



Habitat Preferences of Nitrophila Species

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Abstract

Nitrophila occidentalis and *Nitrophila mohavensis* are both members of the same Family and Genus, and they are both found in the Great Basin region. They are the only members of the Genus *Nitrophila* native to the United States. *Nitrophila occidentalis* flourishes in the Great Basin, but *Nitrophila mohavensis* is endangered and limited to a few populations. Habitat analysis was done on the two species using GIS (Geographical Information Systems) to gain some new insight on how to preserve this endangered species. A discrete difference in soil alkalinity preference was found, which may help in saving *N. mohavensis*.

Introduction

The genus *Nitrophila* is in the family *Chenopodiaceae*, and there are two species, *Nitrophila occidentalis* and *Nitrophila mohavensis*, belonging to this genus that are native to the United States. They are rhizomatous, perennial herbs, found in moist alkaline soils, and they are good indicators of a shallow water table. *Nitrophila occidentalis*, also known as the common niterwort, is found abundantly among the Great Basin region, where as *Nitrophila mohavensis* was federally declared endangered in 1986, and it is only found among the Carson Slough of the Ash Meadows in the Amargosa Desert along the Nevada/ California border.

Carson Slough is a wetland consisting of abundant springs and seeps, a carbonate aquifer charged by the Spring Mountains, and it is a watershed for winter run off. Although the streambeds are dry for most of the year, the area is characteristic of a shallow water table, usually between 3 to 6 inches below the surface. Carson Slough has decreased in size recently due to human activities that threaten the habitat of *N. mohavensis* including mining activities (such as peat mining), construction, farming, livestock grazing, and road construction. Although, the largest threat to the habitat of *N. mohavensis* is water depletion due to human activities. In consequence, *N. mohavensis* faces another threat of competition by saltgrass, which can tolerate dryer conditions and is found in close association with *N. mohavensis*.

A report published by the Soil Ecology and Research Group, stated that *N. mohavensis* was found most abundant on the alkali mud flats of the Carson slough where there existed a layer of encrusted salt over the top soil. The group also found that *N. mohavensis* preferred sandy loam soil with an approximate pH of 8.4. In a walk through of the study area, they also reported observing an intermediate form which showed characteristics of both *N. mohavensis* and *N. occidentalis*. This was explained as being either a member within one of the species or indicative of hybridization.

Literature on the comparison of the two species is scarce, so we performed an analysis of the habitats of both native species in North America. We were interested to see if any differences in habitat preferences could be detected between the wide ranging *N. occidentalis* and the endangered *N. mohavensis* through GIS (Geographic Information Systems) analysis.

Nitrophila mohavensis



Nitrophila occidentalis



Materials and Methods

ArcView 9.3 was the program used for data processing. Thirty one species of *N. occidentalis* were used from the New York Botanical Gardens collection of georeferenced herbarium specimens. Georeferences for species of *N. mohavensis* were used from the Calflora data. All *N. mohavensis* species were located in Inyo County, California, and of the 6 georeferenced species of *N. mohavensis*, one was a documented specimen, one was a reported location, and four of the locations were cited from literature. These georeferenced species were used to create a shapfile in ArcView. Raster spatial data sets on sodium and chloride concentration maps were downloaded from the Great Basin Center for Geothermal Energy at UNR. All downloaded datasets were Lambert Conformal Conic projections, and the concentration maps were produced using an inverse distance weighted interpolation method.

Results

When layered in ARCVIEW, the species points and concentration maps showed a clear pattern. The species of *N. mohavensis* were clearly restricted to areas of the highest sodium and chloride concentrations, where as the wide ranging *N. occidentalis* showed a range of habitat preferences as demonstrated in Table 1. Some were found in high concentration areas, and some were found in low concentration areas.

Table 1

Species	Water Table	Sodium Concentration	Chloride Concentration
<i>N. occidentalis</i>	High	Intermediate-High	Low- High
<i>N. mohavensis</i>	High	High	High

Discussion

Most literature on *N. mohavensis* suggests the best action to be taken in preserving the few populations is to regulate ground water levels of Carson Slough closely. In this study, we assessed the habitat specifications of *N. mohavensis* compared to *N. occidentalis* to gain further insight into the habitat preferences of *N. mohavensis*. Both species seem to have similar preferences to water availability, but a clear distinction can be drawn between the two species and their soil preferences. *N. mohavensis* prefers much more alkaline soil than *N. occidentalis*. This insight may be used to take conservation a step further, past the efforts of the present, to locate possible sites that would be a suitable habitat for *N. mohavensis* populations.

References

- Demographics and Ecology of the Amargosa Niterwort (*Nitrophila Mohavensis*) and Ash Meadows Gumplant (*Grenedia fraxino-pratensis*) of the Carson Slough Area: Soil Ecology and Research Group, 2004.
- Great Basin Center for Geothermal Energy, Regional Spatial Data Download, University of Nevada, Reno. <http://www.unr.edu/Geothermal/datalist.html>
- New York Botanical Garden. <http://www.nybg.org>
- The Calflora Database, Berkeley, California. <http://www.calflora.org>

Sodium and Chloride Concentration Map Of the Great Basin Region

