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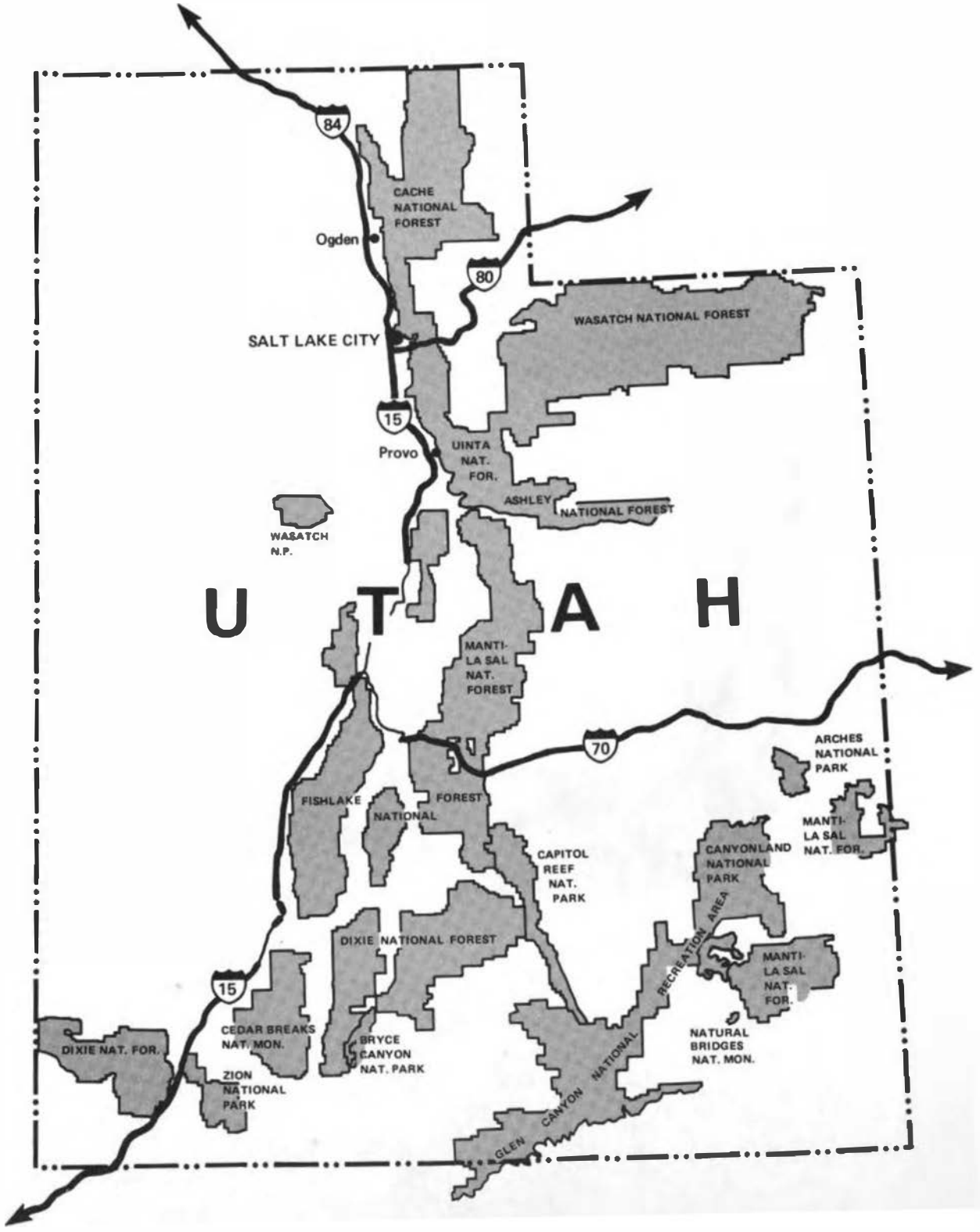

GRAZING PHASEOUT AT CAPITOL REEF NATIONAL PARK

Phase I

Final Report

Committee on Grazing Phaseout
at Capitol Reef National Park

Board on Agriculture

National Research Council

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1984

NOTICE: The project that is the subject of this report was approved by the Governing Board of the National Research Council, whose members are drawn from the councils of the National Academy of Sciences, the National Academy of Engineering, and the Institute of Medicine. The members of the committee responsible for the report were chosen for their special competences and with regard for appropriate balance.

This report has been reviewed by a group other than the authors according to procedures approved by a Report Review Committee consisting of members of the National Academy of Sciences, the National Academy of Engineering, and the Institute of Medicine.

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No study involving open meetings with the concerned public, local and national government representatives, and scientific and trade groups can succeed without the cooperation and on-site logistical support of a number of people. Such support was received in full measure from Superintendent Derek Hamby and his staff from the Capitol Reef National Park, and the committee is most appreciative.

The committee was privileged to visit historic sites and grazing areas within CRNP and the surrounding Bureau of Land Management lands, accompanied by knowledgeable scientists and technical staff. The briefings by these individuals provided us with valuable information on grazing activities and the natural resources of the area.

The committee is indebted to Eric L. Ellwood, North Carolina State University; Robert G. Gast, Michigan State University; Laurence R. Jahn, Wildlife Management Institute; and James O. Klemmedson, University of Arizona, who prepared critical reviews for the advice and guidance of the committee; and to H. E. Wright, Jr., University of Minnesota, who served the Report Review Committee as monitor for the report.

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1

INTRODUCTION

The National Park Service (NPS) is charged by congressional mandate to preserve natural and historic features and wildlife and to provide human enjoyment in its parks. In meeting the charge, careful management of park resources and prohibition of all other forms of land use are practiced. However, this charge has not always been met. Some parks came into the system with carryover land-use activities. Grazing by domestic livestock has not been an unusual condition of acceptance of both public and private lands for establishment of new parks. However, without exception, provisions were made to phase out grazing in some pattern that does not seriously affect those persons who have permits to graze the land or who, by rights of previous ownership, have reserved grazing for a specified time.

Capitol Reef National Monument was added to the National Park System by presidential proclamation in 1937. On December 22, 1971, Public Law 92-207 was signed, which changed the status of the 37,000-acre national monument to a national park and increased its size from adjacent public lands to 241,671 acres. Bureau of Land Management (BLM) and Forest Service (FS) lands were transferred to the park, and grazing allotments then in force were retained by those holding permits. However, Public Law 92-207 provided for a phaseout of grazing, which took the form of a schedule "establishing one 10-year renewal for holders of 10-year grazing permits and 10 one-year renewals for holders of one-year permits" (Mr. Garn, Congressional Record S13781, 1981).

Concerned about the impact of the schedule of grazing phaseout on the local economy and its social consequences, the congressional delegation from Utah introduced legislation in the 97th Congress to permit grazing until December 31, 1994. The law required the director of the NPS in cooperation with the director of the BLM to enter into a contract with the National Academy of Sciences (NAS) for the purpose of conducting a study of grazing in Capitol Reef National Park (CRNP) and vicinity (Figure 1). The bill, Public Law 97-341, was passed on October 15, 1982.

Accordingly, the NPS of the U.S. Department of the Interior contracted with NAS to conduct a study of grazing (as specified in Public Law 97-341) on CRNP and adjacent lands to:

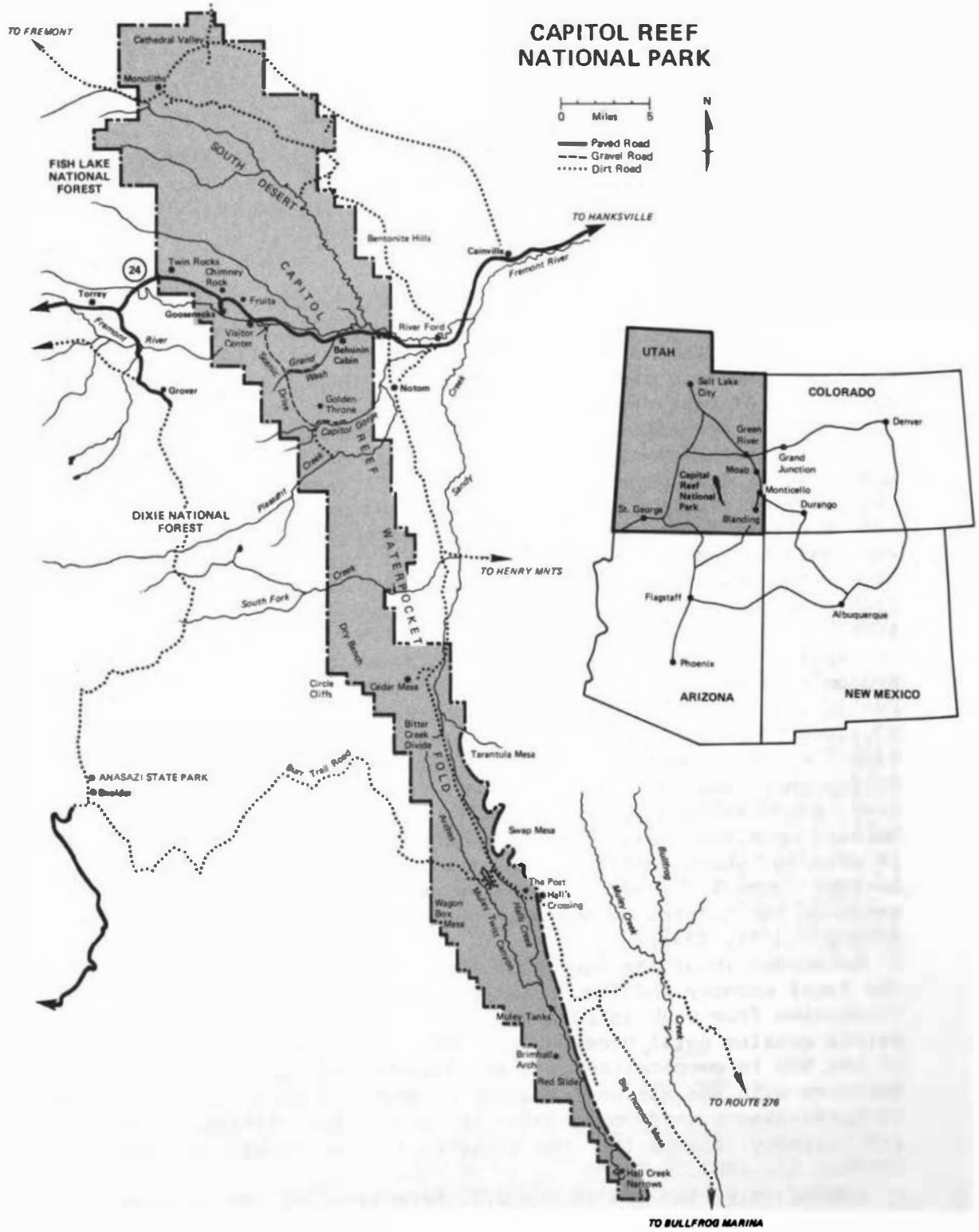

FIGURE 1

1. determine the historic and current impact of grazing on the natural ecosystem and cultural resources of the park;
2. determine the impacts of grazing on visitor use within the park;
3. evaluate alternatives to grazing within the park, including means to increase grazing carrying capacity on adjacent BLM lands;
4. determine the economic impact on grazing permit holders and on the local economy, if such permits were terminated; and
5. include such other information and findings as may be deemed necessary by the secretary of the Interior.

The Board on Agriculture, National Research Council/National Academy of Sciences, developed a plan to carry out the provisions of Public Law 97-341. The plan is to be accomplished in two phases. The first phase called for a committee of experts to evaluate the problem by making onsite visits to the park and its environs; by meeting with interested parties in the region; and by researching the background of the matter through published documents of the several federal and state agencies, private organizations, and from scientist-educators who have studied the natural resources and land management of the region. From these meetings, the second phase, a long-term research effort, was to be developed to provide information to those who must ultimately make the decision on phaseout of grazing on CRNP.

The Board on Agriculture assigned the study to an eight-person committee convened for phase one of the study. Members of the committee had expertise in livestock management, hydrology, range science, agricultural economics, wildlife science and management, recreation, social science, and plant ecology.

The study committee met at CRNP on September 27-29, 1983. At that time the committee met with NPS and BLM personnel to discuss grazing issues and background information on the park and adjacent BLM lands. The committee also met with other concerned parties, including 11 local ranchers, other scientists, county commissioners, and representatives of conservation associations, the Farm Bureau, and Utah congressional staffs and toured the park area and adjacent BLM lands. A report outline was developed, and topics were assigned to individual committee members for preparation of draft material to be included in the report.

The committee held its second meeting in Denver, Colorado, on December 11-13, 1983, to review its first draft and to finalize its report.

This report describes the natural and cultural resources and their management in the park, socioeconomic implications of the livestock industry in southern Utah, and management conflicts between land-use systems and the park's mandated obligation to protect cultural and natural features. It outlines and schedules studies to be done in phase II to provide information for impact assessment and management alternatives. The report discusses the organization and implementation process for phase II. The present phase I committee would be augmented with up to four (4) additional scientists to monitor the proposed research projects (contracted for by the NPS) and will prepare a final report synthesizing the information developed during the course of the studies.

2

NATURAL RESOURCES

PHYSICAL FEATURES

Terrain

The dominant feature of Capitol Reef National Park (CRNP) is the 80-mile-long rift in the earth's crust and associated monoclinal fold or hogback, which locally is called a "reef." The other popular name for this near-vertical exposure of sedimentary strata is the Waterpocket Fold. This derives from the erosion of tanks in the sandstone that store water. The 241,671 acres of CRNP include all of the reef and some adjacent plateau, valley, and badland topography. Because of the rough terrain and lack of palatable forage, less than 60 percent of CRNP is grazed by livestock (Draft Resource Management Plan and Environmental Assessment for Capitol Reef National Park, 1983). Most of this grazeable land is located on the eastern edge of the park.

Elevations in CRNP vary from about 3,900 feet on the south side to about 8,500 feet on the northern boundaries, where it adjoins the Fish Lake National Forest on Thousand Lake Mountain. The variety of climatic regimes is primarily related to this elevational gradient. The prevailing climates are continental and semi-arid. The 1947-1973 mean annual precipitation at Fruita was 6.73 inches (USDI, 1974).

Soils

The variations in climate along with the exposure of 18 geologic formations have led to a great diversity of soils and environment for plant growth. Little soil data exist for the park. A general soils map (Wilson et al., 1975) indicates that rockland, badland-rockland, Typic Torripsamment-Typic Torriorthent, Lithic Calciorthid-Lithic Natrargid, Aquic Xerofluvent-Ustic Ustifluvent-Typic Torrifluvent, and Lithic Ustollic Calciorthid-Lithic Ustic Torriorthent associations are in the park. Recent soil work on adjacent BLM lands (USDI, 1983a) indicates that Entisols and Aridisols are predominant. Entisols are soils with very little horizon development, and Aridisols are soils that are dry for extended periods, low in organic matter, and often have a calcium carbonate accumulation at some depth.

Water

Surface water is very limited in CRNP. The Fremont River flows through the section of park that formerly had national monument status. The only other perennial streams are Pleasant, Sulphur, Oak, and Hall's creeks. There are some springs and seeps scattered throughout the park, but a comprehensive inventory has not been done. Water is temporarily held in man-made stock ponds and natural "tanks." The total number of these tanks and their usual periods of water availability seem to be unknown. Livestock rely heavily on snow for water as they utilize vegetation in the winter. Groundwater is probably abundant, although exploration would be needed to define its distribution and quality.

Air Quality

CRNP is a Class I federal air quality area having a high degree of airshed protection. Visibility has been monitored at Panorama Point in the park since 1978, and an average standard visual range of 199.7 kilometers in winter and 173.7 kilometers in summer has been established.

BIOTIC FEATURES

Floristic

Desert shrub vegetation is dominant on the lower elevations of the park, with pinyon-juniper woodland dominating the higher elevations. Large areas of the park are naturally barren as a result of rock outcrops and badlands on shale soils. Alkali sacaton (Sporobolus airoides), galleta grass (Hilaria jamesii), Indian ricegrass (Oryzopsis hymenoides), squirreltail (Sitanion hystrix), and needlegrasses (Stipa spp.), along with fourwinged saltbush (Atriplex canescens), winterfat (Ceratoides lanata) and areas of greasewood (Sarcobatus vermiculatus) and shadscale (Atriplex confertifolia) are the major species of the desert shrub vegetation. Hazelrush (Luzula spp.), galleta (Hilaria jamesii), western wheatgrass (Agropyron smithii), and blue and black grama (Bouteloua spp.) are common understory plants of the woodland areas. The vegetation in the park grows under an arid environment that naturally produces widely spaced plants and a relatively low total plant cover.

Little is known about the composition of plant communities and the distribution and abundance of exotic, rare, restricted, threatened, and endangered plant species at CRNP. Limited collecting has identified the presence of 512 species of vascular plants. Vast areas of the park have not been visited by plant taxonomists, however. The considerable variety of geological substrates, the elevational and topographic diversity, and the presence of riparian to cliff face microhabitat promise to hold numerous other species.

Exotic plants, tamarisk (Tamarix pentandra), Russian olive (Eleagnus angustifolia), Russian thistle (Salsola kali), and cheatgrass (Bromus tectorum) also grow in the park. The Wright fishook cactus (Sclerocactus wrightiae) is the only listed threatened and endangered plant known to exist in the park. Other rare, restricted, and recommended threatened and endangered plants include Winkler pincushion cactus (Pediocactus winkleri), Ruth milkweed (Asclepias ruthiae), last-chance Townsendia (Townsendia aprica), Harrison milkvetch (Astragalus harrisonii), Rabbit Valley Gilia (Gilia caespitosa), Maguire daisy (Erigeron maguirei var. harrisonii), and Cryptantha barnebyi.

The only apparent information on vegetation is that included in a draft map of cover types prepared by the National Park Service (NPS) from aerial photography. Thirteen cover types are identified, but they have not yet been field checked.

Wildlife

Large ungulates, furbearers, and carnivores have been economically important in the region since the Mormons settled in Utah in 1847. In some places and at some times, wildlife was the only source of food for pioneer settlers. Today it has heritage, cultural, recreational, and economic value. Parks and equivalent reserves afford protection to these resources, and few places outside such reserves provide habitats for wildlife where man's industry is not felt.

CRNP is protected from hunting and other disturbances, except for those disturbances related to the range livestock use. Grazing by various kinds of livestock affects wildlife resources depending on the systems of management. Some are decidedly negative. Others are positive in their impacts, and some have synergistic effects on the production of livestock and wildlife. For the most part, however, fragile environments such as deserts must be carefully managed if their integrity and biological productivity for wildlife (and other resources) are to be maintained.

Many forms of wildlife inhabit CRNP. However, wildlife is not a conspicuous element in the park because the larger animals, including deer, bear, elk, pronghorn antelope, bison, mountain lions, and other carnivores, and furbearers, have either been eliminated or are not numerous. Most large mammals are transient visitors or residents in small areas of the park or only during certain parts of the year and then in low numbers. CRNP is not considered a featured wildlife spectacle because of this scarcity; its beauty is in its unique and magnificently formed land and its geological phenomena. A great many birds and small mammals inhabit the park, although they are inconspicuous to the average visitor. Their numbers have been cataloged at 173 birds and 82 mammals.

Nonetheless, the park contains many species of wildlife that, like all living organisms, constitute parts of an ecosystem. In that connection, the NPS is pledged to conserve and protect all species. Hunting is not permitted in the park.

Mule Deer (*Odocoileus hemionus*)

CRNP lies within four deer-herd management units designated by the Wildlife Resources Division of the Utah Department of Natural Resources (G. K. Jense, State of Utah Natural Resources and Energy, personal communication, 1983). These units are numbers 46, 51A, 51B, and 52, of which the park represents only a small part. Optimum deer numbers, or goals of management, for these four units have been set at 17,050 animals. Censuses of deer at the park have not been made, but it is known that only a small part of CRNP is used by deer and then only as winter range. A few animals are resident yearlong in the bottomland habitats and in the fruit orchard areas and perhaps several hundred migrate from Thousand Lake Mountains into the north part of the park, especially during winters with heavy snowfall.

Desert Bighorn Sheep (*Ovis canadensis*)

Bighorn sheep were historical elements of the native fauna of the park. Now only a few sightings are made from time to time at the southern end of the park. Those seen are stragglers from a small population on BLM land on the west side of the park. It is highly probable that the park will support bighorn sheep. The Utah Wildlife Resources Division and the NPS are cooperating in a plan to reintroduce these sheep into the park in early 1984. The success of the transplants may partially depend on their contacts and competition with domestic livestock.

Bison (*Bison bison*)

The Henry Mountains bison herd is free ranging, managed by hunting, and numbers about 300 to 325 animals. The herd leaves the higher elevations of the Henry Mountains and winters on the lower slopes, often on Cave Flat and Swap Mesa. On at least one occasion a part of the herd wintered within the confines of CRNP. It appears that only during the most severe winters, and when hunting forces the bison out of their normal wintering range, can the herd be expected to enter the park.

Pronghorn Antelope (*Antilocapra americana*)

Antelope were once pristine inhabitants of the park, but they have been eliminated from their original range. Transplants to the north of the park have been made, but because of distance and intervening unsuitable habitat it is very unlikely that many of these antelope will move into CRNP.

Other Species

The small vertebrates in the park, especially the fish fauna, have not been extensively researched. Faunal lists are available, and they are reasonably complete. The status of the cold-blooded vertebrates, however, is not well known. Mountain lions, badgers, bobcats, foxes, and other carnivores are found in the park in generally low, but varying, numbers.

Two species of endangered wildlife have been recorded in the park. The Utah prairie dog is classified as endangered by the U.S. Fish and Wildlife Service. It was introduced in the north end of the park in recent years. The Peregrine falcon is known to inhabit the park. A nest was found in an inaccessible area in 1977, and a protection plan for the species was issued in 1977 to protect it and other possible nesting falcons.

3

CULTURAL HISTORY AND RESOURCES

CULTURAL HISTORY

CRNP is located within a region known as the Four Corners, which includes parts of Arizona, Colorado, New Mexico, and Utah. Prehistoric inhabitants of the area were Puebloan. The Anasazi or "ancient ones" were perhaps the most dominant Pueblo culture of the region. There is some evidence of their occupation and use of the area around the park, notably south of the Capitol Gorge area. Among the Puebloan cultures, however, the Fremont Culture was dominant within and around the immediate area of the park from about A.D. 700 to 1275. The Fremont Culture was characterized by small villages with both pit and surface houses of adobe and masonry; irrigated farming of squash, beans, and corn; generally plain pottery; and rock art or pictographs (Gunnerson, 1969).

The earliest record of white man in the region is the date 1692, which is scratched in sandstone at Hall's Crossing. The authenticity of this marking has not been verified, however. The Dominquez-Escalante expedition entered the area in 1776 via the Crossing of the Fathers, approximately 80 miles south of Hanksville. For the next 80 years, from 1776 to 1855, Spanish expeditions were made into various parts of what is now Utah. The Spanish were engaged in trading, prospecting, and slave hunting (USDI, 1983b).

White settlers came to the area in the 1880s and 1890s. Junction was settled in 1881 and Hanksvile in 1890. A string of settlements developed along the Fremont River between Junction and Hanksville, including Blue Valley, Elephant, Caineville, Aldrich, and Clifton. These remote communities were part of the last settlement efforts of the Church of Jesus Christ of Latter Day Saints (Mormons). Settlers were drawn to the area by the availability of grazing lands and water and by the remote location, which insulated polygamous Mormon families from potential arrest under the antipolygamy statutes of the 1880s.

Many of the communities along the Fremont River were subjected to repeated flooding during the early twentieth century. Junction, which was renamed Fruita in 1901, was spared this disruptive experience because of its more favorable location at a higher elevation. Among all the communities along the Fremont River, Fruita developed the most extensive and succesful orchards, at one time having more than 3,500 trees. It has been described as "a microcosm of the distinctive, pre-World War II rural culture of southern Utah (Davidson, 1983, p. 3).

Stock raising was introduced into the region at nearly the same time the Fremont River Settlements were being developed. Ranches were built as early as 1882, with large cattle herds being introduced to the Henry Mountain area east of the park in the 1890s.

A number of significant attributes from the late nineteenth century culture still prevail today, including the influence of the Mormon religion on local culture; small, widely dispersed communities, and livestock grazing as a primary economic activity.

ARCHAEOLOGICAL AND HISTORIC RESOURCES

Archaeological Resources

The majority of the archaeological sites recorded in the park are associated with the Pueblo-period Fremont occupation and are dated approximately A.D. 700 to 1275. Open habitation areas and campsites, chipping sites, rock shelters, storage sites, petroglyph and pictograph panels, and associated artifacts are attributed to that occupation. These cultural resources are particularly valuable because they are the type-sites for definition of the Fremont culture and southern San Rafael Fremont rock art style. Evidence of Archaic- and Pueblo-period Anasazi cultures, as well as more recent Paiute occupation, is also evident. Recent discovery of Folsom-like dart points near the park indicate an even older prehistoric period.

Studies carried out in the vicinity of the park suggest that only temporary occupation by marginal agriculturalists or true hunter-gatherers was possible in the harsh desert environment. The Fremont agriculturalists augmented their diet with seasonally available game and wild plants. The true hunter-gatherers of the Archaic period were solely dependent on the seasonally available natural resources. The Capitol Reef area was probably also occupied on a seasonal basis by travelers passing around and through the Waterpocket Fold.

The easiest prehistoric routes through the Waterpocket Fold and across the park were along the Fremont River, the Oak and Pleasant Creek drainages, and the Hartnet. The density of temporary habitation sites and aboriginal art on the sheer rock walls and boulders along these drainages indicate that early human groups made good use of these natural corridors. Occupation during the historic period also occurred in these areas, typified by the Notom, Sandy, and Sleeping Rainbow ranches and the town of Fruita.

Many of the more obvious archaeological sites within CRNP have been seriously altered by modern man. Much of this vandalism occurred before the National Park Service (NPS) began protecting the area.

One of the petroglyph panels along the Fremont River is interpreted to the public at a roadside pulloff, but the remainder of the sites are interpreted offsite through exhibits and literature.

Historic Resources

Most of the pioneer historic resources of CRNP are related to the small, virtually obliterated Mormon settlement of Fruita. The remaining structures represent several aspects of home and community life during the 60 years Fruita existed. Some of these structures are included in the multiresource Fremont/Fruita Archaeological/Historic District for CRNP, which has been nominated for inclusion in the National Register of Historic Places.

The cultural and religious life of the community was centered in the home, but the schoolhouse provided a meeting place for a variety of religious and secular activities. The Fruita schoolhouse was listed on the National Register of Historic Places on February 23, 1972. The building has been restored and exemplifies a small public school of the 1930s.

Numerous structures are included in the Fremont/Fruita Archaeological/Historic District National Register nomination as contributing buildings. The Pendleton-Gifford lime kiln, barn, smokehouse, and rock walls; the Sulphur Creek lime kilns; and the Chestnut-Pierce residences are noncontributing buildings that are of the historic period but have lost their architectural integrity.

The 2,400 fruit trees in the park are of historic and interpretive value. There are pear, apple, peach, apricot, and cherry trees in the historic orchard sites. The orchards and fields are considered to be as significant as the most prominent reminders of the Fruita settlement days. The orchards and fields are managed according to the objectives described in the "Historic Agricultural Area Management Plan for Capitol Reef National Park" (USDI, NPS, 1979).

Also of historic interest are the Floral and Sleeping Rainbow ranches, the Elijah Cutler Behunin Cabin, the Old Capitol Gorge Wagon Road, the Hall's Crossing Pioneer Trail, and the Burr Cattle Trail.

In 1881, ferryman Charles Hall scouted for an easier trail and Colorado River crossing for Mormon pioneers settling the San Juan mission. The trail he selected wound from Escalante over the Waterpocket Fold and down to the Colorado River. In cooperation with Gregory Crampton (University of Utah Professor Emeritus of History), the NPS has made a preliminary judgment of this trail's location as entering the present-day park from Silver Falls Creek and linking with Lower Muley Twist Canyon about 5 miles south of the Burr Trail. For interpretive purposes, this route has been designated as the Hall's Crossing Pioneer Trail.

LIVESTOCK GRAZING

A subjective reconstruction of the grazing resources can be made by reviewing pioneer journals and other historical documents for the Capitol Reef area. It is obvious that great vegetation changes occurred concomitant with increased livestock grazing prior to the turn of the century. The accuracy of these insights with respect to

the entire region is subject to debate, of course, but clearly profound changes have occurred.

The following excerpt from Bennion (1966) gives an impression of the kinds of conditions the pioneers encountered, at least on certain soil types and rangeland sites, when they first entered the region:

> 'The cattle herd in Salt Lake Valley (about 9,800 sq. mil.) was becoming so large by 1885 that the ranges were becoming noticeably overgrazed. Sagebrush and cedars (Juniperus) were almost non-existent and grassland was abundant and nutritious when originally settled in 1860. By 1875 the range was so badly depleted that cows were calving only every other year and cattle and sheep were being moved in fall and winter to lower valleys to the west.
>
> 'When we first came to the south end of Rush Valley in 1860 we thought it was the best range in Utah, because we could stay in one place all the year around. By 1875 it was all et (sic) out, and we had to move to Castle Valley.' Rush Valley is an area extending south from south of Salt Lake City, to Fillmore, Utah; and, from Nephi to Leamington, Utah, east to west. This is an area comprised of approximately 2,375 square miles and currently receives an average of 10 to 12 inches of precipitation per annum. Castle Valley is an area just north of the eastern boundary of what is now Capitol Reef. At least 2,000 head were moved into this area by the Bennion family in the initial group. There were various other cattle ranchers in the same area and a very minimum estimate places overall cattle numbers at 20 to 30,000 head by 1880. This very minimum estimate indicated that within a year or two at least 4 to 6,000 square miles of range were required to sustain the herd at 125 acres/cow. Grazing livestock take out the most flavorful forage first, when these forms are killed out they adjust their taste to forage with lesser nutritional value. Under a regime of unlimited grazing the vegetation alive on a range of 6 to 12 inches of annual precipitation within just a short time bears little resemblance to the original forms.'

GRAZING PERMITS ON PUBLIC LANDS

The original northern European settlers of the region were Mormons. Settlement followed the usual pattern established by the church. The people built homes in close proximity to one another in small communities, while their farm and ranch properties were located on the outskirts of the town. This settlement system probably worked well in this ranching area because the ranch livestock is seldom, if ever, held together at the ranch headquarters. Most of the original settlement families held permits to graze livestock on public lands. Grazing "rights" were held by preeminence, buff, and firepower prior to 1902 for Forest Service land and 1934 for Bureau of Land Management (BLM) land. The Mormon church was also the arbitrator of control of

grazing land prior to federal influence. Thus, these grazing permits have obtained value beyond what one would expect if viewed only from the size of the permit and its ability to produce livestock products. Having a permit to graze livestock on public lands separated the old-timers from the newcomers.

Grazing permits are valued assets even if they are not being used. Data show that the average use of grazing permits on the Henry Mountain Planning Area, BLM, is about 55 percent of the licensed use. The other 45 percent is a valued asset. Ranchers believe that holding these nonuse permits gives them a preference for additional grazing if it becomes available as a result of improvements or changes in use of the land. Often when redirections in grazing permits were made, they were understood to be of a short-term nature and that the grazing rights would later be given back to the permittees. Some permittees had a chance to purchase extra permits from neighbors, which they did, and to retain them in nonuse as an insurance against further reductions in grazing permits. Probably the most important reason for wanting to retain nonuse permits is because the rancher's banker lists them on the loan collateral sheet, and the rancher has borrowed money against their value. This asset value is crucial at the present time because ranchers are facing financial crises.

4

CURRENT RESOURCE USE

LIVESTOCK

Grazing has been practiced on the land occupied by the park for over 100 years. The 1983 Resource Management Plan and Environmental Assessment for CRNP states that there are 18 grazing allotments totally or partially within the park that are managed by the Bureau of Land Management (BLM) which cover about 73 percent of the park or 177,041 acres. There are 47 permittees who have active grazing preference licenses within the park on these allotments. Many of the permits currently are not used, and the report states that in 1983 there were 22 individuals using 23 permits on the 18 allotments. The average annual animal unit months (AUMs*) of cattle grazing use at the park for the 5 years prior to 1983 is reported to have been 2,714, about one-half of the authorized preference number.

The livestock operations that have grazing preference on the park are cow-calf operations that utilize the grazing lands within the park as winter range from October to April or May with some variation among allotments as to specific on/off dates. This winter range within the park is integrated into year-round management systems that involve grazing on the Fish Lake National Forest, Dixie National Forest, State land, and private range and cultivated lands.

The threat of a loss in grazing preference within the park comes at a time when the BLM is adjusting preference numbers downward and livestock operators are faced wih high fixed operating costs and relatively low prices for their products. To the livestock operator, reduced livestock numbers mean less net return and loss of ranch value, which is viewed as the federal bureaucracy versus private enterprise.

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* AUMs - forage required to sustain a 1,000-pound animal (or equivalent, e.g., cow and calf) for 1 month.

TOURISM*

Southern Utah (south of Interstate 70 and east of Interstate 15) contains a unique concentration of scenic attractions, including 13 state parks, 8 national parks, and 3 national forests. These units vary from arid canyonlands to forested mountains, and recreational opportunities range from hiking and boating to snowmobiling. Camping is available on almost all of the federal lands as well as at many private campgrounds. Private outfitters provide such opportunities as jeeping and river running.

The principal scenic and recreational attractions are the national parks. These units reported about 4.5 million visits in 1980, representing about 1 million individual visitors. Glen Canyon attracts the greatest number of visits, with over 1.5 million in 1980. Next in order are Zion, Bryce Canyon, and Cedar Breaks, followed by CRNP with approximately 400,000 visits. Following CRNP in number of visits during 1980 were Arches, Natural Bridges, and Canyonlands. The majority of park visitors want to visit several national parks in one extended trip. CRNP's location, which is on a scenic route connecting the various parks in the region, accounts for the majority of its use.

The typical park visitor is on a 20-day vacation trip and spends about 6 days in the region. He visits an average of 2.5 national parks in the region, in addition to CRNP. Bryce Canyon and Zion national parks are especially popular. Each park in this region is visited by over 20 percent of the visitors to CRNP.

Less than 40 percent of the visitors to CRNP listed any one place in the region as one of their principal destinations. Only 18 percent named CRNP as one of their primary destinations. Most visit the park, at least in part, because if its location. Most of the travel between the Bryce Canyon/Zion area and Capitol Reef is via U.S. 89 and Utah 24 through Richfield. The Forest Service's road from Boulder to Torrey is currently being improved.

Park Recreation Patterns

Visitor Residence

As indicated in Table 1, over one-third of all park visitors in 1980 were from Utah, and almost one-fourth were from California.

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* Information in this section is taken from the Capitol Reef National Park Final Impact Statement and Land Management Plan (USDI, 1982).

TABLE 1 Percentage of Park Visitors Shown by Location of Residence

Region	Percent
West	78.6
Utah	36.0
California	22.5
Colorado	6.4
Arizona	4.1
Rest of the West	9.6
North central	8.2
South	7.5
Northeast	3.7
Foreign	2.1

Visitor Activities

Visitors to CRNP have reported more satisfaction with their visit than do visitors to other parks in the region. About 65 percent say they will probably return.

Park visitors participate in the following activities in the proportions shown:

- 79 percent stop at the visitor center
- 52 percent visit the petroglyph pullout (15 percent remain in their cars)
- 43 percent make day hikes (1 hour or longer)
- 25 to 39 percent camp in or around the park (66 percent consider themselves campers)
- 26 percent picnic (includes some campers)
- 15 to 30 percent take the scenic drive
- 5 to 10 percent drive Goosenecks Road (about one-half of these walk to the viewpoint)
- 2 percent drive into the South District
- 1 percent drive into the North District
- 1 percent camp in the back country

Visitors have indicated relatively little desire for increased development of any type to support their activities. The strongest support (about one-fourth of the visitors) is for more restrooms and nature trails.

Of those visitors who hike, 79 percent feel that there are enough trails now. Over 80 percent of the hiking is done in the Headquarters District of the park, an area of several square miles.

Over one-half of the backcountry campers are from the Wasatch front (Ogden, Salt Lake City, Provo) metropolitan area. Their average length of stay is 2 nights, and about 62 percent of the backcountry camping trips begin in the central district of the park.

Visitation Patterns

The average length of stay in the park is 21.6 hours; about half of the visitors spend 6 hours or less in the park. Park campers comprise the majority of visitors who stay 12 hours or more. Visitors who do not camp in or adjacent to the park tend not to return to the park the following day.

The peak-use day of the year is usually Memorial Day weekend; in 1980 there were about 4,500 visits on this day (9,000 in 1978). Easter weekend usually has the second-highest peak day, and in 1980 there were about 3,800 visits on Easter.

Through a typical year (1980), June and July are the peak-use months, as shown below. During 1980, use in these months averaged 2,000 visits per day. About 50 percent of the total year's visitation occurs during June, July, and August, with 75 percent occurring from May through September.

Jan.-Feb.	1.5	July	18.0
March	2.9	August	16.0
April	9.7	September	9.3
May	16.3	October	5.4
June	18.0	Nov.-Dec.	2.9

Notwithstanding an average increase of 18,860 visits per year between 1961 and 1980, growth during the last decade has been very erratic, partly because of the gasoline shortages in 1974 and 1979. The resultant sharp drops in visitation were each followed by a period of strong recovery (see Figure 2). The cost of gas seems to have little effect on visitation, while the availability of gas is

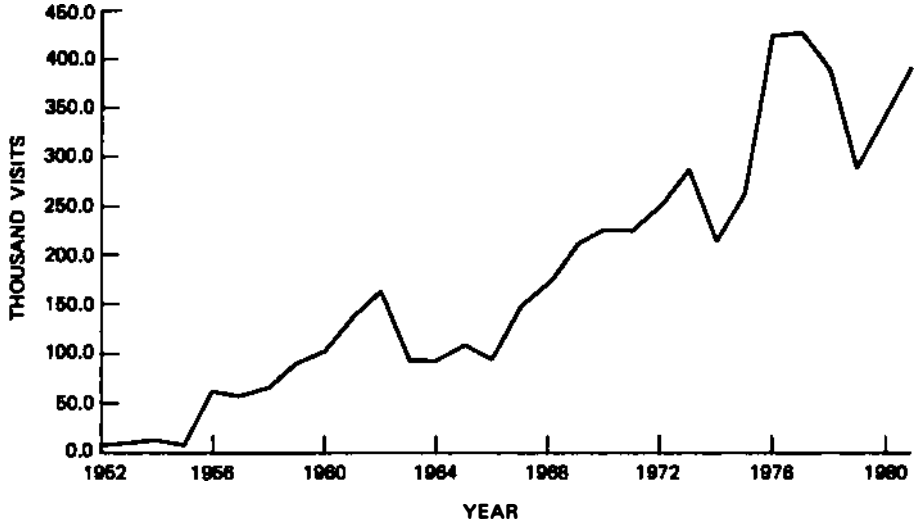

FIGURE 2 Visitation to CRNP (USDI, 1982, p. 75).

critical. Periodic gas shortages similar to those in the past do not appear to affect long-term growth. Visitation to CRNP has shown much stronger growth than overall national park growth in general.

COMMODITY AGRICULTURE

The climate of Wayne and Garfield counties limits the kinds of crops that can be grown. Data from reporting stations in these counties provide an insight into these limitations. Loa, Utah (Wayne County), and Panguitch, Utah (Garfield County), have long-term weather-reporting statistics. The normal annual precipitation is 7.70 inches for Loa and 9.89 inches for Panguitch. The normal frost-free periods are 68 days for Loa and 76 days for Panguitch. The normal mean temperatures are 43.2°F in Loa and 43.9°F in Panguitch. Because of the short growing season and the low annual precipitation, about the only crops that can be produced are small grains, alfalfa, or pasture grass. Over the past few years, there has been a significant increase in the number of acres of land under irrigation in Wayne County. This was made possible with the development of a sprinkler irrigation system, which has allowed more acres to be irrigated with the same amount of water and more land to come under cultivation without intensive land-leveling projects. This development did not increase the diversity of crops produced but did allow an increase in hay and grain production, both crops being used primarily to support the livestock industry of the area. Statistical estimates of crop production in these counties are as follows: barley, 2,100 acres with total production of 180,600 bushels (Wayne County) and 400 acres with total production of 2800 bushels (Garfield County); and alfalfa hay, 8,600 acres with total production of 29,400 tons (Wayne County) and 9,900 acres with total production of 33,300 tons (Garfield County).

NONAGRICULTURE

Counties where over 90 percent of the land is owned by the state or federal government do not have a land base for very much private business. There are a few small sawmills in the counties. The main output from these mills is mine props. Other businesses in the area mainly support the summer tourist trade. These, which include motels, cafes, and service stations, provide some opportunities for ranch families to find off-ranch employment. School teaching and employment by federal land agencies also provide jobs in the area.

There has been some increased activity in the residential real estate business over the past few years. Most of this activity has come from retired persons who have moved into the small communities. Since most of this business has occurred within the small communities, it has not resulted in new development areas or land shifts from agriculture to residential uses.

WATER

The perennial streams flowing through CRNP generally originate outside the park on public land and are fed from snowmelt in the spring and early summer. The sustained streamflow is from subsurface flow. Small riparian areas are also found scattered in the canyons of the park.

Fremont River and Sulphur Creek water is used for irrigation and culinary water for park headquarters. Irrigation water is used for ground maintenance of the picnic areas, campgrounds, and residences and to perpetuate Fruita's agriculture. Potable water from shallow wells near the Fremont River is filtered, chemically treated, stored, and dispensed to visitor and resident facilities. The Sleeping Rainbow Ranch draws its culinary water from a covered spring. There are no other approved culinary sources of water in the park. The other major users of water within the park are livestock and wildlife.

ECONOMIC BASE

Wayne and Garfield counties are two of the most rural counties in Utah. Although agriculture is not the primary means of employment in the counties, farming/ranching families do provide much of the nonagricultural labor force. The relative importance of different economic sectors in the use of the labor force is given in Table 2. A limited economic profile of the counties and the state is listed in Table 3.

TABLE 2 Labor Force Participation in 1979

	Wayne	Garfield
Labor Force:	1,120	1,880
Nonagricultural	600	1,495
Mining	175	185
Governmental	230	435
Agricultural employment	210	200
Largest Employers:		
Federal, state, local governments	175	225
School district	75	145
Manufacturing:		
Uranium	0	135
Sawmills	20	195
Cheese plant	15	--
Meatpacking	12	--
Men's shirts	--	45

SOURCE: Utah State Department of Agriculture (1983).

TABLE 3 Selected Business Statistics for Garfield and Wayne Counties and the State of Utah

	1979	1980	1981	1982	Percent Change 1981-1982
Garfield					
Population	3,800	3,673	3,700	3,850	4.0
Labor Market Data:					
Average civilian labor force	1,882	2,193	1,934	1,853[P]	−4.2
Average nonagricultural employment	1,493	1,786	1,509	1,391[P]	−7.8
Income Data:					
Average monthly nonagricultural wage ($)	775	922	1,051	1,097[P]	4.4
Annual nonagricultural payroll ($ thousands)	13,879	19,760	19,000	18,300[P]	−3.7
Total personal income ($ thousands)	20,822[R]	26,012[R]	28,025	na	–
Per capita personal income ($)	5,884[R]	7,047[R]	6,923	na	–
Tax Data:					
Total assessed valuation ($ thousands)	14,862	25,111	30,613	39,831	30.1
Property taxes charged, by all taxing units ($ thousands)	821	1,011	1,208	1,637	35.5
Gross taxable sales ($ thousands)	15,536	21,277	25,229	20,177	−20.0
Net local sales tax collections ($ thousands)	114	156	185	148	−20.0
Construction (Permit-authorized):					
New dwelling units (number)	27	18	28	23	−17.9
Value of new residential construction ($ thousands)	1,098	763	799	719	−10.0
Value of new nonresidential construction ($ thousands)	19,286	1,786	454	758	67.0
Value total construction ($ thousands)	20,508	3,198	1,511	1,681	11.3
Miscellaneous:					
New car and truck registrations (number)	166	na	90	81	−10.0
In lieu tax payments under Public Law 94-565 ($ thousands)	150	174	184	169	−8.2
Wayne					
Population	1,900	1,911	1,950	2,050	5.1
Labor Market Data:					
Average civilian labor force	1,121	874	873	822[P]	−5.8
Average nonagricultural employment	601	425	421	374[P]	−11.2
Income Data:					
Average monthly nonagricultural wage ($)	898	923	1,024	1,004[P]	−2.0
Annual nonagricultural payroll ($ thousands)	6,478	4,705	5,200	4,500[P]	−13.5
Total personal income ($ thousands)	11,383[R]	12,431[R]	13,439	na	–
Per capita personal income ($)	6,140[R]	6,454[R]	6,128	na	–
Tax Data:					
Total assessed valuation ($ thousands)	4,262	7,440	6,788	6,682	−1.6
Property taxes charged, by all taxing units ($ thousands)	246	292	303	309	2.0
Gross taxable sales ($ thousands)	4,709	6,085	7,942	7,895	−.6
Net local sales tax collections ($ thousands)	35	45	58	58	0.0
Construction (Permit-authorized):					
New dwelling units (number)	21	11	10	4	−60.0
Value of new residential construction ($ thousands)	821	432	466	175	−62.4
Value of new nonresidential construction ($ thousands)	67	8	117	18	−84.6
Value total construction ($ thousands)	939	440	583	316	−45.8
Miscellaneous:					
New car and truck registrations (number)	86	na	73	37	−49.3
In lieu tax payments under Public Law 94-565 ($ thousands)	81	95	97	89	−8.2
State Totals					
Population	1,367,000	1,461,037	1,520,000	1,560,000	2.6
Labor Market Data:					
Average civilian labor force	610,091	618,818	628,878	645,914[P]	2.7
Average nonagricultural employment	548,420	550,787	558,039	560,315[P]	.4
Income Data:					
Average monthly nonagricultural wage ($)	1,004	1,111	1,232	1,301[P]	5.6
Annual nonagricultural payroll ($ thousands)	6,605,121	7,345,961	8,250,200	8,748,500[P]	6.0
Total personal income ($ thousands)	10,007,304[R]	11,226,426[R]	12,632,299	na	–
Per capita personal income ($)	7,067[R]	7,626[R]	8,322	na	–
Tax Data:					
Total assessed valuation ($ thousands)	5,240,517	5,602,369	6,010,968	6,626,820	10.2
Property taxes charged, by all taxing units ($ thousands)	341,391	379,364	417,646	471,396	12.9
Gross taxable sales ($ thousands)	7,731,030*	8,399,415	9,237,779	10,026,338	8.5
Net local sales tax collections ($ thousands)	56,823*	61,736	67,898	73,321	8.0
Construction (Permit-authorized):					
New dwelling units (number)	16,767	10,901	9,253	7,671	−17.1
Value of new residential construction ($ thousands)	645,810	408,310	451,517	347,630	−23.0
Value of new nonresidential construction ($ thousands)	490,274	430,010	378,181	440,007	16.3
Value total construction ($ thousands)	1,232,105	922,068	931,266	963,349	3.4
Miscellaneous:					
New car and truck registrations (number)	61,966	na	52,238	39,851	−23.7
In lieu tax payments under Public Law 94-565 ($ thousands)	7,112	8,147	8,626	7,930	−8.1

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ANALYSIS OF THE ISSUE

The issue that motivated Congress to enact Public Law 97-341, which extends grazing privileges at CRNP to December 31, 1994, and which mandates a study of grazing at the park by the National Academy of Sciences, can be traced back to Public Law 92-207, enacted on December 18, 1972, designating Capitol Reef National Monument as a national park and providing for a phaseout of livestock grazing during the next 20 years. Local ranchers believe that they would be adversely affected by the accelerated phaseout; state and county officials believe that the local economy would suffer; others believe that grazing practices in the park represent no danger to the natural and cultural resources of the park; and the National Park Service (NPS) and environmental groups are concerned about the preservation of natural and cultural resources, including streams; soils; plant and wildlife ecosystems, including riparian habitats; and archaeological sites.

Before considering research studies needed to address the five major areas outlined in Public Law 97-341 (see Section I., Introduction), the committee met with local ranchers; scientists; county commissioners; and representatives of the Farm Bureau, Cattlemen's Association, Wilderness Association, Sierra Club, and Utah congressional staffs. The committee also met with local NPS and BLM personnel. The discussions centered on the perception of the issue, grazing operations of the ranchers, past and ongoing studies, and information needed to provide a basic understanding of the problems.

The ranchers discussed their operational procedures, including trailing cattle and its historical significance in the park, which are of interest to park visitors. However, cattle are moved into the park in November and out of the park in April, during which time there are few visitors in the park. No information is available on the number of cattle grazed in the park. The NPS has some visitor information, but it has not been analyzed. The economic effects on the ranchers and local communities were discussed. Recent socioeconomic studies were considered weak because they did not recognize secondary effects on service industries, schools, etc.

The committee visited the major grazing areas in the park with NPS and BLM personnel, ranchers, scientists from Utah State University and Brigham Young University, and others representing concerned groups or

associations. The group visited the riparian habitats along the Fremont River, Sulphur Creek, Pleasant Creek, Deep Creek, and Hall's Creek. The fouling of the water, water biology, bank erosion, and grazing effects on vegetation were discussed. Several springs used by cattle were visited and the contamination was noted. Effects on soil, including microphytic crusts, and on wildlife and vegetation were also observed during the visit. Several archaeological sites were visited, including a cave with aboriginal rock art and chipping areas. These areas have been used extensively by cattle, as indicated by manure on the ground. The committee became aware that the park's present boundaries do not always coincide with natural barriers to adequately control grazing in the park. However, the committee noted that several natural features--ridges and cliffs in and outside the park--could provide natural protection of certain areas. Discussions indicated that very little information is available on the park's soils, vegetation, and wildlife and that such information must be studied before grazing effects can be assessed.

In summary, the committee found that the problems are significant and that there are major concerns about the effect of a grazing phaseout at this park. The committee also found that very little information exists on the natural (soils, wildlife, vegetation, water) and cultural resources of the park and that research studies would be necessary to gather the information necessary to make a rational decision about a grazing phaseout at CRNP. The committee also noted that many of the problems associated with grazing at the park pertain to many grazing areas in the southwestern United States and that information from studies of the park would help in understanding the livestock management problems in the Southwest.

6

PROPOSED RESEARCH PROJECTS

INTRODUCTION

In considering its mandate from Congress, the committee developed 10 proposed studies (first option) to provide the information necessary for decisions concerning grazing impacts and alternatives to grazing at CRNP. However, the committee also considered two other options. One option is the immediate (1984) buyout of the grazing permits by the National Park Service (NPS), which would conserve the natural and historic features of the park and compensate the ranchers for their lost animal unit months (AUMs). The costs for compensation of lost grazing would have to be negotiated by the NPS. Although the committee did not study this option in detail, it would seem to be more cost effective than option one. A congressional act would be necessary to supercede Public Law 97-341 to terminate grazing, the NAS study, and to mandate the NPS to buy out the grazing permits.

The third option considered by the committee was a 2-year review of existing literature, records, and other information with cursory reconnaissance surveys of CRNP that would be carried out by 2 or 3 experienced scientists in natural resources. This level of investigation would cost about $400,000. Original or new site-specific data would not be generated in the short-term design. Rather, data reviews and the judgment and experience of recognized resource scientists and managers would be used in evaluating the impacts of grazing on natural resources at CRNP. The success of solving conflicts by this general study approach is highly dependent on the amount of coordination and cooperation that go into the study and the expertise and objectivity of the study personnel.

RECOMMENDED RESEARCH PROJECTS

The committee recommends the detailed investigation approach and 10 research projects. This approach would be responsive to the congressional mandate as spelled out in Public Law 97-341. It would also generate new information for use by national park personnel in managing all resources on CRNP, provide more substance for decisions on grazing phaseout on CRNP, and perhaps provide a study protocol for the NPS to use in resolving conflicts at other national parks. The research projects would also provide valuable information for

assessing grazing impacts on rangelands in the Southwest. The following research proposals have not been prioritized, since all the proposed research must be undertaken to provide information necessary for an informed decision to be made concerning grazing in the park.

TITLE: Livestock Use and Management Within the Park

RATIONALE: Livestock grazing within CRNP is currently managed by the Bureau of Land Management (BLM), mostly in conjunction with allotments that are contiguous park and BLM lands. Relative numbers of animal unit months (AUMs) are assigned to the park based on permitted numbers of livestock on the allotment and acres of range within the park, but little data are available on actual livestock use, numbers, and distribution within the park. The actual use is expected to vary greatly, both seasonally and annually.

Information of the actual livestock use, and of where and when the use takes place within the park is necessary to provide baseline data for the evaluation of other studies on current grazing impacts on park resources and on nonlivestock uses.

OBJECTIVES: 1. Determine actual numbers of livestock and their locations in the park at specific times.

2. Determine amount and location of forage use by livestock in the park.

PROCEDURES: To determine actual numbers of livestock and their location, regular (perhaps each 2 weeks) reconnaissance flights will be made, and livestock counts and locations will be recorded and summarized for each grazing season.

Forage utilization surveys will be made following each winter-spring grazing season to determine forage use on key species. These data will be summarized on maps and in tabular form and interpreted along with actual number data and precipitation amount and pattern.

DURATION: 4 years.

COST: $80,000.

TITLE: Inferential Studies of Nonriparian Vegetation and Soils

RATIONALE: Vegetation and soils are the basic renewable resources affecting and being affected by livestock grazing (USDI, 1983b). Welsh (1982) in a preliminary survey documents a deteriorating state of the range resources in the park. One of the charges in Public Law 97-341 is to address the issue of whether livestock grazing has substantially altered these parts of the ecosystem. Because possible impacts are probably greater in certain places and at certain times, it is necessary to sort out changes through time at various locations and to relate any changes to climatic trends, fire history, livestock grazing, and any other possible sources of impacts that may be ascertainable.

OBJECTIVES: 1. Describe range sites found at CRNP and factors affecting the current status.

2. Describe conditions in relation to potential for the major sites used by livestock (major sites to be identified in inventory of livestock use).

3. Identify the degree to which livestock grazing is responsible for the difference between current and potential on the major sites identified above in Objective 2.

PROCEDURES: 1. Describe range sites, extrapolating where feasible from Soil Conservation Service (SCS) and Soil-Vegetation Inventory Method (SVIM) data bases. Relict areas are to be utilized whenever available.

2. Extend or develop range trend guides using relict areas, fence line contrasts, grazing gradients to water, old photos, and written documents (diaries, survey records, etc.) identified with the history of the grazing project.

3. Collect new data on vegetation and soil cover (basal cover of herbaceous species and microphytes, canopy cover of woody species), soil profile descriptions to the family level, and erosion scores (in a manner similar to BLM procedures).

4. Interpret the degree of change in vegetation and soil from probable presettlement condition.

5. Correlate the degree of change with the extent of historical and recent livestock use (developed from an inventory of current livestock use) and any other evidence of effects that may remain (fire, vehicles, insects, etc.). Differences resulting from climatic variation should be factored out.

DURATION: Objective 1 is to be initiated first and will take approximately 3 years. Objectives 2 and 3 can be initiated during the third year of the study and continue until the fifth year.

COST: $180,000.

TITLE: Inventory and Census of Vertebrates and Their Habitats and Competitive Relationship with Livestock

RATIONALE: Checklists of the mammals and birds of CRNP have been developed, but they are incomplete and do not provide information on the numbers, distribution, and habitat preferences of the species. Faunal lists of cold-blooded vertebrates are not available, nor are stream surveys of fishes and their habitats. A complete description of the fauna of CRNP is the first step in wildlife studies. Competitive relationships between and interactions of wildlife and domestic livestock need to be quantified so that livestock grazing impacts can be evaluated.

OBJECTIVES: 1. Develop faunal lists and a numerical status of the vertebrates in the park with emphasis on large mammals; threatened and endangered species; and animals of cultural, historical, and economic value to the region.

2. Describe habitats used by species of special interest, with estimates of their quantity and quality.

3. Determine seasonal uses of the park by migratory species such as mule deer, elk, and bison.

4. Evaluate habitat for suitability in restoration of bighorn sheep.

5. Evaluate food availability and its uses by major herbivores, domestic and wild animals.

6. Evaluate the competitive relationship of wildlife with livestock.

PROCEDURES: A survey of vertebrates and their habitats should be the first stage in studies of wildlife resources. The larger species (e.g., deer) should be censused annually, and these censuses should be correlated with weather patterns, livestock grazing pressures, and habitat quality.

Surveys of smaller vertebrates (birds, mammals, reptiles, amphibians, and fishes) should be conducted using conventional collecting techniques. Voucher specimens should be preserved, and at least adjectival descriptions of the abundance and distribution of each species should be developed from field collections. Careful searches for cryptic and rare species should be made to determine if threatened or endangered species live in CRNP or if other species deserve special protection or management.

Maps of the habitat for animals of special interest should be made, and plots of relative numbers of animals should be used in determining livestock/wildlife interfaces. Guilds or groups of animals, rather than species, may be the level of interaction used to evaluate conflicts. Streamside or riparian species, small mammals, big game, and migratory species are examples of such groups or combinations.

Habitats on CRNP should be evaluated to determine if any plays a key role in the seasonal distribution of migratory species and whether these habitats affect the animals of socioeconomic importance

to residents of southern Utah. With data on vegetation provided by other study projects and with food habitats of the larger ungulates determined by fecal analysis, competition for food resources will be made.

DURATION: 3 years.

COST: $120,000.

TITLE: Livestock Grazing Impacts on Riparian Areas

RATIONALE: Livestock grazing in the park has affected riparian areas by removing protective plant cover, altering the kind of vegetation, and by trampling (USDI, 1983b). Livestock tend to concentrate on riparian areas, and potential impacts include: (1) altered kind and amount of riparian vegetation, (2) altered aquatic habitat, (3) water pollution (siltation), and (4) trampled banks and sides of streams and waterholes. Resultant impacts may include increased erosion and altered water quality, vegetation, aquatic life, and aesthetics. Very little information is available in the literature on livestock grazing on riparian areas.

OBJECTIVES: 1. Characterize the historical composition and structure of riparian areas.

2. Locate riparian areas and determine current water quality, riparian vegetation, aquatic life, erosion, and aesthetics.

3. Assess the impact livestock have had on riparian areas.

4. Evaluate management strategies to minimize livestock impact on riparian areas.

PROCEDURES: Obj. 1. Historical data (diaries, photographs, interviews) and relict areas adjacent to the park or in other southern Utah parks will be used to interpret the condition of riparian areas.

Obj. 2. Riparian areas will be located and mapped using aerial photographs, park information, and ground surveys. Water quality of the riparian areas will be characterized as to their chemical (i.e., nitrogen, phosphorus, potassium, heavy metals, etc.), biological (coliform bacteria), and physical (sediment) content. Water quality parameters that could be affected by livestock grazing (i.e., nitrogen, coliform bacteria, sediment, etc.) will be characterized at least prior to livestock grazing and after grazing for the duration of the study. Other parameters that may not be affected by livestock will be characterized at least once during the study. Water quality will be determined by using standard water quality sampling and analysis procedures (American Public Health Association, 1976; USDI, 1977). Existing erosion will be characterized by standard classification techniques and erosion transects. Trampling disturbances will be quantified. Vertebrates, invertebrates, and aquatic plant life will be characterized.

Obj. 3. Data collected under Objectives 1 and 2 will be used to assess the impact of livestock grazing.

Obj. 4. Several management strategies will be developed and implemented on several riparian areas. Management strategies will be monitored to determine their effectiveness.

DURATION: 4 years.

COST: $150,000.

TITLE: The Influence of Livestock Grazing on Microphytes (cryptogamic) Crusts

RATIONALE: It has been widely hypothesized that microphytic crusts in desert environments protect soils from wind and water erosion. It has been further postulated that some of the microphytes are able to incorporate atmospheric nitrogen into the soil. There is some evidence that trampling may adversely affect the crusts and may reduce any positive environmental potential these plants may have. In addition, trampling may affect the aesthetic quality of the area. Untrampled microphytes may lend the impression of a pristine, unexplored environment that could be important to the quality of a recreational experience. The actual role of microphytic crusts in the natural ecosystem of the park and the impact of livestock grazing need to be evaluated.

OBJECTIVES: 1. Determine the influence of microphytic crusts on wind and water erosion.

2. Determine how and to what extent the presence of livestock affects crusts through trampling trials at different intensities and frequencies.

3. Evaluate recovery rates of microphytic effectiveness following livestock trampling through successive follow-up monitoring.

PROCEDURES: This will be a controlled, replicated experiment with several frequencies and intensities of livestock trampling on a relict or relatively undisturbed area over a period of 3 years.

Characterization of Crusts:
Crusts will be characterized as to species composition; microrelief; soil characteristics (texture, bulk density, soil aggregates, stone organic matter, and other crust types [i.e., vesicular crusts]), and nutrient content, both beneath the crust and in eroded sediments.

Water Erosion:
A rainfall simulator is to be used to determine infiltration rates and sediment potentials.

Wind Erosion:
Wind erosion will be evaluated through a replicated series of wind erosion traps. In addition, microclimatic monitoring will be conducted at the study sites.

DURATION: 3 years.

COST: $150,000.

TITLE: Impacts of Livestock on Cultural Resources

RATIONALE: Cultural resources within the park include archaeological and historic artifacts and sites. Unsystematic observations suggest that grazing does have an impact on unprotected sites. The significance of this impact is unknown. Archaeological resources include extensive aboriginal rock art panels, habitation sites, granaries, quarry areas, chipping areas, campsites, and artifacts associated chiefly with occupation by the southern San Rafael variant of the Fremont culture from about A.D. 700 to 1275. There is evidence of concurrent, but more limited, use by members of the Anasazi culture, and there are scattered Southern Paiute rock art panels from a later period. Eighty-five archaeological sites have been identified; however, complete inventory of the park has not been accomplished. Archaeological sites tend to be along the accessible water courses.

Historic resources include horticultural landscapes, historic structures, trace trails, and historic objects associated with settlements along the Fremont River. A primary focus of the historic resource complex is the small, rural Mormon community of Fruita. Other historic resources that are not in the Fruita area include the sandstone Behunin Cabin (6 miles east of Fruita), the site of Floral Ranch about 12 miles south of Fruita, Hall's Crossing Pioneer Trail, and Burr Trail (some 45 miles south of the Fremont River).

The historic resource complex centered around Fruita is reasonably well protected from cattle. Thus, the primary emphasis of this study should be on an evaluation of the impacts of livestock on archaeological sites and outlying historical sites.

OBJECTIVES: 1. Inventory and describe existing conditions (i.e., size, distribution of artifacts, and signs of trampling) at selected sites representing significant archaeological and historic resources with emphasis on habitation sites, campsites, granaries, and chipping areas.

2. Monitor changes in the archaeological and historic resources during the duration of the study.

3. Identify probable causes of the changes such as livestock trampling, vandalism, and recreational use.

4. Describe and evaluate the direct and indirect effects of grazing and other activities on archaeological and historic resources, including the effects on artifact attributes, locus, and numbers.

PROCEDURES: Cultural resource sites will be sampled and data collected over a period of 4 years, including an initial inventory, and following alternate years, 2 additional data collection periods. If historic Southern Paiute sites other than rock art panels are identified, they should be included in the sample. This study will be coordinated with the grazing and riparian studies for purposes of determining patterns of cattle use in and around the study sites.

DURATION: 4 years.

COST: $100,000.

TITLE: Impacts of Livestock on Visitor Use

RATIONALE: This study will investigate and evaluate the effects of livestock grazing on visitor-use patterns within the park and on visitor satisfaction with the park. No substantive information exists on the interaction of visitors and livestock grazing. However, anecdotal information has been reported to the Park Service from back-country users that they find the most desirable camping areas "carpeted with manure" and the waterholes polluted, areas most subjected to livestock grazing. While less than 20 percent of visitors to the area report CRNP as their primary destination, they do indicate greater satisfaction with their visit to this park than do visitors to other parks in the region. However, the vast majority of the visitors confine their activities to the headquarters and the cultural resources within that area and to the vicinity of Utah State Highway 24, areas generally protected from grazing. Only 2 percent drive into the south district, 1 percent drive into the north district, and 1 percent participate in back-country camping. Since livestock grazing occurs in winter and spring, there may be little direct impact of livestock on visitor use, other than visitors watching the spring round-up.

OBJECTIVES: 1. Assess users' expectations of their visit prior to visitation; experiences in and perceptions of the park during their visit, and post-visit evaluations of their experiences.

2. Assess nonusers' perceptions of and attitudes toward the park.

3. Assess the effects of livestock on recreational sites (land and water).

4. Identify user attitudes and satisfactions with respect to livestock grazing.

PROCEDURES: Onsite visitor surveys should be conducted throughout the visitor season at significant areas within the park such as the entrance, the headquarters area, the cultural attractions, and the back-country camping sites. A mail or telephone survey should be conducted to assess post-visit perceptions and nonuser perceptions of and attitudes toward the park. This study will be coordinated with the grazing and riparian studies for purposes of determining cattle use patterns in and around the recreational study sites and the impacts of cattle on the related land and water resources.

DURATION: 2 years.

COST: $70,000.

TITLE: Socioeconomic Impact of a Phaseout of Livestock Grazing

RATIONALE: Ranchers in Wayne and Garfield counties have very few options for adjustments in grazing as a result of loss of grazing rights on federal lands. Each rancher will be affected in some way if the grazing in CRNP is lost. The effects might range from a reduction in herd size equal to the loss of grazing in the park to the added cost of finding and supplying alternative forage. Most ranchers have a rather complex seasonal grazing program that includes private, BLM, FS, and state land resources. Options for grazing resources are limited for most of these ranchers and can be used only to offset a limited loss of grazing, whether the loss is caused by the NPS or other federal agencies. For example, if a rancher uses his options to offset grazing cuts by BLM, the same options cannot be used to solve problems caused by the loss of park grazing. Ranchers may be able to change the livestock production system they have to offset the need for winter grazing. Increased forage production from private and/or public lands may be possible if range improvements are initiated by the federal government or from private investments.

OBJECTIVES: 1. Determine the economic impact on permittee ranchers of a phaseout of grazing at CRNP.

a. Determine the existing supply and cost of substitute forage available in the area to ranchers to replace that lost in the park.

b. Determine the physical and economic feasibility of increasing forage production on private lands owned by permittees and on other public land areas to offset the loss of forage in the park.

c. Determine the extent of actual and proposed grazing cuts on other public land permits held by permittee ranchers.

2. Determine the biological and economic feasibility of increasing forage production from private and/or public lands to offset the loss of grazing at the park.

3. Determine the economic feasibility of changing the ranchers' livestock production systems to alleviate the seasonal forage shortage caused by loss of grazing at the park.

4. Determine the economic impact on local county and state economies of a phaseout of grazing at CRNP.

PROCEDURES: A list of all ranchers who graze their livestock at CRNP should be compiled. Data to construct a complete ranch budget should be gathered from each rancher. These budgets should include a year-round forage requirement chart. An inventory of the forage resources available for each ranch should be made. Alternative seasonal uses of each of these forage resources should be determined. A personal interview should be made with each rancher to obtain the data needed to compile a complete ranch budget. These budget data will be used as the foundation for evaluating the economic impact of a phaseout of grazing at the park.

A review of each rancher's other sources of grazing should be included in the study. For example, most of the ranchers who run cattle in the park have BLM grazing permits in either the Henry Mountain or Parker Mountain grazing units. Environmental impact statements were recently completed on these areas (USDI, 1979b, 1983a). Changes in grazing are contemplated as a result of these studies. The review of grazing should include a summary of changes in grazing use on all BLM, FS, and state leases over the 10-year period prior to the initiation of the study.

Economic impacts that should be considered include several alternative adjustments to a loss of grazing at the park. At one end of the spectrum, one should consider the impact of ranchers having to reduce the size of their herds if park grazing rights are lost. Other impacts should be considered, such as adjustments in ranch organizations where alternative forage resources are substituted for the loss of grazing at the park.

One possible change in livestock production that should be investigated is a reduction in the number of breeding cows and an increase in the number of yearlings. If this were done, the rancher would have fewer cattle to winter feed, which would offset the effects of a loss of grazing at the park. A rancher could keep more calves over as yearlings or could purchase yearling cattle in the spring and run them through the summer. It is important that changes in ranch income be carefully estimated from these changes in livestock management. Changes in risk associated with buying yearlings for summer grazing should be taken into account. The ranch's capital requirements should be evaluated if ranchers need to borrow money to buy yearlings each year.

If grazing rights at the park are lost, some ranchers may be able to maintain their cow herds by feeding hay to part of the herds during the winter. The economic feasibility of such a proposal should be evaluated.

Interviews should be conducted with ranchers and public land agency (BLM, FS, NPS) personnel to determine the possibilities of improving public lands to replace grazing lost in the park. Such improvements should include brush control, seeding, trail construction, fencing, and water development. The same range improvement possibilities should be considered by ranchers for their private lands. In addition, private pasture and cropland resources should be evaluated for their potential for improvement by leveling, improved irrigation methods, land clearing, and fertilization.

Since we are dealing with a relatively small number of cattle, when viewed from a state or national perspective, research efforts should be concentrated on secondary effects on the local and county economies. Local county input/output models should be constructed or adapted to fit the local situations in Wayne and Garfield counties. From these models the secondary economic impacts from a loss of park grazing should be estimated.

In connection with the local input/output studies, the relationships that exist among ranchers' off-ranch labor and the labor requirements of the BLM, FS, local school district, and

recreation-related businesses (i.e., cafes, motels, and service stations) should be determined. Because ranching keeps families in the county year-round, the families provide a significant source of employment (full- and/or part-time).

A state of Utah input/output table (Bradley and Elested, 1975) exists that lists the range livestock industry as a separate industry. This table could be used to measure the secondary impacts at the state level of a loss of grazing in the park.

DURATION: 3 years.

COST: $150,000.

TITLE: Inventory of Physical Improvements and Opportunities for Boundary Changes

RATIONALE: Information on the location and condition of water for livestock use and fence developments within CRNP are needed. The opportunity of changing the locations of these improvements by piping water and adjusting boundaries and proposed fencing is a requirement for developing realistic allotment management plans during grazing phaseout. Location of existing water developments will also help in the design of utilization studies within the park and interpretation of the impact of livestock on natural resources and visitor use. The NPS has described the need for fencing and boundary changes studies in their Resource Management Plan (USDI, 1983b).

Some boundary adjustments between the BLM and the park have been considered to reduce the amount of fencing to prevent cattle use in the park after phaseout. An evaluation of these boundaries will be made with an objective of minimizing the amount of fence required, minimizing visual impact of the fencing for the park, and providing for realistic livestock management on the remaining allotment.

OBJECTIVES: 1. Determine the locations of existing water and fence improvements.

2. Evaluate alternative locations for boundary fences so as to minimize the amount of fencing and its visual impact, and to minimize the impact on allotments after phaseout.

PROCEDURES: Review BLM and NPS records to determine locations of existing improvements. Interview local rancher permittees and obtain their help in the location of range improvements. Make a reconnaissance of the rangelands inside the park and locate each of the improvements. The locations of these improvements should be designated on maps for use by the NPS and other interested parties. The possibility of moving water for livestock from inside the park to areas on BLM grazing allotments should be considered where there is limited water on BLM allotments. Consult with the BLM, NPS permittees, and other interested parties to determine alternative boundary locations and the visual impact of fencing.

DURATION: 1 year.

COST: $10,000.

TITLE: Social and Cultural History of Grazing

RATIONALE: In addition to the dominant geologic and topographic features that determine the natural science and scenic beauty of CRNP, cultural resources have been identified as part of the resource base to be managed and interpreted to the public. Notable among these are evidence of the prehistoric Fremont Indian residence and the remains of the late nineteenth/early twentieth century Mormon agricultural community of Fruita.

While neither Fruita nor the Fremont residence appears to have been extensively researched, there does exist a modest information base (see USDI, 1982; Davidson, 1983). Such is not the case for the history of grazing in the park and its environs, nor does grazing play a significant part in park management or interpretive programs.

To some local ranchers and elected officials, grazing and trailing of cattle are of historical significance and are a cultural resource meriting the same recognition as the fruit trees in Fruita. Residents and ranchers in the CRNP area appear to view grazing as a unique way of life, a view that is shared and expressed elsewhere in the Southwest. If grazing is part of the park cultural heritage, consideration could be given to management and interpretive programs that parallel those for Indian and Mormon history and cultural resources.

OBJECTIVES: 1. Document the history of grazing in and adjacent to CRNP.

2. Investigate the role grazing has played in shaping lifestyles in the park and its environs and in contributing to an identifiable local or regional culture.

3. Evaluate the historical significance of grazing and trailing within the park and its environs.

PROCEDURES: This study will be based on a review and analysis of historical documents, such as diaries, journals, land survey records, newspapers, photographs, NPS records, transcripts of oral histories, and interviews with long-term residents of the area. The study is to be coordinated with the study on vegetation and soil changes and should provide information, such as old photographs showing vegetation and land form conditions, that might be useful for ecological interpretations.

DURATION: 1 year.

COST: $20,000.

Proposed Research Projects

Project	Duration (years)	Cost ($)
1. Livestock Use and Management Within the Park	4	80,000
2. Inferential Studies of Nonriparian Vegetation and Soils	4	80,000
3. Inventory and Census of Vertebrates and Their Habitats and Competitive Relationship with Livestock	3	120,000
4. Livestock Grazing Impacts on Riparian Areas	4	150,000
5. The Influence of Livestock Grazing on Microphytic (cryptogamic) Crusts	3	150,000
6. Impacts of Livestock on Cultural Resources	4	100,000
7. Impacts of Livestock on Visitor Use	2	70,000
8. Socioeconomic Impact of a Phaseout of Livestock Grazing	3	150,000
9. Inventory of Physical Improvements and Opportunities for Boundary Changes	1	10,000
10. Social and Cultural History of Grazing	1	20,000
	TOTAL	930,000

7

ORGANIZATION AND IMPLEMENTATION PROCESS

THE ROLE OF THE NAS COMMITTEE, FEDERAL AGENCIES, AND THE PUBLIC SECTOR

The present 8 members of the Phase I Committee on Grazing Phaseout at Capitol Reef National Park will be augmented with 2 to 4 additional members to give added expertise to those studies to be undertaken in Phase II. The committee will meet twice each year with at least one meeting at CRNP to monitor the studies being carried out by contractees, and to prepare an annual report and a final report as specified by Congress. Representatives from the NPS, BLM, and the FS will be invited to meet with the committee to provide background and current NPS study information. Local ranchers also will be invited to meet with the committee to provide information on their activities. When appropriate, the committee will communicate with state and local government officials and officials of national and local conservation organizations. The committee will keep relevant congressional staff apprised of its activites.

IMPACT ASSESSMENT AND MANAGEMENT ALTERNATIVE STUDIES

The committee (after discussing the Phase I report) will develop a plan of action for implementing the following projects presented in the Phase I report (the committee at its discretion may add additional studies):

- Livestock use and management within the park
- Inferential studies of nonriparian vegetation and soils
- Inventory of vertebrates and their habitats and competitive relationship with livestock
- Livestock grazing impacts on riparian areas
- The influence of livestock grazing on microphytic (cryptogamic) crusts
- Impacts of livestock on cultural resources
- Impacts of livestock on visitor use
- Socioeconomic impact of a phaseout of livestock grazing
- Inventory of physical improvements and opportunities for boundary changes
- Social and cultural history of grazing

The NPS will develop Requests for Proposals (RFPs) with the help of the committee for each of the proposed studies. Besides the regular Federal Procurement Regulations, the RFPs should include project rationale, objectives, suggested procedures, and reporting requirements. The RFPs will be sent to knowledgeable scientists for their response. The committee will then evaluate the proposals in response to the RFPs basing its evaluation on scientific approach, scientific and technical personnel, management, and cost. The committee will recommend to the NPS those proposals that best address the needs of the overall study. Contracts for the studies will be negotiated by the NPS. Once the studies are under way, the committee will monitor the progress by onsite visits as well as by review of the interim progress reports and the final reports of each study.

In preparing its final report, the committee will assess the information from the studies to (1) determine the historic and current impacts of grazing on the natural ecosystems and cultural resources of CRNP, (2) determine the impact of grazing on visitor use of the park, (3) evaluate alternatives to grazing within the park, including means to increase grazing-carrying capacity on adjacent BLM lands, and (4) determine the economic impact on grazing permit holders and on local economies if such permits were terminated. This information will be synthesized and recommendations or recommended options will be formulated for 1) maintaining or phasing out grazing in the park; 2) managing the natural resources of the park.

REPORTS

In accordance with Public Law 97-341, An Act to Provide for a Study of Grazing Phaseout at Capitol Reef National Park, the committee will transmit to Congress and to the director of the NPS progress reports by January 1 of each year after the initiation of the study and a final report by January 1, 1992.

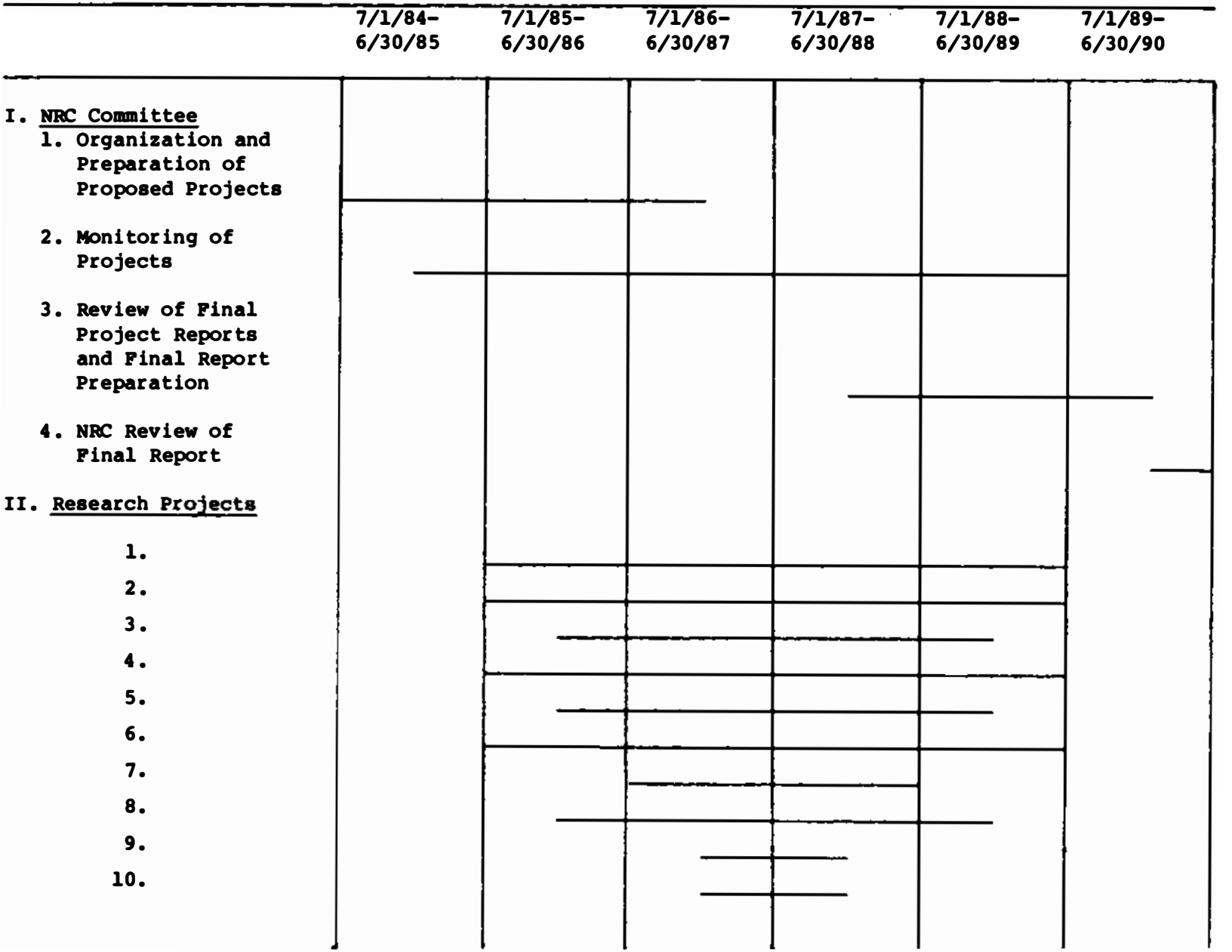
Reports resulting from this effort shall be prepared in sufficient quantity to ensure distribution to the sponsor, committee members, and to other relevant parties in accordance with NAS policy. Reports will be made available to the public without restrictions.

BUDGET

The monitoring and report preparation activities of the committee from July 1, 1984, through June 30, 1990, are estimated to cost $350,000. These funds would be provided by a contract in 3-year increments between NAS and the NPS.

The approximate cost for the 10 proposed research projects is $930,000, which would be provided by the NPS by contract to the individual scientists undertaking the studies.

Time Schedule



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