Faculty Publications   **Spatial Science**

2-2013

Crowdsourcing with ArcGIS Online for Natural Resources Management

Yanli Zhang
Arthur Temple College of Forestry and Agriculture, Stephen F. Austin State University, zhangy2@sfasu.edu

Matthew W. McBroom
Stephen F Austin State University, Arthur Temple College of Forestry and Agriculture,
mcbroommatth@sfasu.edu

Jason Grogan
Arthur Temple College of Forestry and Agriculture, Stephen F. Austin State University, jgrogan@sfasu.edu

Paul R. Blackwell
Stephen F Austin State University

Repository Citation

Crowdsourcing with ArcGIS Online for Natural Resources Management

By Yanli Zhang, Matthew McBroom, Jason Grogan, Paul R. Blackwell

According to Wikipedia, crowdsourcing is a process that involves outsourcing tasks to a distributed group of people. The difference between crowdsourcing and ordinary outsourcing is that a task or problem is outsourced to an undefined public rather than a specific group, such as paid employees. In fact, the best example of crowdsourcing is Wikipedia itself, whose articles have been written collaboratively by volunteers around the world.

With the development of web-based GIS technology, it is now possible to collect spatial information through crowdsourcing, even for general GIS users. Esri's Education Programs team recently published an article about a crowdsourcing method, "Fun with GIS 128: Crowdsource Your Fieldwork," at esriurl.com/funwithgis128. We offer a demonstration of this method by using ArcGIS to set up a web service to collect data on the distribution of giant salvinia from the public.

Giant salvinia (*Salvinia molesta*) is an invasive aquatic fern from South America. The plant has had catastrophic impacts on aquatic ecosystems on several continents. It damages aquatic ecosystems by outgrowing and replacing native plants that provide food and habitat for native animals and waterfowl. Texasinvasives.org has an online form for the public to report occurrences of giant salvinia (www.texasinvasives.org/action/report_detail.php?alert_id=1). Latitude and longitude are needed for location identification. However, users must obtain this information either by other means such as a GPS unit or by using the pop-up Google Map window. Although this works well enough, a web-based GIS application for collecting such information would be much more convenient and user friendly.

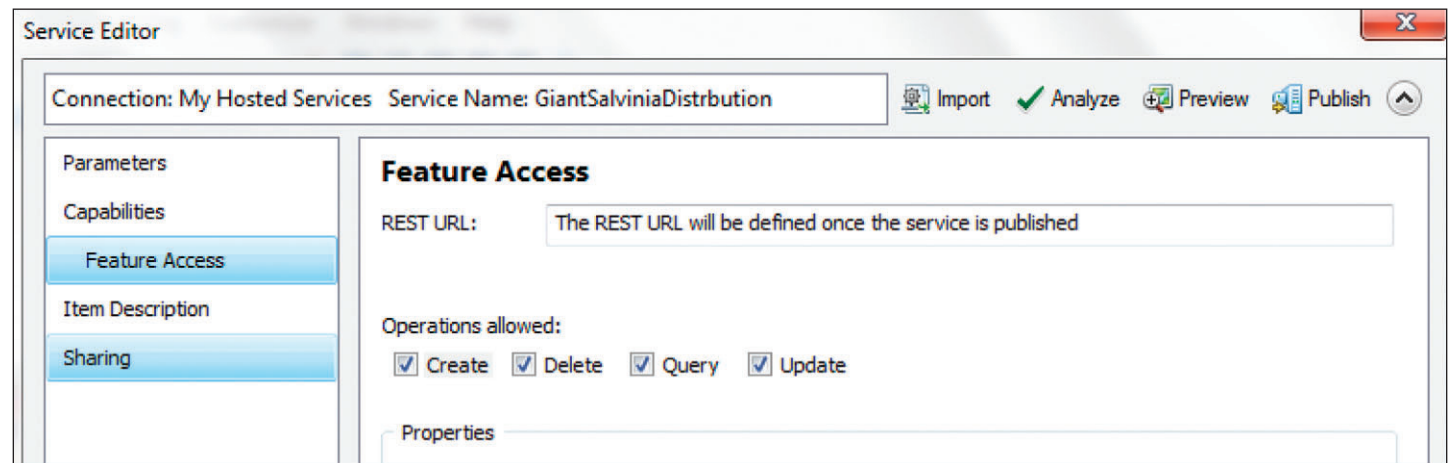The development and deployment of such web-GIS applications is now quite simple. The procedure involves two basic steps. The first step is using ArcGIS Desktop 10.1 to set up the spatial data and map. For our demonstration, we created a point feature class with attributes matching the information to be collected. In this case, the feature class was salvinia and the fields were similar to those on Texasinvasives.org, such as the reporter's name, e-mail, and report date. A relationship class allows for attaching photos and other files. We added a Bing map as a basemap to provide the user with reference information. The newly created feature class was empty, so for demonstration purposes we added a feature at Caddo Lake, Texas, where giant salvinia has been a big problem in the past few years.
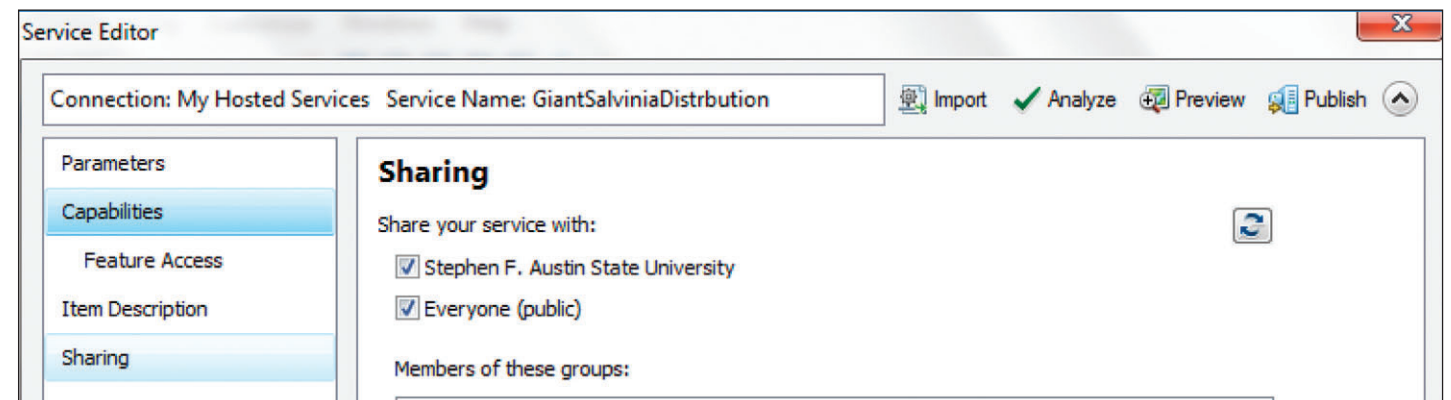
The second step for the demonstration requires an account with ArcGIS Online, which employs cloud computing technology to provide access to ArcGIS Server functionality. Currently, Esri provides a 30-day free trial; thereafter, the lowest price category is $2,500 per year. We used the free trial to implement this project. We published the map as a web service through the "Share as" function of ArcMap.

Here are the settings needed to configure the service: First, select "hosted services on ArcGIS Online." There are three points you need to pay attention to for this kind of project. First, "Editable feature services" is the key to setting up this crowdsourcing application, because map users—members of the "crowd"—will need to create, delete, query, and update the salvinia feature class (Figure 1). Second, make sure the service is shared to the public on the last page of the Service Editor (Figure 2). This sharing property can be modified later at ArcGIS Online. In the Service Editor, click Analyze to make sure your map can be published as a service. The most common problem happens when the basemap cannot be published directly to a service and needs to be removed. When the service is published, users can choose from various basemaps as the background. The last step is to publish the service by clicking the "Publish" button.

The new web service may be accessed at www.arcgis.com. No ArcGIS Online account is needed. Users need only search for the map and open it online. Our example is named GiantSalviniaDistribution. Click on the Open button to access a list of three ways to open the map. Most users will choose ArcGIS Online; the other options are ArcGIS Explorer Online or ArcGIS 10.1 for Desktop.

When you open the map, you first see a world map with a green triangle on east Texas. When you zoom in, you can click on the triangle, an example added for the demonstration, to view and edit the point's attribute information and add an attachment. To add a new point, click on the Edit button, click on the Salvinia layer in the table of contents, and click on the correct location on the map. You enter the corresponding attribute information when

Figure 1. Feature access settings in the Service Editor.
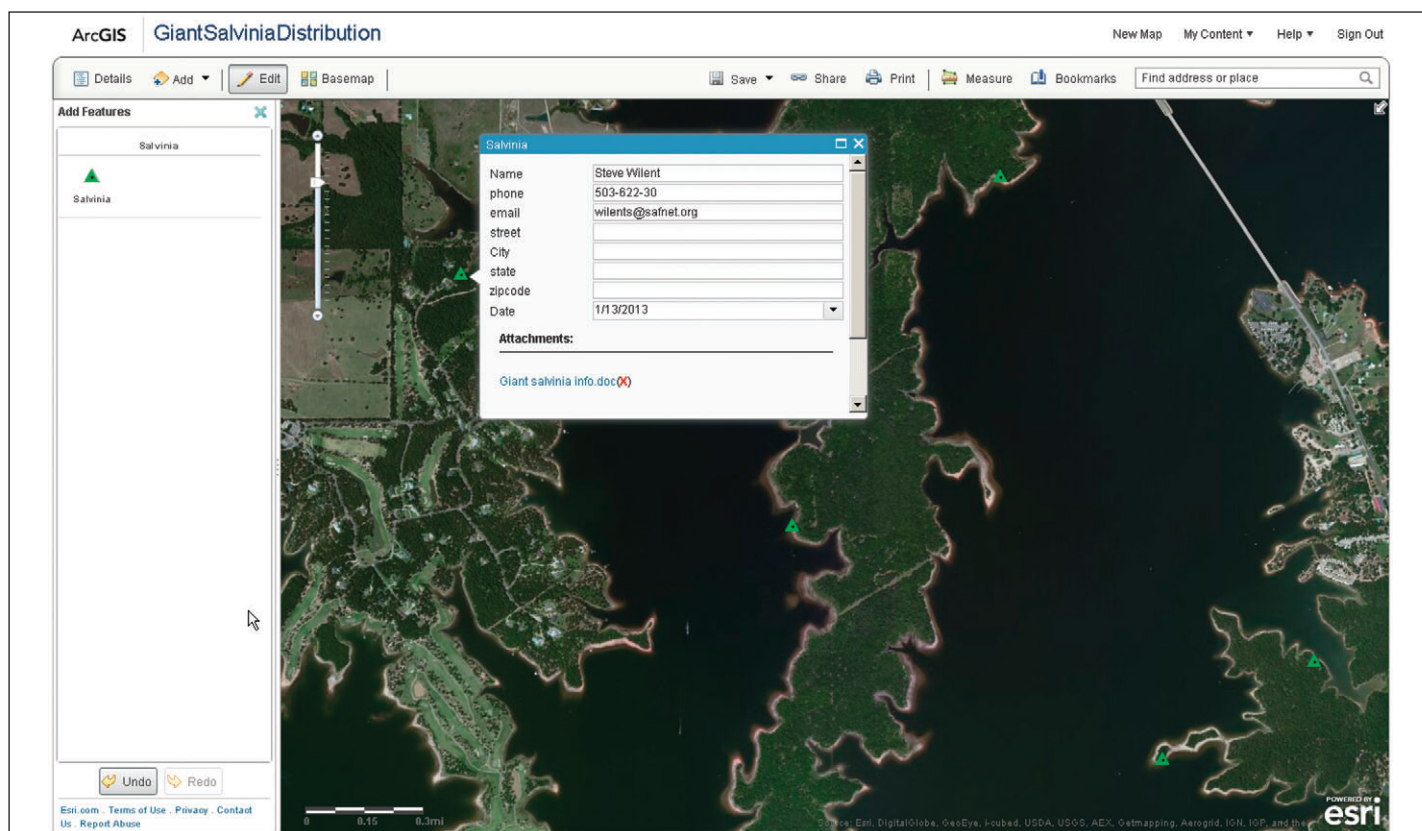

Figure 2. Sharing settings in the Service Editor.

Figure 3. The ArcGIS Online application lets anyone post data about giant salvinia. The green triangles are example locations added for demonstration purposes.

2012 Gregory Award Goes to Mee-Sook Kim

Mee-Sook Kim, an associate professor in the Department of Forestry, Environment, and Systems at Kookmin University, Seoul, South Korea, is the winner of the 2012 Gregory Award. The award provides economic assistance to outstanding students or professionals from outside of the United States and Canada to attend the annual conference of the Society of American Foresters (SAF) and have meaningful engagement with foresters on this continent. In October, Kim attended the 2012 SAF National Convention, held in Spokane, Washington.

Kim said she could not have attended the convention without the $1,800 award.

"The SAF convention provided me with an extraordinary opportunity to interact with diverse forest professionals for information exchange about current and future research needs at the ground level, and to acquire and exchange valuable information to improve my service in teaching and extension," she said. "With these interactions, I am confident that I am better informed and prepared as a teacher, researcher, and extension specialist for the South Korean forestry community and other international activities."

Kim received her bachelor's and first master's degrees in forestry from South Korean universities. She later earned a second master's (1995) and a PhD (1999) from the Department of Forestry, Fisheries, and Wildlife and the Department of Plant Pathology, respectively, at the University of Nebraska–Lincoln. She served as a plant pathologist at the US Forest Service's Rocky Mountain Research Station from 2002 to 2006. Kim has been a member of SAF since 2003.

"This award is very special to me because it came from the organization to which I have dedicated much involvement and feel a strong connection throughout my professional career," Kim said.

Since joining SAF, Kim served as chair of the SAF Forest Pathology and Entomology Working Group (D5) from 2006 to 2007. As chair, she organized two scientific/technical concurrent sessions for the SAF National Convention. She also served as associate editor (entomology and pathology) for the *Journal of Forestry* from 2008 to 2012.

At Kookmin University, Kim's re-search areas include forest/plant pathology, forest genetics, and forest biology. She teaches classes such as Introductory Forestry, Forest Pathology, Forest Biotechnology, and Field Practice. She conducts research on Korean oak wilt disease, which is one of the most serious forest diseases in South Korea, and armillaria root disease in the interior northwestern United States. In addition, she provides extension services and technology transfer to foresters from the government and private sectors on various issues related to forest disease and forest sustainability in South Korea.

Mee-Sook Kim

In addition to SAF, Kim is a member of the Korean Forest Society, American Phytopathological Society, International Union of Forestry Research Organizations (IUFRO) working parties, Western International Forest Disease Work Conference, and Southern Nursery Association.

Kim said she hopes to be able to attend the 2013 SAF National Convention, to be held October 23 to 27 in Charleston, South Carolina (www.safnet.org/natcon13/index.cfm).

"Unfortunately, I was considerably under the weather at the SAF meeting last fall, and I was capable of only limited interaction with committees of the Gregory Award and other participants at the banquet," said Kim. "So this provides me with additional motivation to attend the 2013 SAF meeting."

The Gregory Award honors G. Robinson (Bob) Gregory, a pioneer in forest economics and resource development who always thought of himself as a forester. Bob had a special interest in assisting low-income countries develop their forest resources in thoughtful ways for the good of society. With his wife, Ann, Bob traveled much of the world consulting for the Ford Foundation, the United Nations Food and Agriculture Organization, and host countries on matters related to forest development. Ann's intuition and social awareness of cultural attributes of each country were integral to Bob's success in partnering with individuals, governments and companies in various cultures and countries. The award seeks to mark the achievements of the Gregorys' remarkable career and further their interest in international relations.

New Mexico State University Renames Research Center in Honor of Harrington

New Mexico State University (NMSU) has renamed its forestry research center the John T. Harrington Forestry Research Center at Mora, in honor of **John T. Harrington, CF,** the late NMSU researcher and 2009 SAF Fellow who directed the facility for the past 20 years.

Harrington died in a cycling accident June 6, 2011. During his tenure at NMSU, Harrington contributed to the forestry profession in several ways and went beyond the state's boundaries, as he worked with forest professionals in the Southwest and Mexico to better the region's natural resources. He also made contributions at the national level during a sabbatical in 2006–2007, when he worked with the US Forest Service's policy analysis staff in Washington, DC, and, according to his colleagues, Harrington was instrumental in bringing about a change in the Forest Service's thinking about ecosystem restoration. He also worked at the international level and had traveled to Afghanistan to provide technical advice to the forest restoration program.

In addition to having the forestry research center named in his honor, the first John T. Harrington Memorial Scholarship was recently awarded to NMSU graduate student, Josh Sherman, a horticulture major who is working on a master's degree in tree physiology.

Originally, the Pollards planned to thin out one or two areas per year, but accelerated the projects after seeing some treated areas.

"It looked so good, with such immediate improvement, that we decided to finish the entire project in 2012," he said.

Iowa DNR's Goerndt said the project has four main benefits:
1. Acorn and nut production for wildlife.
2. Faster tree growth and greater potential forest production.
3. Desirable natural tree production, such as oaks.
4. Wildlife cover in the woodland understory for nesting, fawning, loafing, and hiding.

According to Goerndt, research indicates that thinning projects such as the Pollards' can result in a doubling of tree diameter growth rates, and mast production can be improved sevenfold within one cycle.
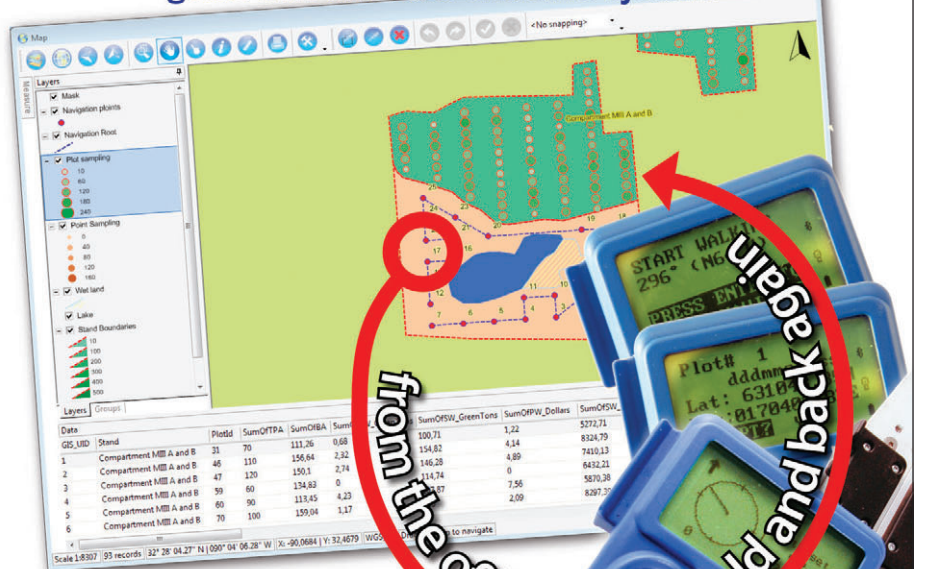
"The thinning practice takes an overstocked forest and makes it a properly stocked forest, which improves the health and vigor of all remaining trees in the forest," he said.

Jason Johnson is an Iowa DNR public affairs specialist based in Des Moines.

For more articles pertaining to silvicultural practices, visit the silviculture web page in the professionals area of the SAF website at www.eforester.org/fp/silviculture.cfm.

prompted. To delete a point, scroll down to the bottom of the attribute window to reveal the Delete button.

With Esri ArcGIS apps for iOS and Android phones, you—and anyone else in the "crowd"—can open the map in the field for on-the-spot data collection.

This simple application demonstrates the use of ArcGIS Online and crowdsourcing for invasive species reporting. It does not require a local web server, thus avoiding complex server setup and maintenance tasks. This exciting and simple-to-implement new technology can be applied to numerous natural resources management projects, such as soil erosion, wildlife tracking, urban trees, water pollution, threatened and endangered species, recreation usage, and countless others.

There are concerns about relying on crowdsourcing for data collection. Unreliable data and malicious entries may produce faulty results. Further, participation may be lacking. Users of this technology should always be aware of these potential problems. However, the advantages of crowdsourcing make it a valuable tool for increasing public participation in natural resources management. Using this new technology really is as simple as following the two basic steps: create a map and publish it.

Yanli Zhang is an assistant professor; Matthew McBroom is an associate professor; Jason Grogan, CF, is a research specialist; and Paul R. Blackwell is the director of the Columbia Regional Geospatial Service Center at Stephen F. Austin State University.