

Rare plant survey at Capitol Reef National Park

By DEBORAH CLARK AND THOMAS O. CLARK

In 1997 and 1998, Capitol Reef National Park received a research and inventory grant from the National Park Foundation and Canon U.S.A., Inc., through their "Expedition into the Parks" program. This grant enabled National Park Service staff, researchers, and volunteers to collect critical data on several of the rarest plants occurring in the park.

Capitol Reef National Park is located in south-central Utah (figure 1), in the Colorado Plateau region, 72 km (45 mi) west of Hanksville on U.S. Highway 24. It was established to protect the longest exposed monocline in North America and is approximately 97,000 ha (241,903 acres) in size. This wrinkle in the earth's crust runs about 160 km (100 mi) north to south and is named the Waterpocket Fold. Unique geological conditions within the fold have created microhabitats that support over 40 rare and endemic plant species.

The six plant species selected for this study were ones most likely to be impacted by increased park visitation around the headquarters or Fruita area. Capitol Reef is primarily a backcountry park and receives about three-quarters of a million visitors each year. Many of these visitors hike the trails within the Fruita area and many of these trails have rare plant populations adjacent to them. Therefore, information on the whereabouts of rare plants in these high use areas and whether they are being affected by visitation is essential for park management.

Three of the six species are federally listed as endangered or threatened: Barneby reed-mustard (*Schoenocrambe barnebyi*—endangered), Maguire's daisy (*Erigeron maguirei*—threatened), and Wright's fishhook cactus (*Sclerocactus wrightiae*—endangered). One species, Rabbit Valley gilia (*Gilia caespitosa*—figure 2), was a candidate for federal listing, but is now being managed under a conservation agreement and strategy that precludes the need to list it¹. The remain-

ing two species are NPS sensitive: Harrison's milkvetch (*Astragalus harrisonii*), occurring only within Capitol Reef National Park, and pinnate spring-parsley (*Cymopterus beckii*).

The study

The primary purposes of this project were to (1) conduct intensive surveys for the target species within the heavily visited Fruita area, and (2) develop monitoring protocols for each species that would detect changes in plant numbers due to visitor impacts. The study area encompassed approximately 10,000 ha (25,000 acres), with about 6,400 ha (16,000 acres) containing suitable habitat for one or more of the target species (figure 3, page 28). Particular emphasis was focused on areas currently being impacted by visitors and on areas where future increased use is expected.

The study began during the 1997 field season when the interagency botanist mapped known locations using a global positioning system (GPS). These locations were entered into the geographic information system (GIS) and were overlaid with soil types, geologic formations, slope, aspect, and elevations to create a profile of potential habitat by species. In addition to accurately depicting known and potential habitats, this refined the range of each of the six species and helped resource managers plan how many people would be needed to accomplish the tasks.

After completing this initial work, field crews conducted surveys in potential habitat for each species (figure 4, page 28). By surveying from April through late June when the majority of plants were in full bloom crews ensured proper plant identification and increased survey accuracy. Each area was systematically surveyed both by walking transects through all accessible areas and by using binoculars to search cliffs. The crews hiked every established hiking trail and other well-used foot route in the Fruita study area during the appropriate blooming time for each species. If a trail or route passed through potential habitat for two or more species and those species bloomed at different times, then those

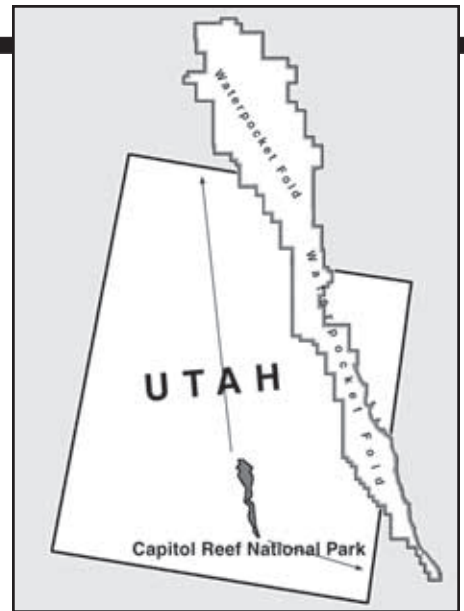


Figure 1. Capitol Reef National Park is located in south-central Utah and encompasses the Waterpocket Fold, a 100-mile-long geologic formation known as a monocline that provides numerous microhabitats for rare plants.

trails and routes were hiked multiple times to ensure surveys were as thorough as possible for each species. Once all maintained trails were surveyed, then routes and areas receiving off-trail use were surveyed. For future reference, crews noted on maps all areas surveyed.

For each new occurrence of a species, crews completed a modified version the Utah Natural Heritage Division Site Visit Account Survey Form, took photographs, and mapped its location on 7.5' quadrangle maps. Wherever possible, a GPS was used to map the precise location of each new occurrence.

Localities found on or adjacent to hiking trails and routes were recorded and



Figure 2. Rabbit Valley gilia, a candidate for federal listing, is now being managed under a conservation agreement and strategy.

¹The conservation agreement and strategy was written by BLM, FWS, USFS, and NPS staff in 1996. This agreement addresses protection measures designed to achieve long-term conservation of the species so that listing under the Endangered Species Act would not be necessary.

"Plant Survey" continued on page 28

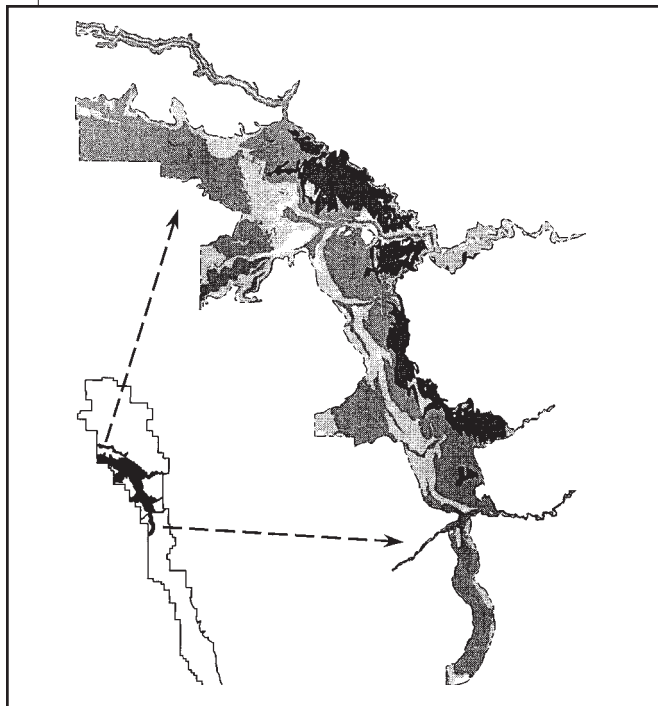


Figure 3. The study area within Capitol Reef National Park encompasses Fruita, an area that contains the majority of visitor use. Darker areas depict potential habitat for a greater number of the target species.

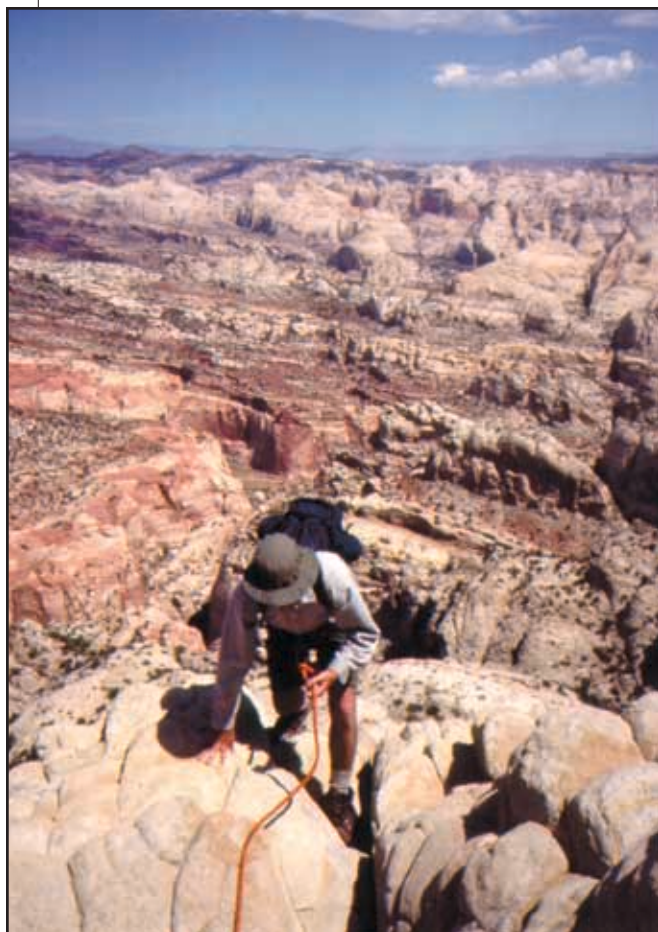


Figure 4. Field survey crews searched for Maguire's daisy, a federally endangered species, in rugged, steep terrain.

mapped so park managers would know about the potential for visitor-related impacts to these populations. All new localities were entered into the park's GIS along with a summary of data about the locality. This ensures long-term retrieval capabilities for future resource managers.

In 1998, the study progressed into the monitoring phase. Resource managers selected monitoring sites where at least 100 individuals of the target species occurred in areas of current or potential visitor impact. The interagency botanist visited each of these areas to determine whether a monitoring plot could be established without impacting the species of concern. Since all these species grow in rugged, steep terrain, some sites had to be abandoned since any monitoring efforts would have disturbed the plants, or the location was deemed too difficult to access repeatedly.

Once resource managers determined the logistical feasibility of establishing a plot at a given site, field crews set up the plots, then tagged individual plants and took their measurements. Measurements included precise location by distance along and from an established meter tape (to enable new crews to relocate individual plants during successive years), plant height, size class, number of flowering stems, and condition of plant. Since almost nothing is known about the life history of these plants, the monitoring method is designed to gather some of that information.

The crews established plots near hiking trails to measure visitor impacts and tagged plants growing within one meter of the edge of trail by burying numbered nails. A second control plot away

from trail impacts was established near the "trail" plot. These control plots were located on the same slope, aspect, and soil type to reduce the number of variables that could affect monitoring results.

Survey results

Crews surveyed the twelve maintained hiking trails and four well-used routes within the Fruita area for each of the target species. They completed 87 site visit accounts, documenting information on all known and new populations of the six selected species in the Fruita study area.

Calendar year 1997 was excellent for botany work in Capitol Reef because winter and spring rainfall was above average, creating a superb year for wildflowers. A long, cool spring prolonged the bloom of several of the target species, enabling survey crews adequate time to cover thoroughly all areas of concern. This also ensured a high degree of accuracy for survey results, since plants tended to be well developed and in full bloom for a longer than average time period.

Findings by species

Barneby reed-mustard

The recovery plan for Barneby reed-mustard reports an estimate of 2,000 total plants known from two locations, one in Capitol Reef. Prior to this study, only one locality in Capitol Reef could be confirmed by botanists. This species occurs only in two geologic formations, Moenkopi and Kaibab limestone. Approximately 3,360 ha (8,400 acres) of these formations occur within the study area, however, only about one-quarter of that area is potential habitat. During this study, all potential habitat for Barneby reed-mustard within Capitol Reef was surveyed, resulting in the discovery of nine new localities and approximately 1,630 individual plants.

Maguire's daisy

The recovery plan for Maguire's daisy reports an estimate of 5,000 individual plants known from 33 locations, representing seven separate populations. Three populations totaling 12 locations (five outside the study area) were known in Capitol Reef before the study. This species occurs only on Navajo sandstone between 1,600 and 2,500 meters elevation. There are approximately 1,920 ha (4,800 acres) of Navajo sandstone within the study area.

Surveys for Maguire's daisy focused on potential habitat adjacent to trails and routes and resulted in 20 localities being recorded (13 new ones) and approximately 1,650 individual plants being found.

Wright's fishhook cactus

The recovery plan for Wright's fishhook cactus reports an estimate of 13 locations in Emery and Wayne Counties, Utah. Only two locations were known within Capitol Reef before this study, both outside the study area. This species occurs on numerous geologic formations, and has a much wider distribution than the two previously discussed species. About 960 ha (2,400 acres) of potential habitat were estimated to be in the study area; however, very little of that acreage occurs near areas of concern. Thus, surveys focused on areas of concern and resulted in the discovery of seven new localities totaling 60 individual cacti.

Rabbit Valley gilia

Rabbit Valley gilia was a candidate for federal listing in 1997, but a conservation agreement and strategy was developed, thereby precluding the need to list it. Before the survey 13 locations for the species were known (nine in Capitol Reef) containing approximately 4,700 individual plants. This species grows only on Navajo sandstone, of which approximately 1,920 ha (4,800 acres) occurs within the study area. Surveys conducted during this study found three new occurrences containing 435 plants.

Harrison's milkvetch

This species is an NPS sensitive species. Until 1998, no extensive surveys had ever been conducted for Harrison's milkvetch. It was thought to occur at four locations in Capitol Reef, totaling about 200 individual plants. Harrison's milkvetch occurs only in Navajo sandstone. About 1,920 ha (4,800 acres) of this formation occurs in the study area, although very little of this area is actually potential habitat. Surveys confirmed the four known locations and added 14 new localities, totaling about 5,000 plants.

Pinnate spring-parsley

This species is an NPS sensitive species. Only nine localities (three in Capitol Reef), containing less than 2,000 plants were known before this study. Pinnate spring-parsley occurs in four formations: Navajo,

Wingate, Kayenta, and Cutler limestone. About 3,800 ha (9,500 acres) of these formations occur within the study area; however, only about one-eighth of the area is potential habitat. This study confirmed the three known locations and added 13 new localities, totaling about 1,250 plants. However, the majority of new localities contain 20 or fewer plants. Often, one isolated plant was found in a slot canyon far from other known locations.

Monitoring plots

Crews established twelve monitoring plots for five of the target species. Resource managers determined that no monitoring plots were necessary for Wright's fishhook since the few occurrences were in areas not likely to be directly impacted by visitor activities. Monitoring plots will be maintained with annual monitoring for at least the first three years. Thereafter, the park will determine whether annual or biennial monitoring should be continued. Additional plots may be established in the future if deemed necessary.

Partnerships and products

Volunteers donated approximately 1,070 hours to this project, representing an approximate monetary worth of \$10,900. Partnerships with Capitol Reef National Park for this project included seven organizations. Capitol Reef Natural History Association managed the grant budget and provided its science projects coordinator (now the interagency botanist) as staff for the project, and Zion National Park detailed one of its seasonal staff in 1997. Four universities sponsored student volunteers (Utah Valley State College, Southern Utah University, Utah State University, and Northern Michigan University), three of whom had specific internship programs through their universities. In 1997, Worthington High School in Ohio sponsored one "walkabout" high school student who assisted with GPS mapping.

The interagency botanist and interpretive staff produced two interpretive exhibits for display in the visitor center. One specifically details Canon's and NPF's role in the project, and the other describes rare plants and geology within Capitol Reef National Park. Additionally, the park installed signs at appropriate trailheads explaining the presence of rare plants along trails and encouraging visitors to stay on the trail. A leaflet educating visitors about

rare plants growing in Capitol Reef National Park was developed and is being distributed in the visitor center.

Conclusions

Work accomplished by this study resulted in the discovery and documentation of several new localities for each of the target species. It also reconfirmed that each of these species is indeed very rare. Each species has its own microhabitat niche requirements that restricts it to very limited areas within the Waterpocket Fold and surrounding area. The largest increase in known localities and number of individual plants was for Harrison's milkvetch. This is because no surveys for this species had ever been conducted. Because of their extremely restricted microhabitat requirements, Barneby reed-mustard and pinnate spring-parsley were found to be the most limited species.

The timing of this grant was excellent since Capitol Reef National Park was in the process of revising its general management plan. Information gained from the 1997 portion of this project was directly applicable to the planning effort. Information gathered during this study also enabled the park to meet legal requirements of the Endangered Species Act, comply with NPS management policies, and address Government Performance and Results Act goals. Conducting surveys and establishing monitoring plots were some of the park responsibilities identified in three recovery plans and a conservation agreement. Knowledge gained about these species and their specific habitat requirements will enable park staff to ensure that these plants are protected and will assist in predicting which areas may contain additional occurrences. Future results from the monitoring plots will provide the means for park managers to make better decisions concerning visitor use and its impacts to park natural resources. **PS**

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