

**LOCATING RELICT AND UNIQUE VEGETATION IN THE GRAND CANYON-
PARASHANT NATIONAL MONUMENT**

INTERIM REPORT FOR 2004

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This report serves as a brief summary of findings for the 2004 field season. A complete report, including work done in an additional field season, will be provided in 2005.

For the 2004 field season, we made two extended trips into the Grand Canyon Parashant Monument: Leila Shultz was accompanied by John McReynolds for work in the southwest portion of the monument, and Alison Kelly was accompanied by Joe Mendelsson for work in the south central portion of the monument – both trips venturing into extraordinarily remote territory. We explored a number of new sites which appeared to be beyond the reach of cattle, and also focused our attention on information derived from an interview with Lee Hughes of the Arizona Strip BLM office. Mr. Hughes provided locations of approximately 15 range exclosures as well as ideas regarding areas that may contain relict vegetation. We found three exclosures and worked to find several others before we ran out of time. At the exclosures we were able to examine, we made estimates of visual cover for all species inside as well as for all species in an equal area outside the exclosure. The vegetation patterns are markedly different, but our sample size is too small to draw any conclusions at the present time. One priority for the next field season is to locate other exclosures so that more vegetation types are represented in the data.

The three remote sites we visited were (1) Twin Point, (2) the area southwest of Whitmore Point, and (3) an isolated butte near Cottonwood Ridge. The Twin Point area has a species composition similar to the slope habitats we encountered at Kelly Point. The area southwest of Whitmore Point will be further explored in the coming field season. A local rancher gave us valuable information about access to the area, and we think the area warrants access by helicopter, if that can be arranged. The isolated butte near Cottonwood Ridge was rather small but appeared undisturbed, and yielded three vegetation data plots and corresponding plots on nearby managed land. A total of 80 voucher specimens were collected, with additional georeferenced observations that have been incorporated in the GIS system we are developing. The two crews worked from 22 April to 30 April.

In the lab, specimens were processed and a GIS layer depicting distance from water sources was developed to further aid in locating relict vegetation. Field work in 2003 suggested that this could be an important predictor for relicts. A summary of our ongoing work can be found in the Appendix.

PROJECT OVERVIEW

INTRODUCTION

The Grand Canyon-Parashant National Monument (PARA) was established in 2000 and encompasses more than 1 million acres of complex and often remote landforms. This complex and inaccessible landscape likely contains relict and unique vegetation types with low amounts of anthropogenic disturbance. Relict areas contain invaluable information for land managers. Data from these communities can be used to evaluate the effectiveness of current ecosystem practices, to guide restoration efforts, and to monitor ecosystem change. Relicts can also serve as important sources of locally adapted seed for revegetation projects.

The probable inaccessibility of such relict sites dictates that careful examination of existing information about PARA lands should be undertaken prior to expending time and resources for travel. We rely on existing information from such sources as Park personnel, maps, and GIS to aid in the selection of likely areas for survey in order to reduce effort and expense while maximizing the chances of discovering relict vegetation.

The goal of this research is to locate and characterize the vegetation of relict and unique habitats in Grand Canyon-Parashant National Monument utilizing a range of existing information to select probable sites.

METHODS

Extensive grazing by sheep and cattle has occurred since the lands were settled during the late nineteenth century. We initiated our work by interviewing monument personnel in order to determine the history of land use and solicit observations regarding areas that have not been grazed. Most monument personnel indicated that the best chance for locating relict vegetation would be to find areas that are physically less accessible to grazing animals because of landform or because of distance from available water. One interviewee suggested that in dense vegetation, especially in pinyon-juniper communities, cattle tended to stay near roads or paths. In 2004, further information on grazing exclosures and potentially isolated areas was obtained from the Arizona Strip Office of the Bureau of Land Management. We believe our characterization of these exclosures could give important data on the effects of grazing.

Initial observations from early fieldwork and the interviews allowed us to focus on landform as the single most important feature in identifying relict sites on the Monument. PARA supplied us with 30m resolution Digital Elevation Models (DEMs), a geology polygon coverage, several digitized soil coverages that described portions of the Monument, and other GIS layers. These were examined carefully and it was determined that the 30m resolution DEMs were too coarse for our purposes. We were able to obtain 10m resolution DEMs in STDS format from the GIS Data Depot (<http://data.geocomm.com/>) and combined these to form a continuous topographic layer using 3dem (<http://www.visualizationsoftware.com/3dem.html>). All other GIS manipulations were performed in ArcView 3.3 with Spatial Analyst or in ArcGIS

Desktop Version 8.3. The layer generated is included on the CD provided in an earlier report.

While the geology and soil type coverages are useful in understanding the diversity of parent materials and soils on the landbase, the fine resolution DEMs are of primary importance in examining landform details. The fine-resolution mapping provides the main source of information for potential relict areas. Visualization of slope and hillshading in ArcView were used extensively to locate areas of any size that appeared to be physically restricted to access by cattle. Most physically inaccessible areas are located some distance from roads or water sources. All potential areas were numbered and marked in a point coverage, also included on the CD. We printed maps of each potential area for use in the field and used these to guide our field searches.

RESULTS AND DISCUSSION

We identified a total of 20 areas as potential relict areas and grouped these in four main regions within the Monument. Point coverage of these sites is included on the CD, and maps of each region described below are included as Appendix A of our earlier report. We visited several of these sites in 2003, and continued our searches in 2004. Nomenclature in this report follows the Plants Database (www.plants.usda.gov), based largely on the ongoing work with the Flora of North America project (www.fna.org). In 2004, the additional information on exclosures and another isolated area (which was too small to be positively identified from the GIS data) was obtained through interviews and our attention was focused on these areas. These data will be presented in the 2005 report. We discovered that one large area that was recognized as a potential relict had not been grazed. We had initially excluded this area because of the presence of grazing water developments and the presence of a mine (found to be historical). It also seemed much too large to be relictual. We plan to visit this area in 2005.

Sites 1-4, Snap Point Region

The area to the west and south of Snap Point had the most promising isolated buttes in the Monument. This area, at approximately 4700 ft in elevation, has sharply defined buttes separated by steep canyons and washes. Each of the four sites in this region are at least 4 miles from any constant source of water. In September 2003, we visited site 2, which is a relatively isolated butte dominated by blackbrush (*Coleogyne ramosissima*), near the southeastern border of the Monument. The rocky ledges leading to the site and the site itself showed very little evidence of impact by cattle. There was excellent development of microbiotic crust on most surfaces, no trails were seen, and the vegetation of the slopes leading to and the periphery of the butte consisted of diverse and healthy populations of grasses with few nonnative species. In this area, we located nine species of grasses (Table 1) which we did not find in any other portion of the Monument during our week of field work. These grasses are generally species one would expect in some abundance, were it not for the grazing pressure.

Table 1. Native Grasses found in Snap Point Area

<u>Species</u>	<u>Habitat</u>
<i>Achnatherum (Oryzopsis) hymenoides</i>	sandy washes
<i>Aristida purpurea</i>	rock ledges, steep slopes
<i>Bouteloua curtipendula</i>	slopes, protection of rock ledges
<i>Bouteloua eriopoda</i>	rock ledges, sandy slopes
<i>Bouteloua barbata</i>	sandy washes, slopes
<i>Erioneuron (Tridens) muticus</i>	rock ledges, steep slopes
<i>Dasyochloa pulchella</i>	rock ledges, steep slopes
<i>Muhlenbergia porteri</i>	slopes
<i>Pleuraphis (Hilaria) jamesii</i>	sandy washes
<i>Sporobolus contractus</i>	sandy washes
<i>Stipa speciosa</i>	rock ledges

The character of this relict community compares favorably with Schmutz et al. (1967), who found a greater abundance and diversity of native grass specimens on the relatively ungrazed Boysag Point (located just east of PARA) when compared with a grazed area. Seven of the eleven grasses listed above were also found on Boysag Point, and of those, four were found only on the ungrazed area within their study. In addition to species diversity, the grasses located in this area were well-developed and could serve as valuable seed sources for revegetation efforts of other areas of the Monument. In years of continuing drought, with increasingly scarce range resources and greater threat of wildfires, knowledge of areas such as this site could be vital for managers.

Sites 5-7, Kelly Point Region

Several points were delineated in this region based on a combination of results from interviews and based on general physical remoteness. These sites tend to be relatively far from water sources (at least three miles), though that criterion was not used initially in their selection. We were not able to visit these sites specifically, however, we did visit the point itself, and we noted large stands of *Bouteloua gracilis* and *Muhlenbergia richardsonis* growing in abundance approximately 4.5 miles from the nearest livestock water source, and approximately 1 mile north of the Point. This site was a higher elevation and more forested area than the previous site. The only native grass species noted growing in abundance over the majority of the Monument was *Pleuraphis jamesii*, which is regarded as a species that is resistant to decline under intense grazing and is only palatable while actively growing.

Sites 8-16, Andrus/Parashant Canyon and East PARA Region

There are numerous sites in this area, many of which are concentrated on what appear to be somewhat isolate benches above the floor of the Parashant Canyon. While the bottom of the Canyon appears to be developed for livestock use, these upper benches may be physically isolated and may contain relict vegetation. We did not visit these sites during our first field season.

Sites 17-20, Black Rock Mountain Region

While this area is not as physically isolated as the other areas delineated within the Monument, we have included it. It is relatively close to a major road into the Monument and thus may be more likely to have anthropogenic influences. The presence of a suite of restricted plant species, including *Townsendia smithii* (described by Shultz & Holmgren in 1980), along with more complex landforms and soil types suggests that this region deserves significant work. Because this area has received attention from monument personnel and consultants from other universities, we have focused our attention in the outer reaches of the monument.

While our findings are limited by our short amount of time in the field, the GIS system we are developing improves the efficiency of our work and should help guide the planning efforts of PARA personnel. Our fieldwork confirms that livestock forage resources are less than desirable for much of the PARA. With continued drought conditions and continued use of allotments, grazing pressure will likely increase on these areas which still contain some diversity and abundance of native grass species, decreasing the ability of these populations to serve as seed sources post-drought. It is imperative that more of these areas are located for future monitoring efforts or to serve as seed banks. Our preliminary findings in the field indicate that distance from livestock water sources may be an important predictor for areas with significant native plant diversity, and this was not initially considered in locating potential relict areas. In 2004, a coverage depicting distance from water sources was developed, and will be refined in 2005. Remoteness of these areas and difficulty of the terrain makes access extremely difficult. While we have decades of accumulated experience in rough terrain, the conditions of the remote extensions of the PARA present extreme conditions. In 2005, we will rely on help from NPS personnel for access to areas that may not be accessible by foot.

Literature Cited

Schmutz, E. R., G. C. Michaels, and B. I. Judd. 1967. Boysag point: a relict area on the North Rim of Grand Canyon in Arizona. *Journal of Range Management* 20 (6): 363-368.

Shultz, L. M. and A. H. Holmgren. 1980. A new species of *Townsendia* (Asteraceae) from northern Arizona. *Brittonia* 32(2): 144--147.