

A VEGETATION STUDY OF CAPITOL REEF NATIONAL PARK

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Objectives

Capitol Reef National Park lies in a relatively unexplored region of southcentral Utah. The diversity in geology and the elevation gradient (3,500-9,000 feet) allows for diverse vegetation including endemic and rare taxa (Welsh and Chatterley, 1985). Previous floristic studies have been conducted in San Rafael Swell (Harris, 1980) and the Henry Mountains (Neese, 1981); however, aside from classification of coniferous habitat types (Youngblood and Mauk, 1985), no community studies have been done in this region.

This was the second year of a three year investigation of the plant communities, flora, threatened, endangered/sensitive taxa distribution and the effects of grazing in Capitol Reef National Park. Our specific objectives for the project are:

1. To complete an annotated list of vascular plant species in Capitol Reef National Park, identifying origin, form, duration special status, flower color(s), general location, abundance, flowering dates, habitat, geology, special use information, elevation, effects of grazing, synonymy and comments.
2. To collect, press, mount and label a few remaining vascular plant species known from the Park but not yet incorporated into the park herbarium.
3. To identify and map locations (SAGIS) for all threatened, endangered, sensitive (rare) species.
4. To identify all immediate and potential threats to threatened, endangered, and sensitive species.
5. To further test and improve the plant community classification currently being constructed by use of multivariate analysis.
6. To map the distribution of all plant community types in the

Park by use of aerial photos, field notes, and the analytical capability of SAGIS.

7. To identify the potential climax state for each type of plant community and to make recommendations for maintaining that climax vegetation (or appropriate seral stages, if those are necessary for maintaining populations of certain rare plants, or if they have other special values).
8. To photograph all threatened-endangered plants and community types.
9. To evaluate grazing impact on the vegetation of waterpockets using Cottonwood, Willow and Miayahan Tanks as examples.

This study will provide baseline ecological data for Capitol Reef National Park. Benefits from this project will include maps of the community types and distributions for rare taxa, additional plants for the herbarium, annotated plant list and some information on the effects of grazing. We also want to incorporate our floristic and vegetational sets into the SAGIS geographical information system (GIS) that is now being installed in Capitol Reef National Park. This is an additional piece of work that was not specifically included in our original proposal, but it will make the results of our research immediately accessible to park managers and will integrate our data with other existing data bases for the Park.

Methodology

The second field season followed a wet winter which produced an unusual show of flowers, and we spent much of the season collecting additional plants that had not been evident in the previous year. The vegetational patterns also have proven to be more complex than originally expected. Even with 300 sample stands, our preliminary multivariate ordination and classification efforts yielded an unacceptably large number of "outlier" stands which show little floristic relationship with other stands.

The classification scheme that is currently being developed is designed to use for management purposes. It will (1) provide a general description of major natural associations of plant species in the area and (2) describe the kinds of habitats and communities within which rare plant species are most likely to be found.

For our vegetation analysis, we now have sampled 300 stands using a 'releve' method which provides a semi-quantitative estimate of species importance (Mueller-Dombois and Ellenber, 1974). Each stand was 50 m x 50 m within an area of homogeneous environment and vegetation. The stands sampled to date represent a major portion of the range in elevation; topographic position, geologic substrate, and disturbance history within the Park.

These data were then arranged in a species by stand matrix and subjected to multivariate analysis using four programs developed by Cornell University (Gauh, 1983): "Ordiflex" (reciprocal averaging and principal component analysis, both forms of ordination); "Decorana" (detrended correspondence analysis--another form of ordination), "Twinspan" (a hierarchical cluster analysis), and "Compclus" (a non-hierarchical classification program). The initial ordinations based on 227 stands sampled in 1986 revealed two major environmental gradients of elevation and geologic substrate which had a great effect on community distribution. "Compclus" and "Twinspan" also produced a preliminary classification of the vegetation consisting of 16 community types. We field tested this preliminary classification in 1987, and concluded that it did not adequately reflect the spectrum of plant communities actually encountered in the field.

Our vegetation sampling in 1987 emphasized plant assemblages and environmental conditions that had not been sampled the previous year, and we added 73 stands to our data set. However, as we became even more familiar with the Park's vegetation and environment, we recognized that there are still significant elements that have not yet been sampled adequately. The vegetation data from 1987 have been added to our computerized data files and new multivariate analyses are currently being made with the VAX computer at Fort Lewis College. The results of these analyses should give a much better picture of the major plant communities and controlling environmental variables in the Park. We will generate a new expanded community classification for field testing in 1988, and will use the results of the ordinations to focus our final season of sampling on those areas not yet adequately represented in our present data set.

Results

After the first year's field season, we are determining and mapping a preliminary community classification. Threatened and endangered plants are also being mapped. An annotated list of all of the plants found in the park is being compiled. Voucher specimens of plants have been identified, mounted, labeled and will be given to Capitol Reef National Park Herbarium. Dr. Stan Welsh has assisted in taxonomic evaluation of specimens. Nomenclature has followed Cronquist, et. al. (1972, 1977, 1984) when possible. Other texts being used include Welsh (1986); McDougal (1973). Generic revisions have been used when applicable.

During the 1986-87 field seasons we located 20 sensitive plant taxa in the park, 4 of which have federal protection (Table 1). The investigators have found 250 previously unrecorded taxa in the park bringing the total to approximately 800 plant species in Capitol Reef National Park.

We plan to complete our sampling during the 1988 field season, subject to continued funding. This will provide us with a sample from the full

Table 1. Threatened, endangered or candidate species found in Capitol Reef National Park.

Threatened-Endangered-Rare Plants

1. Sclerocactus wrightiae (Endangered) The Wright's fish-hook cactus
 2. Cycladenia humilis var. jonesii (Threatened) The Jones Cycladenia
 3. Townsendia aprica (Threatened) The Last Chance Townsendia
 4. Erigeron maguirei (Endangered) The Maquire daisy
 5. Schoenocrambe barnebyi (Candidate)
 6. Gilia caespitosa (Candidate) The Rabbit Valley gilia
 7. Cymopterus beckii (Candidate)
 8. Astragalus harrisonii (Candidate) The Harrison milkvetch
 9. Pediocactus winkleri (Candidate) The Winkler pediocactus
 10. Spiranthes diluvialis (Candidate)
 11. Astragalus barnebyi (3C)
 12. Astragalus malacoides (3C)
 13. Asclepias ruthiae (3C)
 14. Astragalus consobrinus (3C) The Bicknell milkvetch
 15. Lomatium junceum (3C)
 16. Lygodesmia entrada (3C)
 17. Astragalus parcalinus (3C)
 18. Eriogonum corymbosum var. revelianum (3C)
 19. Eriogonum cronguistiii (3C)
 20. Cryptantha johnstonii (3C)
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range of variation in elevation, topography, and geologic substrate in Capitol Reef National Park. Based on this complete data set, we will then develop our final classification, maps, and report during the winter of 1987-88.

Conclusions

No conclusions are possible at this time.

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