues can guide discussion and diffuse polarization to allow planning groups to arrive at informed consensus. Decisions arrived at in this type of a forum become rooted in common goals among agency and non agency people. One step toward resolving disputes in land use planning arises from informed public consensus based on candid dialogue and mutual learning between all participants.

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Urban Idealism Versus Wilderness Realism

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A visitor to a large western park goads a bison to stand for a photograph. The massive beast tries to ignore him until he kicks it several times. Then it stands, charges and before the horrified eyes of his family, gores him to death Another bison, in Yellowstone National Park, falls through the ice onto a river. Environmentalists are shocked when the National Park Service takes no action. Amid strident protests, the Park Service finally backs down and attempts to rescue the animal. It dies in spite of their efforts. Unheard of not many years ago, coyotes, often fed by misguided suburbanites, now occasionally attack joggers and small children. Even mountain lions have joined in this seemingly alien behavior as civilization and the wild encroach on one another and blend in unpredictable ways.

A climbing party in the Cascade Mountains of Washington is hit by a sudden blizzard. Failing to use training they have been given, two people continue to hike through the storm rather than build snow shelters and they die of hypothermia. Their families sue the guides, the guides' company, and for permitting the forests to be used in this dangerous manner, even the US Forest Service is hailed into court. A little over a week ago, 8 people died attempting to climb 29,028 foot Mt. Everest in the Himalayas. Over the years, approximately 100 of the roughly 600 who have attempted to scale its heights, or 1 out of every 6, have died on the mountain. Radioing what would be his last words to any living soul, Rob Hall, an experienced climber and a leader of the expedition, spoke by VHF radio high on the mountain through a satellite telephone patch at base camp to his 7 months pregnant wife in New Zealand telling her not to worry about him too much. Trapped by a freak blizzard, without tent or sleeping bag, he was one who died during that night. One survivor was brought off the mountain by the highest ever helicopter rescue from an elevation of 20,000 feet. The paradox is that these deaths occurred in 1996 in the presence of the highest technology available. Even so, nothing could be done to save them when natural processes intervened. Does this mean that mountaineering ventures like this ought not be attempted, or that nature was unfair? No, it merely reinforces a point I've been making for years. In over 30 years of teaching wilderness survival, a major point I always make is that my students ñ be they fighter pilots or Boy Scouts ñ are not learning to beat Mother Nature at her own game. First of all, nature is not a female, whether mother or maiden. When we survive wilderness emergencies, we do so by learning to function within the constraints of a series of rather randomly distributed and very powerful natural forces. One of the things a person learns in true wilderness is the fact that "fair" and "life" have nothing to do with one another. If you are doing the last 15 minutes of Ph.D. research on mountain snow structure in a remote valley and a monstrous avalanche engulfs you, you're not going to graduate even if you scream "it's not fair" all the way down.

If wilderness is to remain, it is imperative that people stop trying to mold it to their ideas of "fair" and "appropriate" , demanding complete safety in the outdoors. Almost by definition, when we leave the relative sheltered confines of our homes and wander far from the doorstep of trauma centers and critical care units, life becomes less safe. And, that is as it should be. Yes, mentally limited people, whether youth or adult, should be protected from themselves and perhaps prevented from bringing deep sadness upon those who love them. And, we shouldn't allow children to wander untaught and unguided

in dangerous wilds. But, apparently competent adults ought to be able to, even if that means putting themselves in harms way. At the same time, we must develop a policy of " assumed risk" in wilderness activities. When normally prudent adults and older youth go outdoors, they should not expect to be able to cry foul and litigate their mistakes and misunderstandings.

As a mountain rescue specialist with the County of Los Angeles and the National Park Service, I noticed, even years ago, that more and more inexperienced people were getting into trouble in the outdoors. Lacking in technical expertise, wearing and carrying insufficient clothing and equipment and expecting either a transcendental, spiritual experience, or something akin to an extended stroll past the edge of their lawn, they fell over cliffs and succumbed to hypothermia instead.

Today, most people have no real comprehension of nature's forces or of what it means to live close to them. Most of us live out our lives in a series of artificial, life support boxes with little or no contact with nature's harshness or the source of our basic needs, such as food, clothing and shelter. That may be one of the most insidious and dangerous problems we have in maintaining a realistic perspective on what wilderness is really all about. Ranger, do your mean to tell me that you allow wolves and cougars to eat deer. Our urban lifestyles have created for us a strange, unreal set of expectations about the outdoors. And, the reasons are simple. Most people never come into contact with wilderness. It is quite possible today, living in a metropolitan area, to arise every morning in a tastefully decorated, windowless, environmental chamber, where we clean, dress, and feed ourselves while moving through a series of small boxes within the chamber. We then might walk down a long, horizontal box to a smaller, cable supported (we hope) box which, descends within another long, but this time, vertical box to the underground box in which our mobile, rubber tired environmental chamber awaits, already started by a radio control on its cooling or heating equipment maintaining its interior at an ideal comfort level. Then comes the peak experience of adventure, pumping adrenaline through our system, as we drive into the wild outdoors on the way to work. Brief glimpses of sky, an almost subliminal awareness of daylight and with a shudder of gratitude from having survived our foray into the outdoors, we plunge beneath our work building and into its buried garage. Of course, this subterranean vehicle repository is also environmentally controlled and we comfortably walk into another elevator, rise up another box, stroll down still another one and enter our office container. After a stimulating day of desk sitting, we reverse the entire process, box by box, day after day, month after month after year, until finally, they put us in a last, very expensive, tastefully or not so tastefully decorated, narrow box and place it six feet underground sealed, I might add, inside a concrete outer box, lest we contaminate the soil from which we came

And, these are the people who, after having wound their emotional springs for 50 weeks, migrate from the cities to the forests, the deserts and the mountains. There they seek to unwind in two weeks the stresses of the previous 50. They come in company with a cat, two dogs, three children, a 40 inch TV/stereo combination, separate bedrooms (a sized kingsized bed for mom and dad) tastefully decorated, mounted on wheels, environmentally cooled and heated, with a satellite antenna on top, getting 5 miles per gallon of gasoline or diesel fuel. Following obediently behind, towed by a special hitch, a smaller 4 wheel drive vehicle dutifully awaits the family's call to make occasional safaris away from the mother ship. Outside, as darkness falls, they enhance the grandeur of the night by stringing Japanese lanterns and a spectacularly popping and sizzling bug zapper.

Do you have any poisonous snakes here?" the RV visitor to a southern National park asks. "Yes, we do", replies the ranger." Coral snakes, rattlesnakes, water moccasins and copperheads". "What! How can that be? I thought this was a Federal park!" the visitor blurts. Encouraged by a completely unaware parent, a 6 year-old girl offers the "teddy bear" a peanut butter sandwich, and the ragged lacerations she receives reach from near her elbow to the tip of her fingers, exposing the bones of her arm. Over 200 stitches are required to close the wound initially, followed by several bouts of plastic surgery. The family sues everyone in sight for permitting wild, dangerous animals to exist in close proximity to people

Wilderness is by definition (wild=no perceived order, chaos; deer = wild, dangerous animals) a place which triggers the imagination. A place which frightens and awes us. A place of beauty and solitude and isolation Roderick

Nash (*Wilderness and The American Mind*) says "wilderness" is a noun that acts like an adjective. It describes a location; an area of land, but more importantly for us, it describes characteristics of the land and perhaps even more significantly, it describes intangible and difficult to describe feelings and expectations in the human mind and heart.

Today, most of the people in this country, if they think about wilderness or the outdoors at all, come from two extremes. The Bambi, Beauty and Bounteous Love folks and those of the Hunt, Fish, Trap, Live in a Log Cabin and Carry Heavy Loads Up Slippery Trails clan. On the one hand, the Bambi folks seem to believe that only peace, tranquillity and love exist in the wilderness. The HFT....clan are those who "wanna be a ranger and live in the mountains and never see people again". Or, at the farthest extreme, if it moves, they want to kill it. (No, I'm not against some kinds of hunting and fishing.) The frightening thing is that it is these urban Daniel and Daniella Boones' who, through legislation and law, will place demands and limitations on wilderness qualities and experiences which are entirely unwarranted and based on, instead of real experience and sound science, emotion and high intensity media hype. What can we expect from a population whose outdoor lighting drives even the stars from the heavens? Whose stereo boom boxes reduce to zero the chances of hearing crickets and Whippoorwills? How many will never hear the bulging of a bull elk or the magnificently desolate cry of a loon over northern lakes? How many will ever realize what they have missed? How many will care? And, how many can experience such things before the wilderness becomes no longer wild?

The questions are many and varied. The answers, it would seem are not so complex. They lie in education. Children need to be better educated about the outdoors, and it needs to begin early. In Michigan, beginning in the 1960's all children 11 years of age spent two weeks at outdoor education camp as a regular part of their schooling. I assume, or hope, that is still the case. It is imperative that our urban ignorance be ended and that increased understanding take its place.

The answers lie too in improved education for elementary and secondary teachers. Too often, our children's first teachers, in completing the requirements for their credentials and certificates have only two courses in science and one of them may be only first aid. It also lies in the enhancement of the quality of graduating teachers. Far too frequently, our colleges of education are populated by students whose grade point averages are the lowest in the university.

Part of the answer is also tied to us. We must expand our communication outside the narrow confines of our personal academic and professional boxes. To do so will require that we become expert communicators to nonprofessional and nonacademic audiences. We must be able to translate the technical and often complex language of the environment into non-technical language, with no loss in accuracy, in such manner as to create new sensitivity, awareness and understanding. Only when these three components are in place will we have any hope of helping the general public feel appreciation, enthusiasm and commitment about something that to most, is irrelevant and outside their experience or needs the earth beneath their feet, the forests and valleys around them and the sky overhead. Only then is there real hope that we can all develop and grow from where we are to where we ought to be. Only then will we have really accomplished enough to say our jobs are done.

Wake Up Call
Conference Summary

Tom Kovalicky, Wilderness Consultant
Grangeville, ID

Good afternoon! You could not help but notice and then get in touch with the setting of this meeting. It was casual and relaxed with lots of sharing. Most noticeably was the care and feeling for the Wilderness resource.

This gathering had a serious commitment by Line Officers from all the agencies such as the following:

- Deputy Chief Forest Service
- Great Smoky Mountain National Park Superintendent
- Several Forest Supervisors and Deputies
- A Regional Forester
- Rangers from the grassroots of the National Park Service and the Forest Service.
- The Wilderness Director from the National headquarters for each agency: Forest Service, National Park Service, Bureau of Land Management, U.S. Fish & Wildlife Service and the National Biological Survey.

And when you add the representatives from the many organizations, institutions, state agencies and universities you have the makings for some serious knowledge sharing. The trick is to make good use of this information so we can keep our Eastern wildernesses and wild places intact and ensure wilderness integrity into the future.

Let's give recognition to our conference organization for pulling this event together.

- Larry Phillips—Forest Service
- Michael Legg—Stephen F. Austin State University
- John Burde—Southern Illinois University
- David Kulhavy—Stephen F. Austin State University

And a special thanks to Rita Cantu and her interpretive musical interludes that kept us in touch with the spirituality of the Wilderness and natural areas.

That hand clap is also for the people who had the courage and commitment to attend all or most of this informative sharing event.

The focus of our gathering is on Eastern North America and the approximate 3.5 million acres of Federal Land designated wilderness some twenty years ago. This provided a performance platform for researchers, planners and managers (I prefer the word stewards) to start working together better. Starting today, right now!

Why? Because the issues on their Eastern wildlands are complex and are kept that way by the deep seated cultural, traditional and spiritual values of a very large and growing population. And quite frankly, as managers we are not keeping pace with the trends and threats and threats to the resource. We have to strengthen our commitment to keep the wilderness character and values intact.

Setting the Stage

When we heard the Great Smoky Mountains National Park experience, as related by Superintendent Karen Wade, we can now better appreciate the crush of events our public stewards are facing. When you take 3.5 million cars and 9 million people, who visit this park and couple them with $800 million dollars of commercial tourist income generated by the communities of Gatlinburg and Pigeon Forge; you produce an 8 mile viewshed that once was 60-70 miles and ecosystems will no longer respond to demands. You have big time problems.

This is a sign we are moving towards the European model of total development at an alarming rate. Our priorities are not conserving things but exploiting them. It's the lack of the American Land Ethic showing through the worn spots in our American Landscape or Fabric.

Conferences such as this often do not produce answers, but more questions, and not necessarily negative ones. Folks, in this wildlands business there are no solutions only choices and opportunities.

I ask you to indulge in the daily practice of asking tough questions and then setting a rigid timetable. As an example: Where do we want to be in 5 or 10 years with our precious few wildernesses and natural areas in the Eastern USA?

You know of course "they" are no longer making clean air, clean water and wild things. What we have is all we are going to have to pass on to future generations. Wild places are what shaped the American character and personality. We need to have pristine examples of that so that the "people to come" don't have to rely on museums and theme parks to capture their heritage.

We need, across all ownerships, some new and meaningful collaborative leadership and some National contemporary heroes if we expect to see our Eastern wildlands remain intact.

We must not be afraid to ask the following questions:

- It is too late?
- Can we do it?
- Is the American public (The Congress) giving the Land Management agencies an impossible stewardship task?
- And where the "heck" are the public, environmental and conservation organizations when we need them the most? We need their collective support for stewardship funds from the budget process. They fought good battles for the designation of an enduring resource of wilderness. Now they are choosing to neglect management of eastern and western wilderness. Don't they know or don't they care that agencies are on the threshold of walking away from wilderness management?

Where are the educated publics, the activist publics and the intelligent, diligent press when the public agencies want somebody to ask the tough questions?

Let's allow the real goal of this conference to become a "Wake Up Call" to not only the public stewards of the wilderness resources, but the educated activist publics.

When you go home you should articulate these feelings and needs, loudly, visibly, noticeably and vigorously. Not to your bosses, but to your peers, constituents and customers. Perhaps only then will the intelligent, diligent press create the "Wake Up Call."

Give it your best shot! It may be our last chance to influence the outcome and if you think for one moment you can participate in a dynamic meeting such as this one and go home without an assignment or a piece of wildland ownership, think again! We can not allow it. We must get involved or we will have to come back and do this conference over again until you get the message.

Good people, the National Wilderness Preservation System and its stewardship has nearly been abandoned by not only the agencies, but the Congress, the environmentalists and conservationist organizations.

It's up to us to bring the system back into sharp focus, the stewards. We signed up for these jobs, let's get on with it. Let's take career risks of getting caught standing up for the wilderness resource. Its another form of surprise and adventure to be enjoyed without leaving your office.

Let's discuss some topic areas that this session put on the table for examination.

Public Agencies (USFS—NPS—USF&WL—BLM)

It took a long time for our public agencies to start the process of cooperation. It took 28 years to create the Interagency Arthur Carhart Wilderness Training Center; 28 years to establish the Interagency Aldo Leopold Research Center; 19 years to write the first Interagency Wilderness Strategic Plan; and then it took another 13 years to find and update it. The original plan was never really close to implementation, even though it was an excellent simple strategy. You were handed a copy of this latest update by Chris Barns and Jeff Jarvis from the BLM earlier today.

Will the Strategic Plan ever reach implementation? It's up to you! This plan is the glue that holds the four National wilderness agencies together, but it is not waterproof. Will these agencies make something happen on the ground for the public? If they are to succeed in this through collaboration they need to take a lesson from nature, "the only thing a bear is afraid of is a bigger bear". These four agencies in lockstep would be one "big bear" that would stop the growing threats to the National Wilderness Preservation System.

EDUCATION

The goals for wilderness education, stated

today, are exactly the same that they were in 1964. I know we have made a great deal of progress in this arena, but has it or is it producing the desired effects on the ground? I don't think so! I hope somebody has the statistics to prove me wrong.

Somehow, we must produce a single national effort to make land ethics a mandatory subject at our grade and high schools. If we do not accomplish this I doubt we will be able to reach an expanding population on an ad hoc basis.

Please note that I am not saying Wilderness Education, rather I am saying teach a national land ethic that would include wilderness. Perhaps the time is right to produce and introduce, via Internet, a continuing review of wilderness educational programs designed to reach, lets say, sixth graders. Who wants to be in charge?

Diversity

It has been noted several times during this meeting that people of color were not here. Go ahead and ask the tough questions, not to me, but to those people who are not in attendance. The latest statistics from Backpacker Magazine for people that backpack Nationally are: 4% Black, 19% Hispanics, 70% White. The remaining 7% is probably a combination of other minority groups. Perhaps this will give you a clue that will allow you to examine the relationship between how people recreate and what line of work they choose for a career. No doubt if the diversity ratios change in America, so will the wilderness management implications and values.

Here is what's happening globally. David Briscoe states in the World Watch Institute Statistics May 19, 1996 that, "World Population, or it has every year, reached a new high growing by 87 million to 5,732 billion with more than 80 million added in developing countries".

We need to make certain that diverse populations in America have an opportunity to discover the wilderness resource, otherwise they may never develop an ownership in the voting booth.

RESEARCH

When you consider the number of universities, institutions, public agencies and janitors across our nation engaged in wilderness research it is mind boggling. If you were to combine that effort we could create a wilderness PAC group that would send politicians who dislike "natural things" reeling. I mention janitors because they read opinions that other people throw away. They can come up with some really creative alternatives that are free from the politics of the agency, plus janitors are 85% correct regarding office rumors. They are a great resource.

Seriously, we need to get a handle on this problem of producing new information without overloading our ability to process it and use it. If the five leading federal agencies, including NPS, would consolidate all of their wilderness research funding into the new Aldo Leopold Research Institute we could make some startling progress.

When I talk to management groups they are trying to process information they can not use or implement. The SAF (Society of American Foresters) Wilderness Management Working Group appointed John Hendee, from the University of Idaho Wilderness Institute, to scope out and produce such a proposal, hoping to jump start the process. Unfortunately the SAF officers declined to endorse or print the finished product. Jerry Stokes, Forest Service Wilderness Director at the National Office, can locate this document if you are interested in pushing its agenda. This is a tough problem, and for the most part, out of step with the stewardship job.

WILDERNESS ACT OF 1964 (Implementation)

It's somewhat comforting to know that our agencies are trying to implement the Wilderness Act of 1964 via a similar interpretation. If the NWPS is to survive intact we need to remember one thing, in all decisions we make regarding our actions inside wilderness, "The Wilderness Resource Must Win". If it doesn't then you have made a choice to hasten the erosion of that wilderness, the Wilderness Act of 1964, and eventually the system itself. In other words you have chosen to take the easy way out. Yes, there can be compromises, but only on a temporary basis. Abandonment is not an option.

The Forest Service recently had a fine hour when its Chief, Jack Ward Thomas, overruled the Regional Forester in the Southwestern Region regarding his decision concerning grazing cattle in the Gila Wilderness. The Regional Forester and his Forest Supervisors actually made a decision to favor cattle grazing

first and then the wilderness resource second. This not only flew in the face of Forest Service policy but the Wilderness Act of 1964. The Chief had to get tough. He did and saved the agency from disgrace and collusion. He is a wilderness resource champion and the new national role model for Wilderness stewardship. This action needs your examination and advertisement when somebody tells you that the wilderness resource should not win over money, politics and ignorance.

If you want some great reading obtain a copy of the Chief's "Diamond Bar Allotment" decision for the Gila Wilderness dated February 7, 1996, file code 1570/2320. Please do not change your wilderness Management integrity to appease or otherwise accommodate selfish publics or uneducated officials. Too much of that is going on right now. Wilderness stewardship is not business as usual. You are going to learn sooner or later that nature rolls the dice not you.

My comments are designed to become not only challenges but concepts and perceptions that you can share with me or others. I challenge you to answer the questions I have posed today. Not to me, but to yourself and your peers.

It's obvious that too few employees of the agencies involved in wilderness administration are assigned to the job of caring and feeding the wildland resource—especially here in the east. Lets hope this conference also serves as a "Wake Up Call" to the administrators of wilderness in the far west and far north. Its a prediction of things on the horizon.

We need to change that paradigm. Lets start today with you.

When you go home all I ask is that you choose to implement one idea or technological transfer device that you acquired at this meeting. If you promise to do that you will have energized the role of wilderness stewardship at least 182 times (the number of people registered for this session).

And by the way, good Luck out there because, "if you don't know where you are going you'll probably end up somewhere else". (Yogi Berra)

Thank you for your patience.

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