

Semi-annual Report

Vegetation Survey of Salinas Pueblo Missions National Monument
1992 Progress

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Table of contents

1. Project overview	2
2. Background information.....	2
3. Specific objectives.....	4
4. 1992 Results	4
5. Projected 1993 Timetable	5
6. Literature	6

Project overview

The southwest desert flora, derived from Madro-Tertiary Geoflora of Axelrod, has been classified into nine biotic communities by the widely accepted classification of Brown and Lowe (1980). The piñon-juniper ecosystem of central New Mexico is composed of the Colorado piñon, *Pinus edulis* and the one-seeded juniper, *Juniperus monosperma*. Understory varies from grasses to shrub components and in heavily grazed areas, numerous cactus species. Salinas Pueblo Missions National Monument consists of an array of vegetation exhibiting both Madro-Tertiary and Great Plains floral elements, modified by differing degrees of human disturbance.

At the request of the Salinas Pueblo Missions National Monument we proposed a two-year study to meet the objectives outlined by the National Park Service Research Center's Request for Proposal (Floyd-Hanna and Heil, 1992). We proposed to define and map the existing vegetation communities, list the species present in terms of their relative abundance, and record the presence of threatened, endangered, or sensitive species within the Monument boundary. This will be carried out in late 1992 and 1993. The first year, 1992, consisted simply of site reconnaissance and acquisition of remote data depicting two of the Monument Units, Quarai and Abo. This report summarizes the reconnaissance activities.

Background information

Description of the study area: Two units are to be surveyed for vegetation community composition. The Abo State Monument is approximately 260 acres and occurs at elevations of 1848 m to the Cañon Espinos bottom at 1836 m. The originally defined unit at Quarai is 60 acres between 2000 and 2045 m near Punta de Agua; an additional acquisition of land will expand this project area. The vegetation at Abo is primarily piñon-juniper woodland which, until recently has been subject to grazing impacts (Fulfer, personal communication). Piñon-juniper woodlands and their relationships to topography in south-central New Mexico have been outlined elsewhere. The close association of density and understory composition with topographic variations is unique to this geographic area (Pieper and Lymbery, 1986). At the Quarai unit, a more heterogeneous vegetation is supported by perennial water.

Piñon-juniper succession. Both the Abo and Quarai sites are disturbed by grazing, previous land use in historic times, and possibly prehistoric land use patterns. We will consider relevant studies of succession within the piñon-juniper ecosystem, chosen to illustrate possible post-grazing recovery of the Monument units.

An important contribution to the study of succession in piñon-juniper woodlands is provided by Richard Everett and colleagues (Everett et al., 1986) which focuses on the single-leaf piñon, *P. monophylla*. Quite often, information on *P. monophylla* is used to make generalizations about the responses of *Pinus edulis* (Harrington, 1987). Perhaps this is because there are few studies of succession which focus on the Colorado piñon. On a powerline cut in northern Arizona, succession resulted in herbaceous vegetation rather than the woody piñon and juniper species which dominated prior to the disturbance. A rather large body of literature exists regarding succession of piñon and juniper on converted grasslands after their intended eradication.

Vegetation dynamics, or changes over time, are critical to interpreting plant communities. Grazing, past agricultural uses and visitor impacts have influenced succession in the Salinas Pueblo Mission National Monument region. In other studies we are, for example, investigating the effects of fire on vegetation dynamics in piñon-juniper communities of

southwestern Colorado (within Mesa Verde National Park). Here, knowledge of post-fire succession of plant communities may provide one means of evaluating prehistoric use of plant resources. If piñon and juniper are critical food resources, and if they are destroyed by fire (Wright, et. al., 1979.), the human population must weigh the use of fire with the relative food potential of plants in the resulting successional seres. Alternative uses of piñon and juniper, such as for construction and fuel wood, might have been facilitated by fires. The vegetation in central New Mexico has also been shaped by disturbances such as clearing, grazing and fire, and our experience with these projects may assist us in interpretation of succession within the Salinas Pueblo Missions National Monument. Success of tree establishment varies with site characteristics. *Pinus edulis* seedlings require shade, often from nurse shrubs or mature trees, in order to become successfully established, thus grazing impacts on shrubs is critical to the future success of piñon and juniper establishment. The range of demographic patterns in Colorado piñon stands (Floyd, 1986) is derived from differences in piñon establishment and survival, and much of this depends on the conditions under which piñon juniper invasion occurred.

Threatened and endangered taxa of the region : The following taxa which have rare, sensitive, or threatened or endangered status (State or Federal Listings) are known from the central region of New Mexico: *Hesperdemia filifolia*, *Mammalaria wrightii* (3.1 B), *Tourneya paprycantha* (3.1 B) and *Astragalus pleienthus* (Gallegos, Raymond, Memorandum 12/28/91; New Mexico Native Plant Protection Advisory Committee). When conducting field work, particular attention will be given to searching for these taxa.

Mapping using Geographic Information Systems. One goal of the National Park's research is to integrate the data from these studies with its geographic information system (GIS). Using GIS techniques to facilitate resource management decisions is becoming common place. In particular, it is used to develop maps and delineate areas of critical concern in the decision making process (Glasgow and Franklin, 1992) and to generate predictive models of environmental change (Jensen, et.al., 1992). A preliminary discussion of GIS use as it relates to the vegetation studies (Hanna, 1991) describes various data layers needed for the study. One important aspect of this is the acquisition and use of Landsat TM satellite imagery for delineating the vegetation classes found within the park. Many studies have shown the utility of using satellite imagery to generate thematic maps of classes of vegetation as a resource management tool (see for example Kramber and et.al., 1992; Lauver and Whistler, 1992 and McGwire et.al, 1992). Although the Salinas Pueblo Monument has no GIS work station in place, the Southwest Region of the National Park Service is building their GIS base, and it is reasonable to assume that ultimately all research in cultural and natural resources will become organized within the GIS environment. Toward that goal, we propose to utilize color infra-red photographs which can be scanned and obtained in digitized format to create the vegetation map of Salinas National Monument. GRASS and ELAS software are available at San Juan College to process the information once scanned, and the researchers operate a PC-based GIS program IDRISI. Several recent studies of piñon-juniper woodlands with remotely sensed data include those of Tueller (1986) and Lin et. al. (1992).

Specific objectives of the 1992 field season

1. Reconnaissance of the Abo and Quarai units of Salinas Pueblo Mission National Monument. Preliminary evaluation of the vegetative communities was made, and visible plant taxa were identified.

2. Reevaluations of the proposal was made based on the additional land acquisition at the Quarai Unit.
3. Aerial coverage was obtained for each unit and converted to digitized format.

Results of the 1992 field season

Lisa Floyd-Hanna and David Hanna visited each unit on October 15 and 16, 1992. Reconnaissance of the Quarai Unit was assisted by Gary Swanson, Salinas Pueblo Missions National Monument Ranger, and the Abo Unit was surveyed with Glenn Fulfer and Gary Swanson. Plant specimens which were available at this time were collected. An initial assessment of each unit as to vegetation types was made. Monument boundaries and survey stakes were located. A list of identified plants is found in Appendix A.

The Quarai Unit, because of the perennial water source, supports a more diverse community structure than does Abo. A preliminary assessment of the riparian communities includes four possible communities:

- Cottonwood-willow
- Typha wetland
- Rose-horsetails
- Pseudoriparian meadows

The uplands at Quarai include:

- Piñon-juniper-berberis woodlands
- Oak-piñon woodlands
- Open, early successional piñon woodland
- Ponderosa pine stand
- Sagebrush-horsebrush stands
- Variously disturbed meadows-remnant of historic occupations
- Apple orchards-

Our preliminary reconnaissance of Abo Unit indicates that communities include:

- Piñon-juniper woodland
- Tamarisk stands
- Salix-cottonwood riparian
- Oak brush

Color infrared aeriels and B/W were obtained by Dr. Milford Fletcher of the Albuquerque CPSU office. Dr. Fletcher provided us with the color IR photographs. The photographs have been scanned on a flatbed scanner and the digitized images show quite good clarity. These digitized images are now being transferred into the GIS program IDRISI for georeferencing and analysis. In some cases, where tree density is low, individual trees can be deciphered, and in riparian areas, the images will serve as a starting-point for community delineation.

Proposed 1993 Timetable

Jan-April, 1993- Process scanned images of each unit in IDRISI. Propose initial vegetation classification.

May-September, 1993. Preparation of species lists and survey of threatened, rare, and sensitive taxa. Ken Heil. Community analysis, ground-truthing of vegetation map. Lisa Floyd-Hanna, David Hanna.

November- December, 1993. Map preparation, report writing. Lisa Floyd-Hanna and David Hanna.

TABLE 1. Gantt chart showing the time during which each study will be carried out in the proposed research.

	1992	1993
TASK	M J J A S O N D / J F M A M J J A S O N D	
PRELIMINARY RECONNAISSANCE	_____	
AQUISITION OF REMOTE SENSED DATA	_____	
FIELD WORK, RELEVÉ ANALYSES		_____
MAP PREPARATION		_____
REPORT WRITING		_____

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Appendix A

Plants visible in October, 1992, at Salinas Pueblo Missions National Monument, New Mexico.
List not intended to fully represent flora of Monument.

Trees

Pinus edulis, Piñon pine
Pinus ponderosa, Ponderosa Pine
Juniperus monosperma, One seeded Juniper
Populus fremontii, Cottonwood
Quercus gambelii, Scrub oak
Quercus turbinella, Scrub oak
Ulmus pumula, Siberian elm

Shrubs

Cercocarpus sp. Mountain mahogany
Atriplex canescens, Four winged saltbush
Yucca datil, (total of 3 species)
Berberis fremontii (*Mahonia fremontii*)- Fremont Mahonia
Prunus sp.
Rhus trilobata, Squawbush
Tetradymia canescens, Horsebrush
Heterotheca villosa, Hairy Goldenaster
Ceratoides lantana, Winterfat
Salix exigua, Sand-bar willow
Rosa sp.
Ribes sp.

Herbaceous plants

Artemisia campestris
Artemisia dracunculus
Artemisia frigida
Lepidium campestris
Gilia multiflora
Aster commutatus
Conyza canadense, Horseweed
Opuntia ? echinocarpa, Pale cholla
Cirsium arvense, Thistle
Lycium ? torreyi, Tomatilla
Equisetum sp., Horestails
Clematis lingustricum
Parthenocissus quinquefolia- Wood bind
Mammalaria sp.
Eriogonum alatum

Grasses

Bouteloua curtipendula, Side oats grama
Stipa commata
Oryzopsis hymenoides, Indian ricegrass
Festuca ovina