

Vegetation of Salinas National Monument

Abo and Quarai Units

Semi-Annual Report

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Introduction

In 1992 the Southwest Region of the National Park Service requested a study of the vegetation of Quarai and Abo Monuments of the Salinas complex. Upon reconnaissance, we found that the Abo Monument supports piñon pine and juniper woodlands in varying degrees of recovery from historic use. Clearing of juniper, probably for fence poles, had altered the terrain over much of the recently expanded Monument. A rich assemblage of riparian plants is supported in the perennial water ways. The mounds created by prehistoric archeological ruins are covered with cholla cacti and herbaceous "weedy" species. At Quarai, a relatively complex group of plant communities are found; piñon-juniper woodlands, juniper woodlands, mountain shrub complexes, open meadows of various degrees of historic disturbance, well developed riparian zone along the Punta de Aqua Spring. Mounds, remnants of archeological sites support wolfberry, cholla and numerous shrub species.

We consulted with the National Park Service staff to determine the product which would best suit their management goals. We determined that a vegetation map based on available aerial coverage would be developed and that each vegetation unit would be named with the Brown, Lowe and Pace classification which is currently being adopted by the Colorado Plateau Parks. We also determined that specimens could not be housed at the Monument or the Regional herbarium, therefore San Juan College was chosen as the repository for all plant specimens. Finally, we decided that photographs of the common elements of the vegetation communities would assist the Interpretive staff. Where possible such photographs were taken.

This report summarizes progress to date. An initial reconnaissance was made in the Fall of 1992, preliminary community boundaries were made from aerials provided by the Monument (Fulfer, pers. comm.), the field survey has been completed, photographs have been recorded, and the vegetation survey has been statistically delineated into communities using a multivariate analysis called TWINSpan/CANOCO. We are presently awaiting base maps upon which we can overlay the vegetation zones to create the final map, generously being provided by the staff at the Southwest GIS Center (Fletcher, pers. comm). When the base maps are available, the spatial delineation of each community will be made.

Methods

A color aerial photograph (1977 flight) was available for the Monument, and was used to determine spatial delineation of the vegetation prior to ground truthing. Landsat imagery was not used because of the small size of the Monument units. Vegetation classes were proposed from the remote data and sampling points were selected within each class at the Quarai Unit. Because of the uniformity of the vegetation at the Abo Unit we established a series of east-west transects along which samples were made approximately every 200 m. A Trimble Global Positioning System was obtained from Dr. Milford Fletcher and 180 points were collected at each sampling point to be averaged for the point. Correction of GPS data was made by Dr. Fletcher. Dr. Fletcher also provided a copy of EPPL-7, a GIS program in use by the southwest region of the National Park Service. In this way we were able to locate all sampling points on a GIS layer which will be easily transferred to Salinas Monument. Loretta Mosely, GIS specialist at Salinas will be involved in the transfer and will handle the GIS data, including the vegetation layer, when completed.

A semi-quantitative releve analysis (Moore and Chapman, 1986; Mueller-Dombois and Ellenburg, 1974) was used to define communities at these sites. The releve analysis was statistically analyzed with a multivariate cluster analysis (TWINSPAN/CANOCO, Cornell University Programs) to define vegetation communities. The releve analysis was carried out in square plots (the number determined by the spatial extent and homogeneity of the vegetation in a given area, generally 2 per site), aligned along transects bisecting proposed homogeneous vegetation units at Abo. At Quarai, plots were either placed along transects in the piñon-juniper communities or established in a random manner along the riparian zones. Data were collected in June and October, 1993. Plot size was determined by minimum-area techniques, and was generally 15 by 15 meters. The cover and abundance of each species was estimated using Braun Blanquet's Cover/Abundance Scale as follows:

- 5 Any number, with cover >75% of reference area
- 4 Any number, with 50-75% cover
- 3 Any number, with 25-50% cover
- 2 Any number, with 5-25 % cover
- 1 Numerous, but less than 5% cover or scattered with cover up to 5%
- + Few, with small cover
- r solitary, with small cover

The first four scales refer only to the vertical crown or shoot area projected on the ground, while the lower three scales estimate abundance (actual numbers), therefore this is called a combined estimate scale (Mueller-Dombois and Ellenburg, 1974). Site characteristics, slope, aspect, geologic formation, soil type and microbial characteristics were collected at each releve sampling site.

Data were arranged in a sample-by-species data matrix for multivariate analysis (see below). A cluster analysis was run with TWINSpan and CANOCO, a divisive multivariate analysis program developed by Cornell University (Gausch, 1972; Gausch and Whitaker, 1981). The distribution of sampling points in each cluster type was overlain on the proposed vegetation classes, and adjustments were made to accommodate the original spatial extent of visually-distinct classes, as determined from aerial coverage. Finally, each community was named (at this stage, proposed) using the Brown, Lowe and Pusey nomenclature system (Draft 3.42) adopted by the Colorado Plateau Vegetation Advisory Group.

Results

From visually distinct units in the 1977 color aerials we initially defined 7 vegetation types within the Abo Monument and 8 within the Quarai Unit. Extensive ground-truthing allowed us to modify this to a total of 12 plant communities in the Quarai Monument and 12 at the Abo Monument.

The communities will be named in the Brown, Lowe, and Pusey nomenclature system for the Colorado Plateau (CPVAC, Draft 3.42) in the final draft of this document, once final determinations are made with the georeferenced base maps. Below is an outline of the tentatively assigned vegetation communities:

I. Vegetation Communities of Abo Monument

Sporobolus/ Sitanion/ Convolvulus (and domestic trees, old Homestead)
Chrysothamnus/ Fallugia
Opuntia/ Sporobolus (Mounds of Indian ruins)
Opuntia/ Kochia/ Boutelouea (Mounds of Indian ruins)
Juncus/ Equisetum/ Populus
Juncus/ Salix/ Tamarisk/ Verbena
Juniperus/ Senecio/ Sporobolus
Boutelouea/ Muhlenbergia/ Gutierrezia
Juniperus/ Senecio/ Boutelouea
Juniperus/ Fallugia/ native grasses (Sitanion, Agropyron)
Boutelouea/ Agropyron
Juniper/ Piñon/ Muhlenbergia

These 12 communities will be lumped, once base maps are available, into fewer units to more easily meet the Resource Management objectives (Fulfer and Bolls, pers. comm). For example, riparian elements will be lumped, while those containing the introduced invader species Tamarisk will remain distinct so that eradication plans can be easily drawn.

The clustering algorithm used to delineate these communities is found in Appendix A. We are in the process of completing plant identifications, therefore unknown species will be defined precisely.

II. Vegetation communities of Quarai Monument

Berberis/Opuntia/Artemesia/Weedy(Mounds of Indian ruins)
Populus/Salix/Ribes/Scirpus
Rosa/Juniper/Typha
Populus/Juniper/Oak/Toxicodendron
Juniper/Piñon/Berberis
Atriplex/Artemesia
Ceratoides/Berberis
Piñon/juniper/Yucca/Poa (includes a site with Ponderosa Pine)
Juniper/piñon/Boutelouea
Artemesia /grasses (fields
Bouteloua/ Yucca/ Melilotus
Opuntia/Berberis/weeds

It will be difficult to aggregate these classifications of vegetation communities because of the myriad of recent disturbance at Quarai. Recently, additions to the Monument have been made, incorporating highly disturbed land which can not be classified as any existing vegetation type, although it will likely return to native vegetation in the future if left undisturbed.

The clustering algorithm used to delineate these communities is found in Appendix B. We are in the process of completing plant identifications, therefore unknown species will be defined precisely. Plant specimens will be retained at San Juan College under the direction of Ken Heil.

Conclusion

We report on the progress made in vegetation studies at the Abo and Quarai National Monuments. Vegetation communities have been defined and the field phase of the work is complete. Preliminary boundaries of the spatial extent of each community are drawn, however the acquisition of georeferenced base maps will allow the creation of precise, referenced, GIS vegetation layers for each Monument Unit. All releve sampling points have been located with a GPS and organized into a GIS layer in EPPL-7. Slides of the important plant species in the Monuments have been taken and will be copied and made available to Jim Bolls for Interpretation staff use.

Plant species are being identified by Ken Heil. A base map is being prepared from Orthophoto Quads (1:24,000) by the staff under Dr. Milford Fletcher, Southwest GIS Field Technical Support Center. When these two data sets are available, the final map of spatial extent of the defined vegetation classes will be assembled.

Relevant literature on succession in piñon-juniper woodlands and biological invasions of plant communities has been included in the bibliography. Much of the Abo Unit has been recently disturbed, and weedy, non-native species are common. In addition, the riparian areas of Abo are invaded with the phreatophytic Tamarisk. It is strongly recommended that Tamarisk be eradicated, as it will soon out compete the willows and other species that are native in the waterways. The weedy infestations of Quarai may be replaced by native communities with time. The references included may be useful to Resource Managers when discussing the options for alien species.

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