

Chapter 3

Affected Environment



CHAPTER 3 - AFFECTED ENVIRONMENT

INTRODUCTION

The Proclamation establishing the Monument identified an array of scientific and historic resources that are to be protected. These resources include objects of biological, geological, paleontological, archeological, and historic interest. The Proclamation also requires an analysis showing the extent to which water is necessary for the care and protection of the resources.

This chapter contains a description of the existing physical, biological, cultural, social, and economic characteristics and resources of Grand Staircase-Escalante National Monument. The description of these resources serves as the baseline for analyzing and determining the effects of the various alternatives on resources. These resource descriptions are discussed only in as much detail as needed to analyze the effects of plan implementation. The affected environment is described according to the various Monument resources.

LAND OWNERSHIP

Grand Staircase-Escalante National Monument covers 1,684,899 acres of Federal land in south-central Utah. The Utah School Institutional and Trust Lands Administration manages about 175,000 acres of surface rights and 200,000 acres of mineral rights within the Monument boundary. About 15,000 acres of

land within the Monument boundary are privately owned. Approximately 68 percent of the Monument is in Kane County, while the remaining 32 percent is in Garfield County. About 49 percent of Kane County and 18 percent of Garfield County lie within the Monument boundary (Figure 3.1) (Map 3.1).

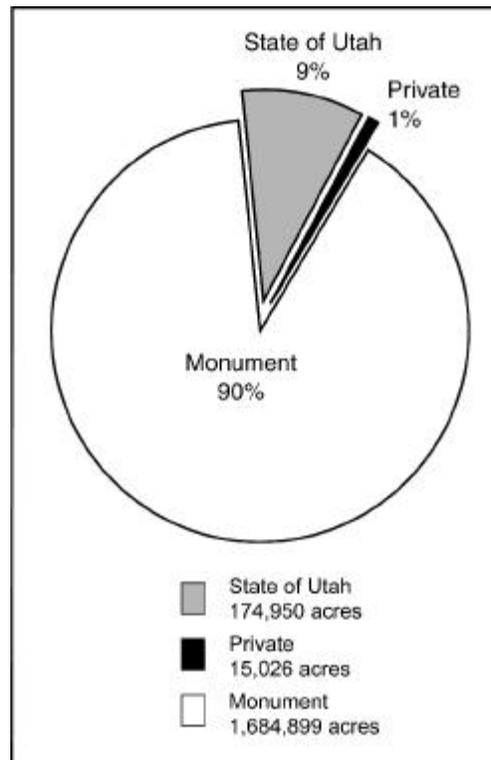


Figure 3.1 Land Ownership

The Monument is primarily surrounded by other public lands. Dixie National Forest borders the Monument to the north, Capitol Reef National Park to the east, Glen Canyon National Recreation Area to the east and southeast, Bryce Canyon National Park to the northwest, and other Bureau of Land Management (BLM)-administered lands to the south and west. Kodachrome Basin State Park also adjoins the Monument.

GEOLOGY AND PALEONTOLOGY

“...The monument is a geologic treasure of clearly exposed stratigraphy and structure...The monument includes world class paleontological sites...” (Proclamation 6920, 1996)

Regionally, the Monument is divided into three broad landscapes described (from west to east) as the Grand Staircase, the Kaiparowits Plateau, and the Escalante Canyons (Map 3.2). Approximately 270 million years of history is revealed in the exposed rocks of the Monument. The oldest rocks record a time when the equator angled northeast from southern California past the southeastern corner of Utah. The area of the Monument was a marginal lowland of streams, flood plains, and tidal flats. The sea lay to the west, but occasionally spread east across the area, leaving beds of limestone with sea shells,

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sponges, and other fossils between red beds of sandstone and mudstone. The Hermit, Toroweap, Kaibab and Moenkopi Formations, which crop out in the Circle Cliffs and at Buckskin Mountain, record events covering the first 35 million years of geological history in the Monument (Map 3.3)(Figure 3.2).

Remarkable specimens of petrified wood, such as logs exceeding 90 feet in length, occur in the Triassic Petrified Forest Member of the Chinle Formation found in the Circle Cliffs area. Fossils of other plants, fish, amphibians, reptiles, tracks of early dinosaurs, and freshwater clam and gastropod shells also give hints of this period of geologic history in the Monument. Beds of the Moenkopi, and the ledge formed by the Shinarump Member of the Chinle Formation, form the Chocolate Cliffs of the Grand Staircase in the southwestern part of the Monument.

During the late Triassic, this region was again eroded before being covered by great sand dunes in early Jurassic time (208 to 187 million years ago). Early Jurassic rocks of windblown sand and stream deposits form the Vermilion (Wingate/Moenave and Kayenta Formations) and White cliffs (Navajo Sandstone) of the Grand Staircase, which comprise most of the prominent erosional features in the Escalante Canyons area. Though generally void of fossils, these rocks occasionally exhibit

fossilized tracks of reptiles, including small to medium sized dinosaurs.

The middle Jurassic Carmel Formation is composed of color-banded layers of sandstone, limestone, calcareous shale, siltstone, gypsum, and mudstone deposited in and near the southern edge of a shallow sea. Limestone beds contain marine fossils of mollusks, brachiopods, crinoids, coral, and algae. As the sea retreated, dunes (Entrada Formation) formed on top of the Carmel Formation. The Late Jurassic Morrison Formation, deposited in lakes and east flowing streams, is found eastward and southeastward of the Kaiparowits Plateau. The Morrison is absent west of the Kaiparowits Plateau, removed by erosion prior to Late Cretaceous time. Middle and Late Jurassic sedimentary formations and erosional periods span time from about 180 to 144 million years ago.

After 45 million years of erosion and non-deposition during Late Cretaceous time, mountains rose to the west and provided sediments for streams flowing east into a great continental sea. This sea covered most of the interior continental United States from Alaska to the Gulf of Mexico. As sediment accumulated, the shoreline area sagged. This caused the sea to oscillate east to west for 30 million years at the end of the Cretaceous Period. This created a series of alternating terrestrial-marine deposits. The Dakota Formation was deposited on remnants of either the Morrison Formation (east)

or Entrada and Henrieville Sandstone (west), and is a mix of stream sediments and near-shore marine deposits. The Dakota was covered by marine clays of the Tropic Shale. Deposition continued, becoming more terrestrial through time, resulting in the Straight Cliffs Formation, the Wahweap Formation, and the Kaiparowits Formation. These formations are seen on and around the Kaiparowits Plateau and form the Gray Cliffs of the Grand Staircase.

Extremely significant fossils, including marine and brackish water mollusks, turtles, crocodylians, lizards, dinosaurs, fishes, and mammals have been recovered from the Dakota and Tropic Shale, and the Tibbet Canyon, Smoky Hollow, and John Henry Members of the Straight Cliffs Formation. Within the Monument, these formations have produced the only evidence in our hemisphere of terrestrial vertebrate fauna, including mammals, of the Cenomanian-Santonian Ages. This sequence of rocks, including the overlying Wahweap and Kaiparowits Formations, contains one of the best and most continuous records of Late Cretaceous terrestrial life in the world.

Map 3.1: Land Status

-  Principal Communities
-  Monument Boundary
-  Highways 89 & 12
-  Other Roads
-  BLM
-  Forest Service
-  Indian Lands
-  National Park Service
-  Private
-  State

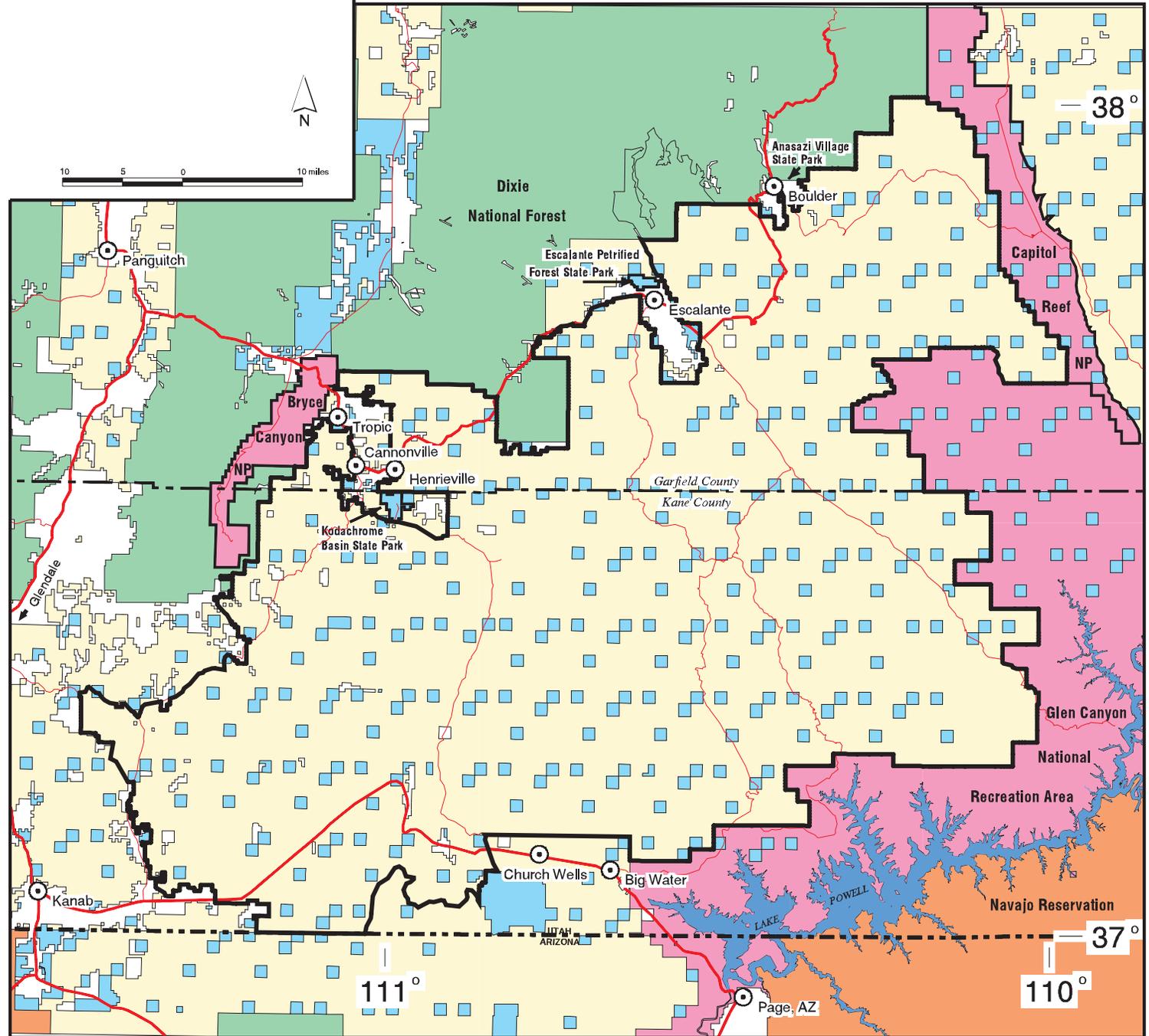


Location Map

Data has been gathered from a variety of sources and has been integrated to provide a planning context. The data shown outside the Monument may not have been verified. This map represents available information, and should not be interpreted to alter existing authorities or management responsibilities.



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Map 3.2: Physiographic Regions



-  Principal Communities
-  Monument Boundary
-  Physiographic Region Boundaries

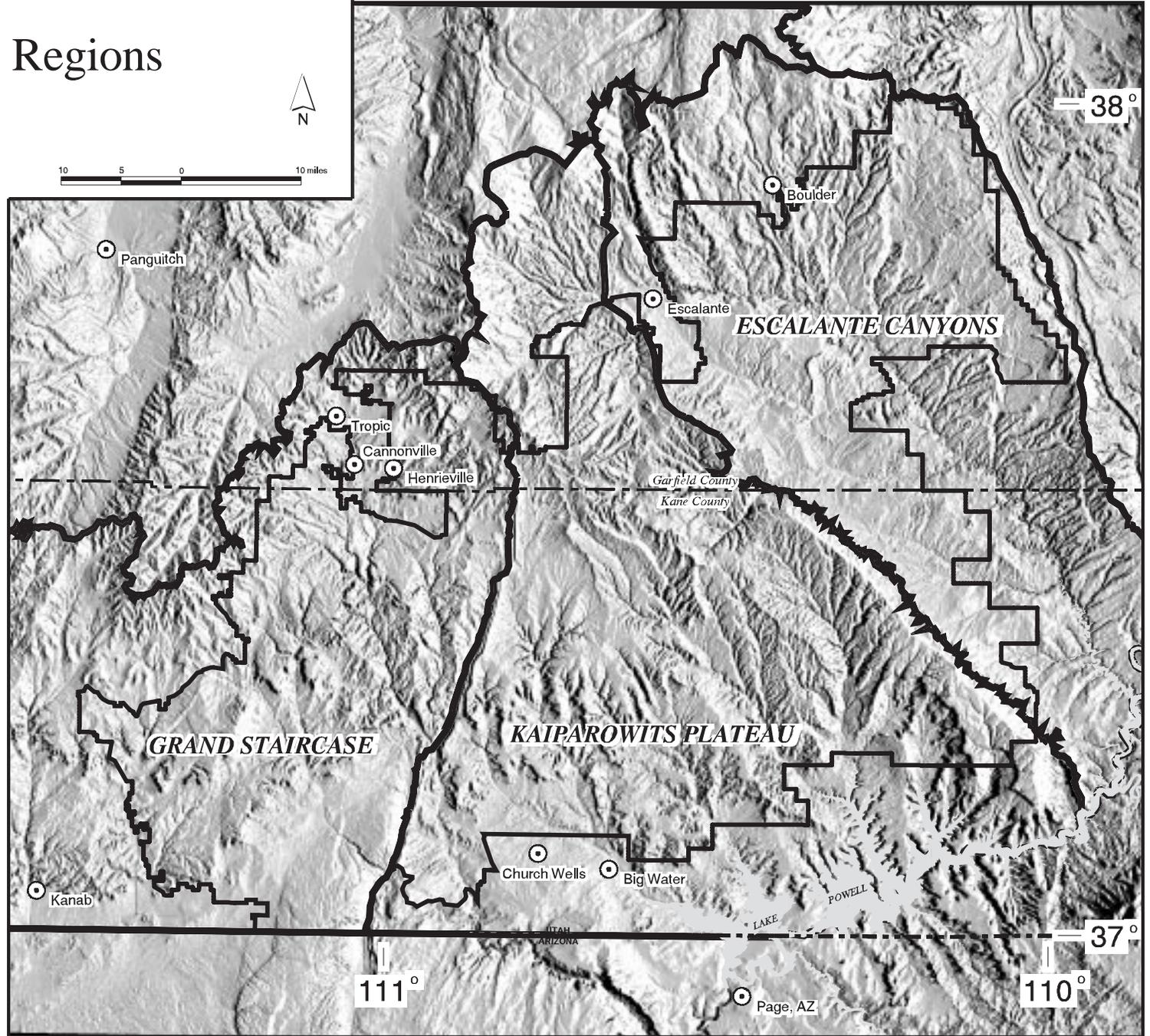


Location Map

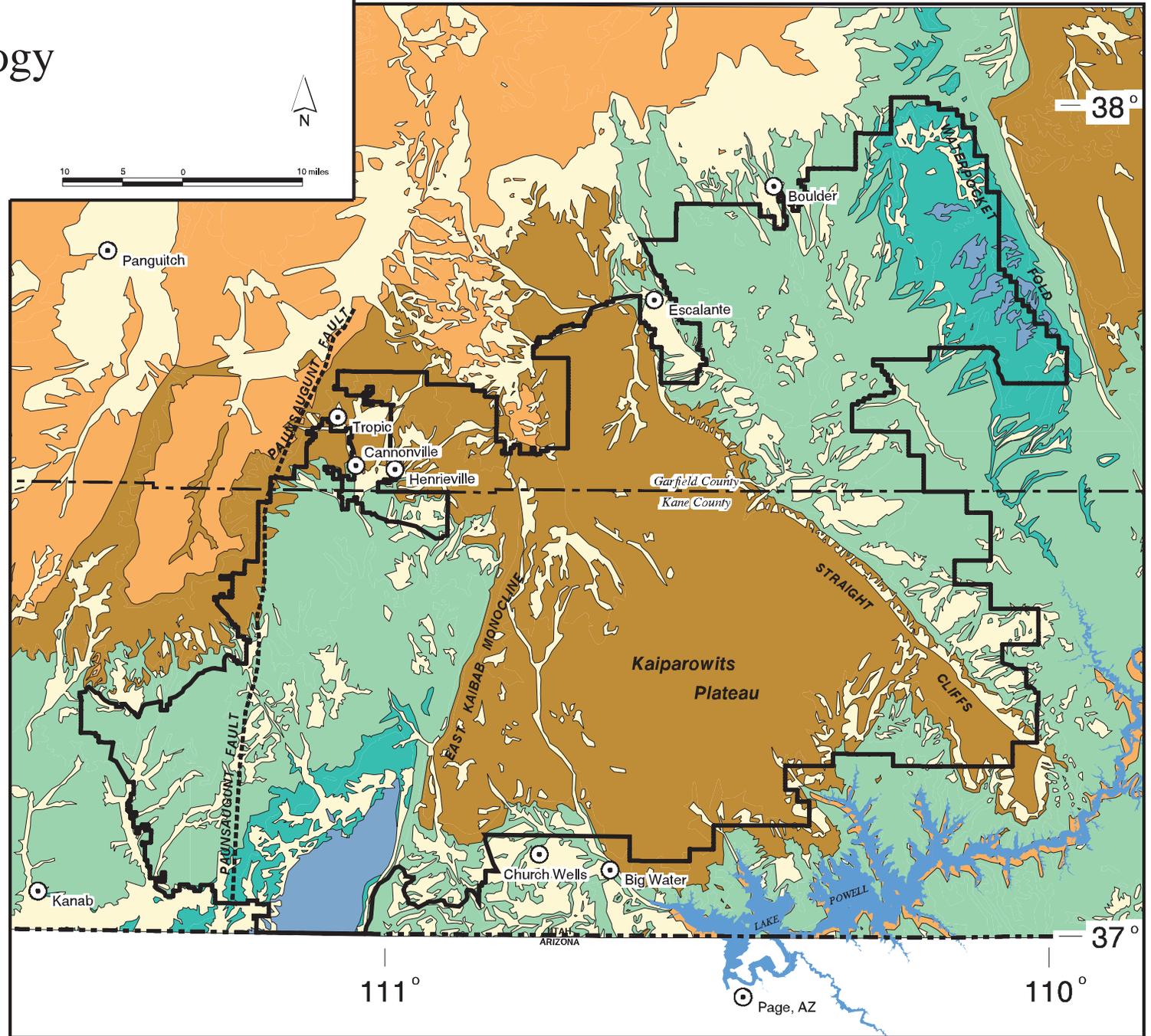
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Map 3.3: General Geology



- ⊙ Principal Communities
- ▬ Monument Boundary
- Quaternary
- Tertiary
- Cretaceous
- Jurassic
- Triassic
- Permian



Location Map

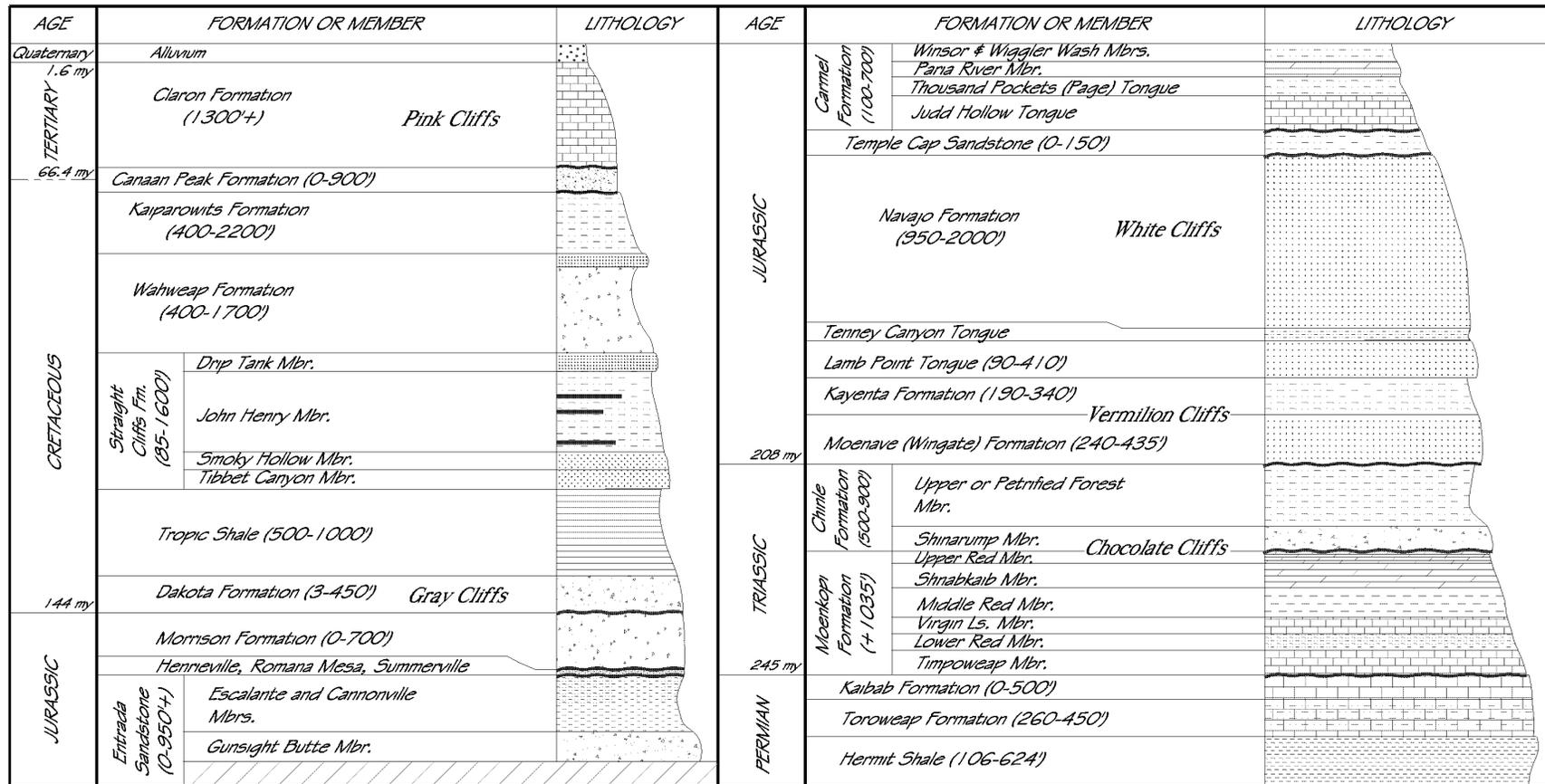
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Figure 3.2 Generalized Stratigraphic Column, Grand Staircase-Escalante National Monument (After Doelling and Davis, 1989)



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The Canaan Peak Formation straddles the boundary between the Cretaceous and Tertiary Periods. The beginning of the Tertiary Period marked the end of marine environments in or near the Monument. Several large lakes occupied an area from southwestern Wyoming to southwestern Utah. The Claron Formation, seen as the Pink Cliffs at Powell Point and Bryce Canyon, was deposited in lakes during this time. Uplift of the Colorado Plateau over the last 15 million years activated the erosional cycle, which uncovered geologic formations dating back 270 million years and created the present landforms. Fossils are known from all but three of the 20 sedimentary formations exposed in the Monument. Evidence of Pleistocene (< 1.6 million years) fauna may also occur in the Monument (Appendix 10).

Today, the region is relatively flat-lying strata, locally warped along north-south oriented folds that together form the three broad landscapes found inside the Monument. Many of these folds are anticlines, or geological upwarps opening downward, with one steeply dipping side, or limb, often called a monocline, and one gently dipping side. The east and west geologic boundaries of the Monument are the Waterpocket Fold, comprising the east limb of the Circle Cliffs anticline and the Paunsaugant fault, respectively.

The generally northward-tilted strata of the Monument are structurally separated by the East Kaibab monocline (The Cockscomb), where strata dip up to 80 degrees. The Grand Staircase portion of the Monument lies west of The Cockscomb. Between The Cockscomb and the Straight Cliffs lies the Kaiparowits Plateau, a wedge-shape topographic highland which is also a geological basin comprised of Cretaceous-age rocks. Within the Kaiparowits Plateau numerous smaller but similar folds (Smoky Mountain, Upper Valley, Reese Canyon, and Escalante anticlines) are also present. Northeast of the Straight Cliffs and extending to the Waterpocket Fold lie the Escalante Canyons, a landscape typified by “slickrock” benches and many deeply dissected canyons.

Since the late 1800s geologists have studied the exposed rocks and surficial deposits within what is now the Monument. Geologic studies of southern Utah were first done during the course of government surveys by J. W. Powell, J. C. Fremont, and G. M. Wheeler. C. E. Dutton prepared the initial studies of the Southern Utah High Plateaus. H. E. Gregory later presented the geology and geography of the region through his papers on Zion National Park, the Paunsaugant Plateau, and the Kaiparowits Plateau.

Geologic studies in the region have been made in conjunction with evaluations of mineral

resources, particularly coal resources in the Kaiparowits Plateau. These studies are identified below.

1. The U.S. Geological Survey published a series of 1:125,000 scale maps illustrating various geologic aspects of the Kaiparowits Plateau (Price, 1977a, 1977b, 1978, 1979; Carter and Sargent, 1983; Hansen, 1978a, b; Sargent and Hansen, 1980, 1982; Williams, 1985; and Lidke and Sargent, 1983).
2. Hettinger and others (1996) combined all previous studies on the Kaiparowits Plateau and presented the U.S. Geological Survey's overall evaluation of the coal resources in the Kaiparowits coal field.
3. Stratigraphic studies by Peterson (1969) and Bowers (1972) led to the current formal divisions of Upper Cretaceous and Tertiary strata in the Monument region.
4. Sedimentological investigations by various workers (Shanley and McCabe, 1991; Shanley et. al., 1992; McCabe and Shanley, 1992; Hettinger et. al., 1994; and Hettinger, 1995) demonstrated the detailed relationships between coal-bearing continental and related marine strata and provided sequence stratigraphic divisions for the Upper Cretaceous rocks.
5. Doelling and Graham (1972) studied the coal resources of the Kaiparowits coal field and reported the results of their surveys of 24, 7.5-minute quadrangles.

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6. Doelling and Graham (1972) also reported the results of similar work for several quadrangles in the Alton coal field near Bryce Canyon.
7. Doelling (1975) prepared a detailed report on the *Geology and Mineral Resources of Garfield County*.
8. Doelling and Davis (1989) emphasized geology, mineral resources, and geologic hazards in a report on *The Geology of Kane County*.

There are 20 sedimentary geological formations found within the Monument. These range in age from Permian (270 million years ago) to late Cretaceous (65 million years ago). Fossils are known from all but three of these formations. Quaternary sediments (younger than 1.8 million years) also occur in the Monument and have a potential for Pleistocene fossils.

Most of the recent paleontological research in the Monument has focused on Cretaceous formations of the Kaiparowits Plateau. Over the last two decades, researchers (Cifelli and Madsen, 1986; Cifelli and Eaton, 1987; Eaton, 1987a, 1987b, 1988, 1991, 1993a, 1993b, 1995; Eaton et. al., 1987; Kirkland, 1987; Eaton and Cifelli, 1988; Cifelli, 1990a, 1990b, 1990c; Cobban, 1993; Cifelli and Johanson, 1994; and Eaton et. al., 1997) have brought attention to the paleontological importance of Late Cretaceous formations

within the Monument. The Grand Staircase and Escalante Canyons regions of the Monument expose formations of Permian, Triassic, and Jurassic age (Davidson, 1967; Doelling and Davis, 1989; Doelling, 1975; and Gillette and Hayden, 1997).

The BLM and Utah Geological Survey (UGS) entered into a Cooperative Agreement in an effort to better understand the abundance, distribution, and importance of fossils in the Monument. The project utilizes a UGS data base to relocate previously known paleontological sites in the Monument.

Gillette and Hayden (1997) published a preliminary inventory of paleontological resources within the Monument a few months after the Monument was established. They concluded that “Knowledge of the paleontology of all the formations in the monument is still rudimentary, as indicated by the recent intensified interest in the fossils of the Monument and vicinity. For all formations, fieldwork, museum curation, and laboratory analysis are essential.”

Fossil collecting by professionals and non-professionals in the area now included in the Monument has a long history. Only recently has the need to manage paleontological resources on public lands been recognized.

Following the establishment of the Monument, the Secretary of the Interior issued Interim Guidance

which closed Monument lands to collections except where intended for legitimate scientific purposes. Past practices have often treated fossil resources (such as petrified wood) as mineral materials to be managed as rip-rap or building stone. Prior to monument designation, BLM policy allowed for collection of petrified wood and invertebrate fossils (U.S. DOI, 1996 a,b,c). Fossils of invertebrates and trace fossils (tracks) are also known to have been collected on lands now within the Monument. Rockhounds collected a variety of minerals and invertebrate fossils including: petrified wood, agate, concretions, clinkers, gypsum, jasper, septarian nodules, pelecypods and cephalopods.

ARCHAEOLOGY

“...Archaeological inventories carried out to date show extensive use of places within the monument by ancient Native American cultures. The area was a contact point for the Anasazi and Fremont cultures, and the evidence of this mingling provides a significant opportunity for archaeological study...” (Proclamation 6920, 1996)

Archaeological sites are fragile, non-renewable evidence of human influence on the landscape. Only 75,559 acres (less than 5 percent of the Federal lands on the

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Monument) have been inventoried for cultural resources, with 2,764 sites recorded to date.

Human use of the lands within the Monument has been documented for the Paleo Indian period, approximately 11,000 years ago. The end of this period was brought on by shrinking ice caps and major environmental changes in flora and fauna. The Archaic period (from about 7,000-500 B.C.) was characterized by nomadic hunters and gatherers who roamed the region on seasonal rounds. Limited evidence has been found on the Monument for this period. By at least 500 B.C., Basketmaker, Anasazi, and Fremont permanently settled in the region. Throughout their tenure these people continued traditions of hunting and gathering but relied more and more on agriculture as time passed. By 1300 these people had moved to the south and east, aggregating into larger villages; most likely at Hopi, Zuni, Laguna, Acoma, and the Rio Grande Pueblos. Scientific evidence for additional Native American Indian use of the Monument include the Paiute occupation by at least A.D. 1350. The Paiute practiced limited agriculture and utilized the entire Monument area for hunting and seasonal gathering rounds. Even later, more sporadic use of the Monument by the Navajo is indicated, but much less material evidence has been documented related to this culture.

Archaeological and historic sites are fragile, non-renewable, deteriorating resources. The Monument holds exceptional research opportunities for use and development of stabilization and conservation techniques and methods, as well as for understanding cultural and temporal adaptations by people to this landscape.

The most sensitive sites are rock art sites, rock shelters, sites with standing walls, wooden structures, and traditional cultural properties. These sites contain important information and perishable organic materials not found at other locations. Other significant sites include clusters of unique sites that represent contact between the Fremont and Anasazi in the Kaiparowits region.

Specific research questions include, but are not limited to: (1) the Fremont/Anasazi relationship, (2) the evolutions of agriculture in the American Southwest, and (3) cultural and social studies in association with paleontology, botany, wildlife, interests, and interfaces. Moreover, the "...cultural resources discovered so far in the Monument are outstanding in their variety of cultural affiliation, type and distribution..." (Proclamation 6920, 1996).

Because of the size and diversity of the landscape, the Monument may provide the geographic context to analyze site distribution data on the scale necessary to identify Anasazi and Fremont settlement patterns. We may also

begin to understand regional site distribution patterns (incorporating data from adjacent lands). We can define their relationship with the environment in order to ultimately model the adaptive strategies employed by prehistoric peoples.

Human history is of interest to scientists and visitors alike. There are approximately 2,800 prehistoric sites in the Monument. These sites attract visitors to the area. There is also high interest in outfitter/guide tours to archaeological sites. Limited interpretation or information regarding site etiquette is currently available. Patrols and law enforcement efforts are also limited.

The Utah State Comprehensive Outdoor Recreation Plan (SCORP, 1992) includes the goal to "stop destruction and vandalism of...cultural, historic, and prehistoric resources in the State." Objectives associated with the State's goal are to:

1. Strongly encourage education programs for the public. These programs will assist the public in awareness of the importance of these sites so that vandalism can be reduced and controlled.
2. Encourage training and educational programs for personnel involved with historic parks and resources.

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3. Implement additional disabled access provisions for both facilities and opportunities at historic sites (1992:335).

Contemporary Native American Indians recognize some sites and landscapes that are important to their cultural continuity today. These Traditional Cultural Properties and sites of tribal significance need to be managed sensitively in the context of expected increases in recreation demands and continued livestock grazing. The issues of protection of site location and sensitive information is of major concern to the tribes. Of particular interest to Native American Indians are concerns regarding collection of medicinal plants, piñon nuts, wood gathering, hunting, and access. Consultation is underway with the Kaibab Paiute, Paiute Tribe of Utah, San Juan Paiute, Hopi, Navajo, and Zuni groups.

HISTORY

“...The monument has a long and dignified human history; it is a place where one can see how nature shapes human endeavors in the American West, where distance and aridity have been pitted against our dreams and courage...” (Proclamation 6920, 1996)

The first European group to traverse the region and leave records was the Dominguez and Escalante expedition, which passed

through the southern portion of the Monument in late October 1776. Trappers and prospectors had probably crossed this rugged landscape earlier, following the watercourses, but as elsewhere they left little or no documentation of their explorations of the region. In 1854 the first Mormons entered the region on an exploring trip to locate natural resources and scout for possible sites for new communities (Heath, 1997).

The region played an important part in the early scientific government exploration of the region. John Wesley Powell’s mapping expedition used Flag Point, on the southern reaches of the Monument, as one of the main triangulation points for their baseline mapping of the region.

“A large part of the human history of the (Colorado) Plateau can be written in terms of its cliffs. The location of almost all the towns, roads, railroads, dams, and cultivated areas have had to be determined with due regard to these great natural barriers” (Stokes, 1973). These rugged features not only determined where people could travel but determined where and how water was available for people, livestock, and agriculture. Farming in this semi-arid region could only be established in areas where water for irrigation was available or could be made available through the development of canals, diversions, reservoirs, and ditches.

The Pahreah area was first settled in 1865 (around Rock House Spring). The Pahreah town site on the Paria River was settled in 1871, at the same time as the town of Adairville, by families that abandoned Rock House Spring. Adairville was abandoned a few years later, when the inhabitants moved up river to Pahreah.

Pioneers moved into the region of what is now eastern Garfield County beginning in the 1870s. Georgetown (1874-1900), Cannonville (1874), and Henrieville (1878) were settled by “refugees” from Pahreah after various flood events washed out most of the farmable soils surrounding the town. Escalante was settled by people from Panguitch in 1875. Tropic (1892) was settled by people from Cannonville and Henrieville only after the “ditch” was created from the East Fork of the Sevier across what is now the northern part of Bryce Canyon National Park. The first livestock in the Boulder area were brought in from Sanpete and Wayne Counties in 1879 and the first full time residents of Boulder arrived in 1889.

There are approximately 150 known historic sites within the Monument. Approximately 40 of these sites have been recorded.

The Monument has contracted for a Historical Resources Overview with the Utah Division of State History in the collection of oral

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histories. This includes topics related to the passage of the Taylor Grazing Act and the establishment of the Federal Grazing Service. It also includes the work carried out by the Civilian Conservation Corp and other activities that influenced the lands of the Monument.

AIR QUALITY

The existing air quality is typical of undeveloped regions in the western United States. Ambient pollutant levels are usually near or below the measurable limits. Exceptions include high, short-term localized concentrations of particulate matter (primarily wind blown dust), ozone, and carbon monoxide. Locations vulnerable to decreasing air quality include the immediate operation areas around mining and farm tilling, local population centers affected by residential emissions, and distant areas affected by long-range transport of pollutants.

The entire management area has been designated as either attainment or unclassified for all pollutants and has also been designated as Prevention of Significant Deterioration (PSD) Class II. Nearby PSD Class I areas include Capitol Reef, Canyonlands, and Arches National Parks to

the east and north, and Bryce Canyon and Zion National Parks to the west.

Currently, air quality is not being monitored; however, levels are estimated to be low and within standards. Inhalable particulate matter (PM10) concentrations are expected to be higher near towns and unpaved roads. Regional PM10 levels are probably a result of fugitive (wind blown) dust.

Ozone levels in the Rocky Mountain Region are relatively high, but are of unknown origin. Elevated concentrations may be a result of long range transport from urban areas, subsidence of stratospheric ozone, or photochemical reactions with natural hydrocarbons. Occasional peak concentrations of carbon monoxide and sulfur dioxide may be found in the immediate vicinity of combustion equipment. The U.S. Environmental Protection Agency has recently established fine particulate matter (PM2.5) standards, although it will take some time before background measurements and regional levels can be identified.

PSD Class I regulations address the potential impacts on air quality related values. These values include visibility, odors, flora, fauna, soils, water, geologic, and cultural structures. A possible source of impact on these related values is acid precipitation. No visibility or atmospheric deposition data are currently collected in the Monument area.

The completion of a coal-fired electricity generating station at Page, Arizona in 1976 brought a major point source of airborne sulfur compounds to the area. The Navajo Generating Plant consists of three 750 MW units which burn a maximum load of 25,000 tons of coal per day. The plant has recently completed the installation of the first of three wet limestone scrubbers which will remove most of the sulfur dioxide from the emission plumes of the plant.

Visibility impacts occur from atmospheric increases in small, light-scattering particles or increases in light absorbing-gasses (typically nitrogen dioxide). Mechanisms of acid precipitation formation are currently under study, but results have correlated ambient sulfuric and nitric acids with combustion by-products (sulfates and nitrates).

The State has determined that the greatest impact to visibility in Utah is uniform regional haze moving into Utah from other areas. Utah is a partner in the Western Regional Air Partnership, a collaborative effort of western states, tribes, and Federal agencies to address western regional air quality concerns. One of its primary roles is to coordinate visibility protection options recommended by the Grand Canyon Visibility Transport Commission.

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SOIL AND CLIMATE

“...Fragile cryptobiotic crusts, themselves of significant biological interest, play a critical role throughout the monument, stabilizing the highly erodible desert soils and providing nutrients to plants...”

(Proclamation 6920, 1996)

Cryptobiotic soil crusts, also referred to as cryptogamic or microbiotic, are composed of living organisms and their by-products which form a crust of soil particles bound together by organic material. These crusts are composed of cyanobacteria, algae, mosses, and lichens. Cryptobiotic crusts are widespread on various soil surfaces throughout the Monument. These crusts perform many important ecological functions including: preventing soil erosion, fixing atmospheric nitrogen by means of cyanobacteria, improving plant soil-water relationships, contributing to nutrient cycling, and providing sites for seed germination and plant growth. These crusts are particularly sensitive to ground disturbance, especially compression caused by such occurrences as vehicle or foot traffic (Belnap, 1994).

Understanding the condition of soils is important to the management of many resources. Available data on soils varies across the Monument. Currently, there are

three levels of available data for the Monument.

- C Kane County Soil Survey: This unpublished survey was conducted at a scale of 1:63,360 (1 inch per mile). Due to a lack of interpretive value for this survey, the Kane County portion of the Monument is being remapped and updated to a scale of 1:24,000 (1 inch = 2,000 feet).
- C Panguitch Area Soil Survey: This published report covers a small portion of the Monument in the Tropic, Cannonville and Henrieville areas, Upper Valley area and around "The Blues." The farming areas near Escalante and Boulder are also represented in this survey and add some insight to the soil data in the adjacent areas.
- C STATSGO: The State Soil Geographic Database is generalized soil survey information for the entire state of Utah. This data was collected at a scale of 1:250,000 (1 inch = 4 miles) and can be used at a county or regional level.

In order to improve the information base, the BLM has commissioned a third order soil survey. A third order survey is made for land uses not requiring precise knowledge of small areas or detailed soil information. This type of survey is conducted on all National Forest lands and the majority of private and public rangelands. The survey is expected to be completed in 2001.

Annual precipitation varies from about 6 inches at the lowest elevations to approximately 25 inches at

the highest elevations. The variations in elevation and precipitation produce three different climate zones: upland, semi-desert, and desert. At the highest elevations, precipitation falls primarily in the winter. The majority of the rainfall in the semi-desert areas occurs during the summer months.

The climatic zones and general soils information are summarized in Table 3.1 (Jaros, personal communication, 1/16/98).

**Table 3.1
Climate Zones**

	Desert	Semi-desert	Upland
Precipitation (inches)	6 to 8	8 to 12	12 to 16
Temperature (degrees F)	50 to 57	47 to 55	43 to 50
Frost Free Period (days)	170 to 200	125 to 170	100 to 125
Elevation (feet)	4000 to 4800	4800 to 6200	6200 to 7500

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The Desert climate zone is found in two general areas of the Monument:

1. The Sooner Bench area of Hole-in-the-Rock Road is typified by soils of very minimal development. Structural benches and dunes on Navajo and Entrada Sandstone, the Carmel Formation, and Quaternary alluvial deposits characterize this area. Dominant vegetation for this area includes blackbrush, mormon tea, broom snakeweed, indian ricegrass, and galleta.
2. The Big Water area is typified by soils of very minimal development. Hill slopes and badlands on Tropic Shale, Dakota Formation, and lower members of the Straight Cliffs Formation characterize this area. Dominant vegetation for this area includes mat saltbush, shadscale, galleta, and bottlebrush squirreltail.

The Semi-desert climate zone is found in four general areas of the Monument:

1. The western area of Hole-in-the-Rock Road is typified by very deep (>60 inches) soils. Structural benches and dunes on Entrada Sandstone, the Carmel Formation, and Quaternary alluvial deposits characterize this area. Dominant vegetation for this area includes indian ricegrass, needle-and-thread grass, globemallow, four-wing saltbush, mormon tea, and winterfat.

2. The Phipps-Death Hollow area is typified by soils with shallow to very deep (10 to >60 inches) sandy textures that have been deposited through wind movement from the Navajo Sandstone parent material. Dune topography intermixed with outcroppings of Navajo Sandstone characterize this area. Dominant vegetation for this area includes indian ricegrass, needle-and-thread grass, sandhill muhly, four-wing saltbush, and sand sagebrush.
3. The Circle Cliffs area is typified by shallow soils (10 to 20 inches deep). The Moenkopi and Chinle Formations and the Kaibab Limestone dominate as the parent material of this area. Dominant vegetation for this area includes galleta, locoweed, bigelow sagebrush, shadscale, and Utah juniper.
4. The Highway 89 area between Johnson Canyon and The Cockscomb is typified by very deep soils (>60 inches deep). The Moenkopi Formation and Quaternary alluvial deposits dominate as the parent material of this area. Dominant vegetation for this area includes indian ricegrass, galleta, winterfat, and big sagebrush.

The Semi-desert to Upland transition climate zone is found in two general areas of the Monument:

1. The Death Ridge, Carcass Canyon and Burning Hills areas are typified by shallow soils (10 to 20 inches deep). The Straight Cliffs Formation dominates as the parent material of this area. Typical landforms consist of structural benches with highly dissected side-slope canyons and badland areas of exposed geologic materials. Dominant vegetation for this area includes galleta, blackbrush, mormon tea, and Utah juniper.
2. The Fortymile Bench area is typified by shallow to moderately deep soils (10 to 40 inches deep) over the John Henry Member of the Straight Cliffs Formation. Typical landforms consist of structural benches with highly dissected side slope canyons. Dominant vegetation for this area includes Utah juniper, piñon pine, galleta, mormon tea, and bigelow sagebrush.

The Upland climate zone is found in three general areas of the Monument:

1. The Fiftymile Mountain area is typified by shallow to moderately deep soils (10 to 40 inches deep) over the John Henry Member of the Straight Cliffs Formation. Typical landforms consist of structural benches with highly dissected side slope canyons. Dominant vegetation for this area includes indian ricegrass, galleta, rock goldenrod, bigelow sagebrush, mormon tea, piñon pine, and Utah juniper.

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2. The Kodachrome Basin and Skutumpah Road area is typified by diverse soil properties that are found on the Carmel Formation and Quaternary alluvial deposits. Landforms consist of dissected side slopes and alluvial fans and flats. Important vegetation for this area includes indian ricegrass, galleta, big sagebrush, bitterbrush, piñon pine, and Utah juniper.
3. The Paria/Hackberry area consists dominantly of Navajo Sandstone geology with varying depths (20 to >60 inches deep) of sand. Landforms consist of vegetated dunes and outcroppings of sandstone. Dominant vegetation for this area includes sand dropseed, indian ricegrass, blue grama, mormon tea, piñon pine, and Utah juniper.

VEGETATION

“...The monument contains an extraordinary number of areas of relict vegetation...where natural processes continue unaltered by man...” (Proclamation 6920, 1996)

The size and location of the Monument allow for its inclusion in three main sections of the Colorado Plateau floristic region: the eastern part of the Canyonlands section, the southern portion of the Utah Plateaus section, and a small north-eastern portion of the Dixie

Corridor section (Cronquist, 1972). The blending of these three areas in the Monument provides the potential for a high degree of diversity. Steep canyons, limited water, seasonal flood events, unique and isolated geologic substrates, and large fluctuations in climatic conditions have all influenced the composition, structure, and diversity of vegetation associations of this region. These same factors have also made access into these areas difficult, leaving much undiscovered.

Coarse scale vegetation mapping exists through the Utah GAP program, but this information has not been field checked as it relates to the Monument. Nine primary vegetation associations occur within the Monument as described by Welsh (1993) and Cronquist (1972). These vegetation associations are summarized in Appendix 11. Precipitation (elevation), geology, and soil type are the primary factors influencing the distribution of vegetation associations in the area. Some areas, however, do not fit into vegetation categories. These include: areas traditionally low in diversity (barren areas), treated areas (seedings, chainings), flooded areas (reservoirs), and rock outcrops.

Relict plant communities refer to areas that have persisted despite the pronounced warming and drying of the interior west over the last few thousand years (Betencourt, 1984) and/or have not been influenced by settlement and post-

settlement activities; chiefly domestic livestock grazing. This isolation, over time and/or from disturbance, has created unique areas that can be used as a baseline for gauging impacts occurring elsewhere in the Monument and on the Colorado Plateau. The locations of some of these relict areas are known, but little if any information has been collected on the composition and structure of the vegetation associations or other physical and biological components.

Hanging gardens occur where ground water surfaces along canyon walls from perched water tables or from bedrock fractures. The existence of hanging gardens is dependent on a supply of water from these underground water sources. The geologic and geographic conditions for hanging gardens exist throughout southern Utah (Welsh and Toft, 1981), including the Monument. Inventory work was conducted in conjunction with the Kaiparowits Study (Murdock et. al., 1971-1974), which determined the location and species composition of several hanging gardens. The potential for additional locations of hanging gardens in the Grand Staircase and Escalante sections of the Monument is also high. Due to the conditions of isolation produced in hanging gardens there is a potential for unique species in these areas.

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Mosses, liverworts, and lichens are vegetative life forms that have been overlooked due to their inconspicuous nature. This large group of organisms has been studied to some degree in other areas of southern Utah, but limited information about these organisms exists for the Monument area specifically.

The unique topography, variety of geologic substrates, and presence of hanging gardens and relict areas have all contributed to the presence of many endemic plants. Known to be located within the Monument boundaries are one Federally listed endangered and two Federally listed threatened plants. In addition to these, there are others just outside the boundaries that are Federally listed as threatened. The protection of the Federally listed species is governed by the Endangered Species Act, and activities relating to these species are coordinated with the U.S. Fish and Wildlife Service (FWS). The Federally listed species are joined by a list of sensitive species, with limited distributions and/or population sizes, that warrant special consideration during activity planning (Appendix 12). Listed and sensitive species, in and around the Monument, have been monitored over the years and will continue to be studied to ensure that actions are taken to recover Federally listed species, and that actions are not taken which would lead to listing of any sensitive species.

Consultation with FWS under section 7 of the Endangered Species Act was begun by letter on April 1, 1998. A list of threatened and endangered species was requested. A copy of the letter from Fish and Wildlife Services appears in Appendix 13. The letter lists one endangered and two threatened plant species which may occur within the Monument. No candidate species are identified. This document is being reviewed by the FWS to determine if the alternatives may affect any listed species or its critical habitat, or if the alternatives are likely to jeopardize a proposed species or result in the destruction or modification of proposed critical habitat. In the case of a "may affect" finding, consultation or conferencing on the affected species would begin and the results would be included in the Proposed Management Plan/Final Environmental Impact Statement.

There is one Federally listed endangered plant species known within the boundaries of the Monument. Kodachrome bladderpod (*Lesquerella tumulosa*) is located in the Grand Staircase portion of the Monument. Surveys for this species were conducted in 1989 and a draft recovery plan is being prepared. Current taxonomic research is underway to address inconsistencies in classification of this species. Threats to these populations include cross-country vehicle travel, cattle grazing, and fuelwood cutting.

The two Federally threatened plants known to occur within the boundaries of the Monument are listed below. Two vegetation studies, begun in 1998, will survey areas of the Monument for potential additions to this list, or additional populations of these species.

1. Ute ladies'-tresses (*Spiranthes diluvialis*) was listed as a threatened species on January 17, 1993. This plant grows in moist riparian meadows or stream banks. This plant species is dependent on the unimpeded natural water flows and stream channel changes that occur in the watershed in which it grows. One population is known to exist in the Monument, in the Escalante Canyons section. A recovery plan has been prepared for this species. Currently, the greatest threat is from recreation use.
2. Jones' Cycladenia (*Cycladenia humilis* var. *jonesii*) grows on clay deposits in central and southern Utah and northern Arizona. Some work was done to survey for populations and establish monitoring in Glen Canyon National Recreation Area (Spence, 1994). These populations are close to the populations in the Monument and may have included Monument populations. The influence of soils on distribution has been studied by Boettinger (1998). Mining, grazing, and off-highway vehicle travel all occur in the area, but are currently not threatening the populations because of its relative inaccessibility.

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The location of the Monument on the Colorado Plateau and the unique and isolated geologic substrates have contributed to the botanical diversity of the area. The potential is great for research on many aspects of these vegetation associations.

Although much is known about the general structure and context of vegetation in the Monument (Albee et.al., 1988; Atwood et.al., 1991; Barneby, 1989; Cronquist, 1994; Cronquist et.al., 1972; Cronquist et.al., 1977, 1984, 1997; Welsh and Toft 1981; Welsh et.al., 1975; Welsh et.al., 1978; and Welsh et.al., 1993), little detailed information has been collected in the area. Isolated intensive studies and voucher collections over the last 50 to 100 years provide some insight into the potential diversity.

Collection of wildland seed, though labor intensive, is common on public lands. The demand for native seed in restoration projects in the West has increased collection efforts. Limited information is known on the quantity of seed collected or the location of seed collection sites in the Monument.

Human disturbances have contributed directly and indirectly to the loss of plants and plant associations from many areas, including the Monument. Direct impacts from physical removal of vegetation by chaining, spraying, cutting, and consumption

by livestock are evident. Much of the disturbance we see today is the result of intensive grazing activities at the beginning of the 20th century. Recovery from these impacts is slow and in some cases may never occur, or may require intensive restoration efforts. A secondary effect of disturbance is the introduction of invasive non-native species. Many plants were brought in specifically for forage. Other plants, such as cheatgrass, were introduced accidentally in livestock feed or through incidental transportation. These non-native plants, whether introduced accidentally or intentionally, continue to displace native species and dramatically affect the structure of sensitive plant associations (such as riparian and threatened and endangered plant populations). Once established in disturbed sites, non-native plant species quickly spread out into adjacent undisturbed lands and disrupt the natural plant and animal associations. Tamarisk, for example, absorbs large quantities of water, making surface water unavailable to wildlife and other riparian plant species.

Numerous policies and guidelines for control of these noxious weeds have been developed. The Partners Against Weeds Action Plan (January 1996), prepared by the Bureau of Land Management, describes the process to begin controlling this problem on public lands and beyond. Weed free hay certification has become a standard policy on Utah BLM lands as well. By working cooperatively with adjacent

agencies and the private sector we can begin to control these invasive species.

The primary avenue for the dispersal of weeds is along transportation corridors, including trails. Disturbance activities involved in maintenance and construction of these corridors create ideal habitat for invasive non-native species. Vehicles, as well as people and animals using these travel corridors, act as vectors for the spread of these weeds to previously unaffected areas. Inventory work completed in 1997 by Ecosphere Environmental Services surveyed the travel corridors (mainly roads) to determine the location of noxious weed species in the Monument area. Of the 35 species that were surveyed for in the Monument, only 9 were found (Appendix 14).

RIPARIAN

“...Wildlife, including neotropical birds, concentrate around the Paria and Escalante Rivers and other riparian corridors within the monument...” (Proclamation 6920, 1996)

Riparian refers to vegetation and habitats that are dependent upon or associated with the presence of water. Riparian areas comprise the transition zone between permanently saturated soils and upland areas. These areas

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exhibit vegetation or physical characteristics reflective of permanent surface or subsurface water. Examples of riparian areas include lands along perennially and intermittently flowing rivers and streams and the shores of lakes and reservoirs with stable water levels. Other examples are wetlands, represented by marshes and wet meadows.

Riparian areas, though they total less than 1 percent of the total lands in the Monument, are some of the most productive, ecologically valuable, and utilized resources. The Riparian-Wetland Initiative for the 1990s established national goals and objectives for managing riparian-wetland resources on public lands. One goal is to provide the widest variety of vegetation and habitat diversity for wildlife, fish, and watershed protection.

A number of plant and animal species depend on riparian areas. Up to 80 percent of vertebrates use riparian habitats at some stage in their lives. Over 50 percent of the nesting bird species in this region use riparian habitats as the primary habitat for breeding purposes. This species richness is made possible by the plant diversity, availability of water, prey species, and the proximity to upland communities with their floral and faunal diversity.

The BLM has completed a Proper Functioning Condition (PFC) Assessment on 8,288 acres of riparian areas within the Monument. This represents approximately 80 percent of the total riparian areas within the Monument. The PFC method is a field evaluation that analyzes a riparian-wetland areas' capability and potential (BLM, 1993, 1994). The process of assessing whether a riparian-wetland area is functioning properly requires an interdisciplinary team approach of resource professionals familiar with the area being rated. The team looks at three components: (1) vegetation, (2) landforms/soils, and (3) hydrology. The riparian area is then placed in one of four categories: Proper Functioning Condition, Functional-At-Risk, Non-Functional, or Unknown. Riparian-wetland areas are functioning properly when adequate vegetation, landform, or large woody debris is present to dissipate stream energy associated with high water flows (Prichard, 1993, 1994). This reduces erosion, improves water quality, filters sediment, captures bedload, aids floodplain development, improves flood-water retention and ground-water recharge, develops root masses that stabilize stream banks, provides habitat necessary for fish production and waterfowl breeding, and supports greater biodiversity. Functioning condition is a result of the interactions among geology, soil, water, and vegetation. The PFC assessment is not an ecological rating of vegetation communities. The PFC assessment produced the results found in Table 3.2.

Table 3.2
Proper Functioning Condition Assessment

PFC Category	Acres
Properly Functioning	2385
Functional-At-Risk	5293
Non-Functional	21
Unknown	589

A base flow of water is mandatory for the health and functioning of riparian areas. Factors which interfere with these processes include water diversions, ground water withdrawals from wells, and changes in vegetation type and cover. Certain activities can also result in degraded water quality and levels of seasonal flow. Resulting changes may be seen in the type and structure of vegetation communities, increased water temperatures, unsatisfactory physical functioning of hydrologic processes, aesthetics, and wildlife habitat.

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FIRE

Vegetation in the Monument evolved with fire as a minor part of the ecosystem, as is evident from the flora and soil characteristics. Periodic fires did occur in the Monument, but little information is known about the frequency or size of these fires. Intensive livestock grazing in the late 1800s and early 1900s drastically changed the vegetation structure, including the removal of native shrubs and forbs. Reduced understory from grazing has allowed piñon and juniper to thrive beyond natural limits in some areas.

Before 1980 little information was kept on the occurrence of fire in the Monument. Since 1980 there have been 218 reported fires, most of which have been lightning strikes, with an average size of 7 acres. The largest recorded fire is 552 acres, which occurred on Fiftymile Mountain. Although there has been some response to these fires, little suppression activity has occurred to control these fires. Wildfires have occurred in a variety of vegetation types.

The Monument is part of the Color Country Interagency Fire Management Area. This area includes Iron, Washington, Beaver, Kane, and Garfield Counties in Utah, and the BLM Arizona Strip Field Office lands of Mohave County in Arizona. This area was established to share resources in

southwestern Utah. Zones and policies, provided in the Cedar City District Fire Management Plan, establish how suppression activities will be managed in the entire area, including the Monument. Most of the Monument is included in zones that have little suppression activity. Some full suppression zones occur within the Monument, found in areas where protection of structures and property are a concern. Protection of other resources is fully integrated into the fire management strategies for all of the zones in southern Utah.

Past use of prescribed fire has involved the burning of piñon and juniper woodlands to reduce density and promote the growth of understory shrubs and grasses. The primary purpose of these burns was to increase forage for livestock and wildlife by removing encroaching piñon and juniper stands. Since 1986 there have been 11 management ignited prescribed fires in the Monument, burning a total of 2,870 acres.

FORESTRY PRODUCTS

Piñon pine and juniper woodlands cover about 425,000 acres of the Monument. There are scattered stands of ponderosa pine, douglas fir, and white fir, mainly confined to the higher elevations or cooler north-facing slopes. Currently, the products from piñon pine and juniper woodlands are for personal use fuelwood, juniper posts, and Christmas trees.

Cutting and collecting of standing dead and down wood is allowed under personal use fuelwood permits. There are limited areas currently designated for live tree fuelwood cutting. No commercial timber harvesting has occurred in the Monument for decades. A timber harvest of ponderosa pine did occur in the 1940s on Mud Spring Bench. A reforestation project was also accomplished after the sale closed.

WILDLIFE

“...The wildlife of the monument is characterized by a diversity of species...”
(Proclamation 6920, 1996)

The Monument provides habitat for nearly 400 species of vertebrates and 1,112 species of invertebrates. To date there have been 9 amphibian, 243 bird, 20 fish, 63 mammal, and 27 reptile species identified within the Monument. Some animals are migratory through the Monument, others are year-round residents, and still others use the Monument as seasonal habitat. A complete list of wildlife species found within the Monument is located in Appendix 15.

Populations of elk move into the Monument for winter use. Mule deer and bighorn sheep are year-long residents. The river and stream systems provide habitat for fish, while

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riparian areas are the main habitat for many bird species.

The establishment of the Monument does not diminish the responsibility and authority of the State of Utah for management of fish and wildlife, including regulation of hunting and fishing, on Federal lands within the Monument.

Consultation with FWS under section 7 of the Endangered Species Act was begun by letter on April 1, 1998. A list of threatened and endangered species was requested. A copy of the letter from the Fish and Wildlife Service appears in Appendix 13. The letter lists eight endangered or threatened animal species which may occur within the area of influence of the Monument Management Plan. No candidate species are identified. This document is being reviewed by the FWS to determine if the alternatives may affect any listed species or its critical habitat, or if the alternatives are likely to jeopardize a proposed species or result in the destruction or modification of proposed critical habitat. In the case of a “may affect” finding, formal consultation or conferencing on the affected species would begin and the results would be included in the Proposed Management Plan/Final Environmental Impact Statement.

Found within the Monument are five species of wildlife Federally listed as threatened or endangered. Those species include:

1. The American peregrine falcon (*Falco peregrinus anatum*) is found in the Monument from early March until early fall. The peregrine falcon was listed as endangered on June 2, 1970. Since the adoption of the recovery plan (December 14, 1984) this population has grown until it is now common to see falcons in the Monument. The peregrine falcon population has risen to a point that steps are being taken to delist the species.
2. The southwestern willow flycatcher (*Empidonax traillii extimus*) was listed as endangered on February 27, 1995. The southwestern willow flycatcher has been observed along the Escalante and Paria Rivers. At the present time there is no recovery plan for the flycatcher. The flycatcher is present in Utah from early spring until migration occurs in the fall.
3. The California condor (*Gymnogyps californicus*) was listed as endangered on March 11, 1967. On October 16, 1996, a population to be released in northern Arizona was listed as an experimental, non-essential population. Six California condors were released at the Vermilion Cliffs in northern Arizona on December 12, 1996. Additional releases have occurred since. These birds have been sighted in Bryce Canyon National

Park, where they may have flown over the Monument.

4. The bald eagle (*Haliaeetus leucocephalus*) is found in and around the Monument as a winter migrant, roosting in large trees and hunting in areas around the roost sites. The bald eagle was first listed as threatened on March 11, 1967. A recovery plan was adopted on July 29, 1983. The bald eagle population has risen to a point that steps are being taken to delist the species.
5. The Mexican spotted owl (*Strix occidentalis lucida*) was first listed as threatened on March 16, 1993, with a recovery plan being adopted on October 16, 1995. Little is known about the spotted owl in the Monument, with only a few confirmed nest sites.

In addition to the above listed species, the Colorado squawfish (*Ptychocheilus lucius*) and razorback sucker (*Xyrauchen texanu*) were once found in the Colorado River prior to the construction of Glen Canyon Dam. There are no known records of these two fish within the boundaries of Grand Staircase-Escalante National Monument.

Populations of the Kanab ambersnail (*Oxyloma haydeni kanabensis*) are found outside the boundaries of the Monument. There are no known records of this species inside the Monument.

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A list of sensitive wildlife species found within the Monument can be found in Appendix 16.

Few wildlife studies have occurred on Monument lands. Between 1971 and 1976, Brigham Young University researchers studied vertebrate species as part of the environmental assessment for the then proposed Kaiparowits power plant. Atwood and others (1980) list inventories from the 1930s along with other studies accomplished prior to the construction of Glen Canyon Dam.

Studies conducted by the BLM during the summer of 1997 showed that 13 of the 19 species of bats found in Utah were identified within the boundaries of the Monument. This work added to the list of bat species recorded for this area (Jackson and Herder, 1997).

In 1997, Peterson and O'Neill (1997) found southwestern willow flycatchers in both the Paria and Escalante River riparian corridors. The known breeding population is estimated at between 300 and 500 pairs; it is known to breed at only about 75 sites within its range, the desert southwest. The population decline is due to the extensive loss, fragmentation, and modification of riparian breeding habitat, which has reduced, degraded, and eliminated nesting habitat, curtailing the distribution and

numbers of the southwestern willow flycatcher throughout its range. Brood parasitism by the brown-headed cowbird is also considered a significant and widespread threat to the southwestern willow flycatcher, which appears to be unable to successfully rear its own chicks when cowbird chicks are present (U.S. Department of Interior, 1997). The flycatcher is also listed on the State of Utah Sensitive Species list as endangered.

The southwestern willow flycatcher nests in dense riparian vegetation, typically near surface water or saturated soil. Other habitat characteristics vary widely among sites. Migrants may occur in non-riparian habitats or in riparian habitats not suitable for breeding. Such areas may be critically important resources affecting local and regional flycatcher productivity and survival. The flycatchers' breeding range includes extreme southern portions of Utah. They winter in Mexico and Central America, although specific wintering sites are unknown (U.S. Department of Interior, 1997).

There have been few studies on the native fish and amphibian species in the Escalante River system. Holden (1974) performed the most recent fish survey. He found populations of non-native species in the lower reaches of the Escalante River and speculated that they may be negatively affecting the native populations.

Big game hunting and associated activities within and adjacent to the Paunsaugunt region of the Monument provide income to local residents. The Paunsaugunt deer herd is recognized world wide by both hunters and wildlife viewers. From data collected by UDWR, this population is the largest population of trophy class mule deer in the western United States.

There are seasons set by the State Wildlife Board for the hunting of the following species within the Monument: deer, elk, bear, cougar, bobcat, ringtail, cottontail rabbit, mink, beaver, badger, desert bighorn sheep, chukar, mourning doves, ducks, geese, coots, pheasant, turkey, forest grouse, fox, and fish. Harvest data, which includes the number of hunter days and species taken, can be found in various UDWR harvest reports.

Under the direction of the Utah Legislature, UDWR is required to manage mule deer and elk according to the adopted plan for each species and management unit. Portions of three wildlife management units fall within the Monument boundaries: Kaiparowits, Paunsaugunt, and Plateau (see Table 3.3). An overview of the herd unit management plans for mule deer and elk can be found in Appendix 17.

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**Table 3.3
Wildlife Management Units**

Unit Name	Total Acres	Acres in Monument	Percent in Monument
Kaiparowits	2,008,332	1,171,782	69%
Paunsaugunt	957,086	384,507	23%
Plateau	2,108,929	128,610	8%

Since 1980, bighorn sheep have been reintroduced by the UDWR and BLM into the Monument area. The goal of these reintroductions is to restore populations to historic ranges. This will be accomplished with up to 200 animals, as they become available from other areas in the State or the West.

Wild turkey and pronghorn antelope have also been reintroduced by UDWR into their historic ranges within the Monument. The first reintroductions took place in 1958, near Boulder, with 15 turkeys released. Turkeys have established viable populations since this program was initiated. Twenty two pronghorn antelope were reintroduced on East Clark Bench in 1970. An additional 105 antelope have since been reintroduced (Smith and Beale, 1980).

Introductions of non-native wildlife species, such as chukar and brown trout, have been

successful. These species are now permanent residents of the Monument. The brown trout population in Calf Creek provides an opportunity for watching wildlife; visitors can easily view these fish from the Calf Creek Trail. Brown trout also provide visitors with recreational fishing opportunities. Chukar populations are found in remote areas of the Monument, where they are viewed and/or hunted.

WATER

“...with scarce and scattered water sources, the monument is an outstanding biological resource...” (Proclamation 6920, 1996)

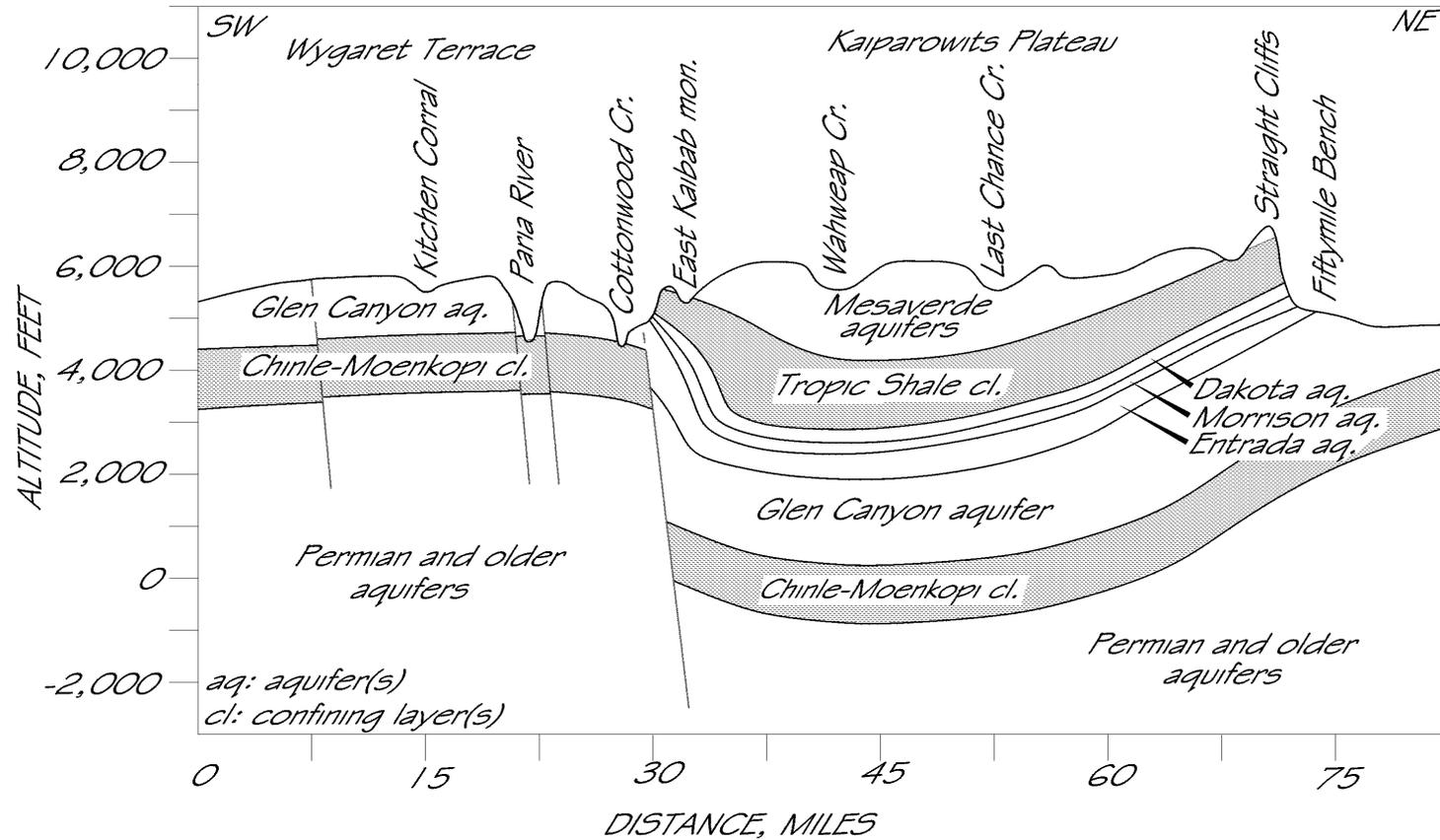
The Monument crosses four broad watersheds, all part of the Colorado River system. The Escalante River system (including Alvey Wash, Pine Creek, Mamie Creek, Sand Creek, Calf Creek, Boulder Creek, Deer Creek, and Steep Creek) flows from the Aquarius Plateau and Boulder Mountain into the upper portions of Lake Powell. Last Chance Creek and Wahweap Creek are the principal tributaries off the Kaiparowits Plateau, flowing into the main body of Lake Powell. The Paria River-Kitchen Corral Wash system (including Hackberry Creek and Cottonwood Creek) extends from the Bryce Canyon-Bryce Valley area, terminating below Glen Canyon Dam near Lee’s Ferry. On the extreme west side of the Monument, Johnson Wash flows southward into Kanab Creek and

eventually into the Grand Canyon. The Monument contains about 2,500 miles of stream channels and washes. Less than 10 percent of these are perennial streams and primarily include the upper reaches of the Escalante River, the Paria River, and Last Chance Creek.

Ground water is present in most of the consolidated rocks within the Monument. Freethy (1997) suggests that the period of major recharge for these aquifers was prior to 10,000 years ago during the waning stages of the last glacial period. Five regional aquifers occur within the Monument (Figure 3.3). In descending order, these are: (1) the Mesaverde aquifer, including Straight Cliffs and Wahweap Formations; (2) the Dakota Formation aquifer; (3) the Morrison Formation aquifer; (4) the Entrada Formation aquifer; and (5) the Glen Canyon aquifer, including the Navajo, Kayenta, and Moenave (Wingate) Formations.

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Figure 3.3 Regional Aquifers (After Freethy, 1997)



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The Glen Canyon aquifer is the thickest and most extensive of the principal aquifers. The rocks of the Glen Canyon aquifer are exposed in the Grand Staircase and in the Escalante Canyons regions of the Monument, but lie in the subsurface beneath the Kaiparowits Plateau to depths approaching 4,500 feet. The volume of water contained within the aquifer is estimated to be greater than 400,000,000 acre-feet (Freethy, 1997). In recharge areas of the Glen Canyon aquifer, or where water table conditions exist (unconfined parts of the aquifer), the water is generally fresh (< 1,000 mg/L total dissolved solids (TDS)) and of the type calcium, magnesium, bicarbonate. Where the Glen Canyon aquifer is confined, primarily beneath the Kaiparowits Plateau, ground water is generally slightly saline (1,000 to 3,000 mg/L TDS), and is sodium, sulfate-type. The lowest TDS-concentration in ground water occurs in the Glen Canyon aquifer (191 mg/L). The highest TDS-concentration in ground water occurs in the Mesaverde aquifer (5,920 mg/L). The lowest TDS-concentration in streams is in Boulder Creek (172 mg/L). The highest TDS-concentration in streams is in the Paria River (3,980 mg/L). The potentiometric surface within the Glen Canyon aquifer in areas near Lake Powell has risen as much as 357 feet due to the inundation by the lake (Blanchard, 1986).

Public Water Reserves were established by Executive Order of April 17, 1926. They were established to reserve for general public use all important springs and water holes on public lands, and to prevent monopolization of the public domain through control of these water sources. There are 248 public water reserves within the Monument (see Table 3.9).

Water resources research in the Monument has been limited to studies of historic and prehistoric flooding events (Webb, 1985) and assessments of ground-water aquifers in anticipation of coal development in the Kaiparowits Plateau (Blanchard, 1986). Several stream courses within the Monument are perennial, but most are ephemeral, experiencing periodic flooding during storm-runoff. Springs issue where canyons cut into the saturated zones of aquifers. The BLM is currently developing a water-quality monitoring program at 60 sites within the Monument, in conjunction with the Utah Division of Water Quality, to ensure that State and Federal standards will be met.

The Escalante River is located in the eastern portion of the Monument. This river system remains remote and largely unexplored from a scientific standpoint. A multi-year, interagency, interdisciplinary research project is being initiated with the goal of systematically collecting a variety of

physical, biological, cultural, and social data on the Escalante watershed. This will cover the area from the headwaters on Dixie National Forest, through the Monument, and continue on to Glen Canyon National Recreation Area until it flows into Lake Powell. The knowledge gained from these efforts will provide a baseline of data for future research on the Escalante watershed. It will better enable land managers to make scientifically based decisions for future use within this ecosystem.

WATER-DEPENDENT RESOURCES AND CURRENT WATER USES

The Proclamation directed that the Monument Management Plan address the extent to which water is necessary for the proper care and management of the objects of the Monument, and the extent to which further action may be necessary pursuant to Federal or State law to ensure the availability of water.

This section describes the extent to which Monument resources are water-dependent, and describes current water uses. Options for ensuring the availability of water under Federal and State law are discussed in Chapter 2, Management Common to all Alternatives.

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WATER-DEPENDENT RESOURCES

The Monument is vast and arid, but its “scarce and scattered water sources” are important to a number of Monument resources. Although water is scarce within the Monument, its effects are pervasive. The landscape has been formed by water, its rock laid down in shallow seas or deposited by ancient streams and dune fields. Water continues to sculpt that rock, forming the canyons, arches, mesas and washes that characterize the area today, perhaps most notably in the upper Escalante Canyons, the Escalante Natural Bridge, and Grosvenor Arch. Upper and Lower Calf Creek Falls, Deer Creek, and the Paria and Escalante Rivers are well known hydrologic features of the Monument. The largest of occurrent peak flows are the most crucial components of the hydrologic cycle to these features.

From the geologic perspective, the primary resources are the geologic processes that formed the unique landforms that now exist: the downcutting process of canyon formation, arch and bridge development, and the development of soils. The continued availability of water, including seasonal and flood flows, is necessary to preserve these formative processes and geological resources. It will be necessary to ensure that instream flows and groundwater levels, and their seasonality, are maintained, and to ensure that

the flow levels and seasonality of seeps and springs are maintained, in order to protect the geological processes of the Monument.

Water is crucial to most biological resources within the Monument, including the communities of plants and animals associated with hanging gardens, seeps, springs, tinajas, and with ephemeral, intermittent, and perennial streams and ponds. The Monument contains an abundance of unique, isolated communities directly related to its scattered water sources, which constitute oases in the vast and arid landscape. These communities have provided refuge for many ancient plant species, and undoubtedly contribute to the high degree of plant endemism found within the Monument.

Hanging gardens occur where ground water surfaces along canyon walls from perched water or in bedrock fractures. Often containing a wide variety of unique plant and insect species, hanging gardens are characteristic of flat-lying strata with deeply incised canyons typical of the Colorado Plateau.

Two threatened, one endangered, and nine sensitive plant species are known within the Monument. Water requirements of these species vary, but all are dependent on adequate water. One of the threatened species, the Ute ladies’-tresses, an orchid,

(*Spiranthes diluvialis*) is dependent on the unimpeded natural water flows and stream channel changes that occur in the watershed in which it grows (Appendix 12).

The Monument provides habitat for over 400 vertebrate and 1,000 invertebrate animal species, most of which depend on water sources within the Monument (Appendix 15). Five species known to occur within the Monument are listed as threatened or endangered species: the southwestern willow flycatcher (*Empidonax traillii extimus*); the American peregrine falcon (*Falco peregrinus anatum*); the bald eagle (*Haliaeetus leucocephalus*); the Mexican spotted owl (*Strix occidentalis lucida*); and the California condor (*Gymnogyps californicus*). The southwestern willow flycatcher (*Empidonax traillii extimus*) is a small bird that occupies riparian zones in the southwest. There have been confirmed sightings of the flycatcher in the Paria River riparian corridor and in the upper Escalante River riparian corridor above the Highway 12 bridge. The bald eagle feeds in riparian areas. The peregrine falcon and the Mexican spotted owl nest and feed in riparian areas. The California condor, an experimental “10e” species, is the only one of the listed species known to occur in the Monument which is not generally associated with riparian areas.

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In addition to the five threatened or endangered species known to occur within the Monument, the endangered Kanab ambersnail (*Oxyloma haydeni kanabensis*) may occur within the Monument where suitable habitat exists. The Colorado squawfish (*Ptychocheilus lucius*) and the razorback sucker (*Xyrauchen texanus*), are endangered species which occur in Lake Powell. Although it is unlikely that either occur within the Monument, actions within the Monument which affect water flowing into Lake Powell could affect them. All of these species are associated with water sources and riparian areas.

The native fish of the Escalante River system, like the flannelmouth and bluehead sucker, normally have evolved with variations in flow regimes, high spring flows and low fall and winter flows. These variations in flows allow for the movement of sediment, building backwaters, eddies and other micro habitats for all aquatic species.

Although they comprise only one percent of the Monument, riparian areas are the most productive and diverse ecological zones in the Monument. Riparian systems include the transition zone between permanently saturated soils and upland areas and reflect physical and vegetative conditions of permanent surface or subsurface water. Wildlife in general, including neotropical

birds, concentrate around the riparian areas within the Monument, because of the vegetation and associated organisms these areas support. Natural base stream flows are required in order to maintain active riparian systems. Base flows can be reduced by surface-water impoundments, disruptions to ground-water flow, and invasions of hydrophillic vegetation such as tamarisk.

Water is integral to the historic sites and many of the archeological sites within the Monument, because the presence of water draws people, ancient and modern, to settle and build near it. The location of the historic Paria townsite and virtually all of the historic line shacks and cabins in the Monument were determined by proximity of water. The same is true for archeological sites throughout the Escalante drainage. Such cultural sites benefit from the availability of the water sources that explain their presence, that form their settings and provide their context.

The Monument was established to protect an unspoiled natural area. Protection of Monument resources requires the protection of the natural systems that support them, and water is integral to those systems. In the arid environment of the Monument, natural systems have developed within the constraints of limiting factors, water being chief among them. Significant reductions in available water are likely to result in

reductions to or eliminations of natural communities and systems. The continued availability of water is, therefore, essential to the maintenance of those systems. The following section discusses the specific issues involved with each of the four individual drainage areas within the Monument.

CURRENT WATER USES

This section addresses current water uses and issues relative to each watershed or watershed group. These watersheds or watershed groups are: the Escalante River drainage; the “Kaiparowits Composite Drainage Area” comprised of eight smaller separate drainages (all of which have their headwaters within the Monument and drain south into Lake Powell); the Paria River drainage; and the “Johnson Composite Drainage Area” comprised of three smaller separate drainages.

Escalante River Drainage

This drainage is the largest in the Monument. The towns of Escalante and Boulder, where most of the existing appropriated water rights are found in this basin, lie fairly high in the drainage. With the exception of the private lands in and around these communities and a few scattered Utah School and Institutional Trust Lands, the Escalante River and all of its tributaries lie within Federal property, either within the Monument, or within the Dixie

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National Forest, Capitol Reef National Park, or Glen Canyon National Recreation Area (GCNRA). When the Escalante River leaves the Monument, it flows through a portion of the GCNRA and into Lake Powell.

The Escalante is one of the few perennial streams in the Monument, and clearly the largest. Within the Monument, the mainstem of the river is perennial below the town of Escalante, as are several tributaries that join the mainstem from the north, including Sand, Calf, Boulder and Deer Creeks. During drier years, The Gulch, including Steep Creek may become intermittent. The only other perennial stream within the Escalante River drainage inside the Monument is the last mile or so of Harris Wash before the stream leaves the Monument and passes into the GCNRA. Most if not all of the perennial portion of this stream within the Monument also lies within Utah School and Institutional Trust Lands. While only limited stream gauge data is available on other tributaries to the Escalante River, it is not believed that any of them are perennially flowing streams.

The United States Geological Survey (USGS) maintained a gauge at the lower end of the Escalante River for five years before the site was inundated by the waters of Lake Powell. During that period of record (1950 to 1955), this gauge recorded a mean flow of 82.2 cubic feet per second (cfs), which included

the depletions from the private and municipal water rights in the vicinities of the towns of Escalante and Boulder. Boulder Creek's mean flow alone is approximately 23 cfs for its period of record (1950 to 1955). It is estimated that the existing water rights are depleting only a small percentage of the average base flow in the Escalante River, and take only a negligible amount from the peak flows during flash floods and other such runoff events, which are the critical flows for the canyon formation process. The large surface area of the Escalante River drainage, almost all of which is Federal land under the administrative jurisdiction of the BLM, the National Park Service, or the Forest Service, will likely ensure that runoff peak flows will continue their contributions to the Monument's water-dependent resources.

Some storage of water takes place upstream of the Monument. The New Escalante Irrigation Company has a small reservoir (200-275 acre feet capacity) on North Creek and another storage reservoir (off-stream) at the lower end of Wide Hollow which stores water from North Creek, Birch Creek, and Upper Valley Creek for agricultural use. This reservoir, which originally had a capacity of 2,400 acre feet, has silted in to the point that it now holds only about 1,100 acre feet. The irrigation company is planning a new reservoir just northwest of the existing reservoir to replace the lost capacity and

expand storage capacity to about 7,000 acre feet (verbal communication Kim Keefe, New Escalante Irrigation Company, 9/10/98). Water is presently conveyed via a canal diverting water from North, Birch, and Upper Valley Creeks and stored in the existing Wide Hollow reservoir. Pine Creek Irrigation Company has a diversion on Pine Creek upstream from where the Creek runs along the Monument boundary (repeatedly passing in and out of the boundary) before Pine Creek reaches the Escalante River. The water from this diversion is delivered directly into a pressurized sprinkler system to irrigate farmlands north and northeast of the town of Escalante. When in use, this diversion reportedly dries up the remaining reaches of Pine Creek.

The culinary system for the town of Escalante (population about 1,000) consists of a spring collection system and one well. The town also has a million gallon storage tank. Given the Utah State Health Department's requirements for a production capacity of 1,600 gallons/day (0.0025 cfs) per connection, the town's collection system can provide 1,020 connections and storage for 625 connections. Approximately 25 percent of the existing reservoir capacity is used for irrigation in the town of Escalante. (The town irrigation system has a back up system which diverts water from the culinary supply system when water in Wide Hollow reservoir is

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depleted) (verbal communication, D. Liston, New Escalante Irrigation Company, 8/6/97).

All these existing depletions in the Escalante River drainage upstream from the Monument result from such direct diversions of surface water and from groundwater withdrawals from wells. Because of this, larger flows that result from precipitation events such as snowmelt runoff and summer monsoonal thunderstorms (the flows that are the most significant to the Monument in terms of channel maintenance, ongoing erosional processes, and canyon formation) are almost unaffected by current diversion levels upstream.

There are 1,313 water rights of record inside the Monument boundaries within the Escalante River watershed. Of these, 844 are owned by the BLM in support of its grazing permittees under the Taylor Grazing Act, 184 are owned by the Utah School and Institutional Trust Lands Administration, most in support of state grazing leases, two amounting to 527 acre feet are owned by the Utah Board of Water Resources, and 282 are owned by private individuals, companies, or municipalities, primarily fairly high in the watershed. The Utah Division of Parks and Recreation owns one water right within the Monument. Within the upper Escalante River Basin, which includes areas outside the Monument, some 1,563 water rights are held

for private and municipal uses. The Utah Department of Natural Resources has not conducted a water budget analysis for the entire Escalante River drainage, but a general overview of the drainage suggests that total depletions to this system are approximately 5 percent of the average annual discharge.

In addition, within the Escalante River basin the BLM holds 94 Federal reserved water rights resulting from executive order public water reserves, most of which lie within the Monument. These water rights protect water at the springs and waterholes but not after it leaves the quarter-section within which the spring or water hole is located.

The Utah State Engineer has closed the area immediately around the town of Escalante to new appropriations of water, due to full appropriation levels of the streams in that locale; the balance of the watershed remains open to new appropriations, but only to small applications of 0.015 cfs or less, because it lies within the drainage area of the State subject to the interstate compacts affecting Utah's use of Colorado River water.

While there is some substantial water development of the Escalante River drainage upstream of the Monument, most of the base flow perennial water available to the Monument enters the Escalante River downstream thereof. This fact, together with

the fact that peak flows resulting from snowmelt runoff and summer thunderstorms will continue to pass through the Monument virtually unimpeded due to the large percentage of the watershed within Federal ownership, and the further fact that the Utah State Engineer has closed portions of the basin to new appropriations and has placed limits of 0.015 cfs or less on new appropriations within the balance of the basin, suggests that the Monument's water resources are currently not experiencing adverse effects from the existing levels of development, and are not likely to do so in the foreseeable future.

Kaiparowits Composite Drainage Area

Lying generally south of the Escalante drainage, the Kaiparowits composite drainage consists of a topographic upland area characterized by numerous dry washes comprising ten principal watersheds. All ten of these relatively small drainages, when flowing, drain southward into Lake Powell after passing from the Monument into the GCNRA. These include Coyote Creek, Wahweap Creek, Nipple Creek, Warm Creek, Last Chance Creek, Croton Canyon, Little Valley Canyon, Rock Creek, Middle Rock Creek, and Dry Rock Creek.

The only perennial streams in this area are an approximately 8 mile reach of Last Chance

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Creek (including the lowest 1 mile of one of its tributaries, Drip Tank Canyon) and a 1 mile stretch in the lower portion of Croton Canyon. Except during periods of high runoff, both of these streams dry up again (disappear into the sand) before they leave the Monument. This perennial water is assumed to result primarily from the surface expression of groundwater. There are no substantial records of water flows in this area; the USGS has maintained only a few scattered peak-flow meters to record the peak discharge of runoff events.

There is no private land within this portion of the Monument, although it does contain the normal pattern of school sections for Utah (four sections per township). There are only eight private or municipal water rights within the Monument in this area. Of the four sections of the Monument discussed here, the area containing these ten drainages is at present the least affected by private water development and likely to remain so. As in the Escalante drainage, precipitation events cause the dry washes to flow for brief periods, sometimes at very high levels.

There are 312 water rights of record inside the Monument boundaries within the combined watershed area described here as the Kaiparowits Composite. Of these, 249 are owned by the BLM in support of its grazing permittees under the Taylor Grazing

Act, 55 are owned by SITLA, most in support of state grazing leases, and eight are owned by private individuals, companies, or municipalities, primarily fairly high in the watershed. The Utah Department of Natural Resources has never conducted a water budget analysis.

A large proportion of these water rights are clustered near the lower reaches of the Warm Creek and Wahweap Creek drainages. Most are quite small, but there is one cluster of existing private and municipal water rights in the Warm Creek drainage. Existing private and municipal water rights in the Wahweap Creek drainage are clearly minor in terms of effect on Monument resources. In addition, within the Kaiparowits Composite drainage area, the BLM holds 61 Federal reserved water rights resulting from executive order public water reserves. These water rights protect water at the springs and waterholes but not after it leaves the quarter-section within which the spring or water hole is located.

Of the entire Kaiparowits composite drainage area, only the extreme headwaters of Wahweap Creek on the south slope of Canaan Peak lie outside the Monument. Within this small area, no water rights have been filed, and the fact that this small portion of the drainage lies outside the Monument therefore does not pose a threat of adverse effects to Monument resources. This drainage area captures

precipitation and passes it through; aside from small stockwatering ponds there are no storage reservoirs or other such facilities to restrain sporadic natural high flows.

Paria River Drainage

The Paria River is the second largest single drainage in the Monument, draining the Monument's west-central area into Arizona and eventually the Colorado River. The towns of Tropic, Cannonville, and Henrieville are located high in the drainage and together represent the area with the highest concentrations of private and municipal water rights.

Most of the mainstem of the Paria River within the Monument (about 30 river miles) flows on a perennial basis, but there are small reaches near the upper and lower extremities of the portion of the river within the Monument that are typically dry. The flowing reaches are fed by subsurface flows, springs and other groundwater expressions, and by bank storage after high flows. A reach of about 4 miles of Cottonwood Creek is also perennial in this drainage, but this creek normally is dry about 2 miles above its confluence with the Paria River. This portion of Cottonwood Creek is also kept flowing by springs and other surface expressions of groundwater. These gaining reaches of the

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Paria River and Cottonwood Creek are followed by losing reaches, however, where they each become intermittent streams, flowing only subsequent to precipitation events.

Particularly during the irrigation seasons, the Paria is depleted seriously but still flowing when it reaches the northern Monument boundary. Shortly after entering the Monument, however, it commonly dries up for about 1 mile, then reappears and flows continuously until a point about 4 miles from where it again leaves the Monument boundaries. Outside the irrigation season, lesser upstream depletions result from the municipal uses of the towns of Tropic, Cannonville, and Henrieville. The USGS gauge “Paria River near Cannonville,” with 20 years of record (1951-55 and 1959-74), is located inside the Monument in the intermittent reach of the river, below the stream emerging from Little Dry Valley but upstream of the river’s confluence with Rock Springs Creek, and shows a mean daily flow of 9.08 cfs despite the intermittent character of the stream in this reach.

Little or no water storage occurs upstream of the Monument. All upstream depletions result from direct diversions of river water and from groundwater withdrawals from wells. Because of this, the larger flows resulting from snowmelt runoff and summer

monsoonal thunderstorms (those flows which are the most significant to the Monument in terms of channel maintenance, ongoing erosional processes, and canyon formation) are almost unaffected by current diversion levels upstream.

There are 427 water rights of record inside the Monument boundaries within the Paria River watershed. Of these, 234 are owned by the BLM in support of its grazing permittees under the Taylor Grazing Act. Fifty-one are owned by SITLA, most in support of state grazing leases. One is owned by the Utah Board of Water Resources, and 141 are owned by private individuals, companies, or municipalities, primarily fairly high in the watershed. There are 584 existing private and municipal water rights in the Paria River basin lying outside the Monument boundary. In addition, within the Paria River basin the BLM holds 38 Federal reserved water rights resulting from executive order public water reserves. These water rights protect water at the springs and waterholes but not after it leaves the quarter-section within which the spring or water hole is located.

The Utah State Engineer has closed the Paria River drainage to new appropriations altogether in the area above the confluence with Henrieville Creek; the drainage below that point remains open to new appropriations, but only to small applications of 0.015 cfs or less.

There are a number of existing surface and groundwater diversions upstream of the Monument in this drainage, and water stored in Tropic Reservoir is in fact imported into the basin from the Sevier River drainage via the “Tropic Ditch.” Because there are no sizable reservoirs or other storage facilities capturing high flows in the natural basin of the Paria River, snowmelt runoff and other large precipitation events continue to operate in their natural manner virtually unimpeded. Erosion and deposition processes continue with downcutting, backfilling, archbuilding and soil development. Upstream use has a more substantial impact on base flows near the northern boundary of the Monument within the Paria drainage. Henrieville Creek contributes to flow, and then 3 miles inside the Monument, the Paria River becomes perennial at the confluence with Rock Springs Creek.

The Utah Department of Natural Resources has never conducted a water budget analysis in the Paria basin, but from an overview it would appear that existing levels of depletions are unlikely to have any significant effect on Monument resources. The existing upstream depletions may be affecting riparian resources in this upper 3 miles, but the small size and small applicable area subject

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to possible future appropriations do not seem to indicate any threat of more than minor, incremental further depletions to base flows in this reach. The other water-related concern in the Paria River drainage relates to this stream as a high source of sediment- and salinity-loading to the Colorado River system, largely as a result of the geologic formations through which it passes (claystone and siltstone of the Chinle Formation and Tropic Shale).

Johnson Composite Drainage Area

Lying immediately to the west of the Paria River is an area characterized by several dry washes, all of which are contained within three drainage basins: Park Wash-Kitchen Corral Wash, Seaman Wash, and Johnson Wash. When flowing, Kitchen Corral Wash drains southward out of the Monument and eventually joins the Paria River in Utah before the Paria crosses into Arizona and joins the Colorado River below Lake Powell. Johnson Wash and Seaman Wash drain southward, eventually joining Kanab Creek in Arizona, and dropping into the Grand Canyon.

The only perennial stream in this area is an approximately 1 mile reach of Johnson Wash (Skutumpah Canyon) immediately inside the Monument as the stream crosses the boundary. Except during periods of high

runoff, this water disappears into the ground approximately 1 mile inside the Monument. This perennial water is a continuation of flows from the tributaries in the northern-most portion of the drainage, in an area of mixed private, BLM, State, and Forest Service lands. There are sketchy records of water flows in this area. The northern tributaries of Thompson Creek and Skutumpah Creek have brief periods of record in 1976-77, a particularly dry period, showing respective mean daily flows of less than 1 cfs. Johnson Wash then enters the Monument boundary into an area where additional intermittent tributaries join it but where there are no additional flow records. It is thought that these tributary washes flow only during periods of precipitation. The Wash then leaves the Monument boundary. Seven miles downstream from the boundary the USGS maintained another gauge from 1994-1997 which showed a mean daily flow of 0.53 cfs, although this is apparently an intermittent reach of the stream.

There are scattered tracts of private land within this portion of the monument, as well as the normal pattern of school sections for Utah (four sections per township). Stream courses in the Johnson composite area are probably affected very little, either at present or likely in the foreseeable future, by private water development. As in the other watersheds of the Monument, precipitation events cause the dry washes to flow for brief periods, sometimes at very high levels.

There are 238 water rights of record inside the Monument boundaries within the combined watershed area described here as the Johnson composite. Of these, 159 are owned by the BLM in support of its grazing permittees under the Taylor Grazing Act, 16 are owned by SITLA. Most of the SITLA-owned water rights are in support of state grazing leases. Also, 63 are owned by private individuals, companies, or municipalities.

In addition to the above water rights located inside the Monument boundaries, there are a number of water rights taking water from the northern tributaries of Johnson Wash before the water enters the Monument. Of these, there are 67 existing private water rights, 19 BLM water rights for stockwatering, and 23 SITLA-owned water rights in support of grazing leases. The Utah Department of Natural Resources has not conducted a complete water budget analysis of this drainage system, but existing uses are not considered substantial.

Headwaters for The Seaman Wash drainage is entirely inside the Monument. Water rights in Seaman Wash consist of six private water rights and 17 owned by the BLM for stockwatering. Park Wash is a larger drainage lying almost entirely within the

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Monument boundaries; that portion lying outside the Monument is a small piece of the drainage at the extreme northwest of the drainage. Some of the headwaters to Park Wash lie inside Bryce Canyon National Park and pass through only Dixie National Forest lands before entering the Monument. Other headwater streams in this portion of the Johnson composite drainage originate on National Forest lands and pass through an area of mixed private, State, and BLM lands before entering the Monument. There are 177 scattered private, State, and BLM water rights in this area upstream of the Monument.

In addition, within the Johnson composite area the BLM holds 52 Federal reserved water rights resulting from executive order public water reserves. These water rights protect water at springs and waterholes but not after it leaves the quarter-section within which the spring or water hole is located.

The depletions to Park Wash resulting from water rights upstream of the Monument are small, and are not felt to have significant effects on Monument resources dependent on base flows. They are thought to have virtually no effect on high flow runoff events. Upstream depletions in Johnson Wash, however, are clearly more significant in terms of their effect on that stream corridor. While the Monument encompasses most of the mid-stream tributaries on Johnson Wash, the

upstream depletions are much higher as a percentage of annual flows, and the number of wells in this portion of the drainage basin upstream of the Monument are likely having an effect on the amount of surface water available in the stream inside the Monument. All three of the streams in this area are intermittent, however, and are usually dry even under natural conditions.

VISUAL RESOURCE MANAGEMENT

There are 1,275,900 acres categorized as Visual Class II, in which the objective is to retain the existing character of the landscape. Visual Class III areas, covering 561,300 acres, are areas in which the objective is to partially retain the existing character of the landscape. Finally, 35,300 acres are categorized as Visual Class IV, in which the objective is to provide for management activities which require major modification of the existing landscape. Appendix 8 describes the Visual Resource Management (VRM) class objectives, and Map 3.4 shows the VRM classes.

WILDERNESS STUDY AREAS, INSTANT STUDY AREAS, OUTSTANDING NATURAL AREAS

The Monument contains 16 WSAs, totaling approximately 880,600 acres, or about 52 percent of the BLM acres in the Monument. These areas are shown on Map 3.5 and listed in Appendix 9. These WSAs were identified in a 1978-80 inventory as having wilderness character and thus worthy of further study to determine their suitability for designation as part of the National Wilderness Preservation System. In 1990, the Utah Statewide Final Environmental Impact Statement analyzed the suitability of the WSAs for designation, and in 1991, the Utah Statewide Wilderness Study Report made suitability recommendations to Congress.

Existing WSAs in the Monument will be managed under the BLM's Interim Management Policy (IMP) and Guidelines for Lands Under Wilderness Review (BLM Manual H-8550-1) until legislation takes effect to change its status. The major objective of the IMP is to manage lands under wilderness review in a manner that does not impair their suitability for designation as wilderness. In general, the only activities permissible under the IMP are temporary uses that create no new surface disturbance nor involve permanent placement of structures.

Map 3.4: Visual Resource Management Inventory Classes



- Principal Communities
- ▬ Monument Boundary
- ▬ Highways 89 & 12
- ▬ Other Roads
- Class II
- Class III
- Class IV

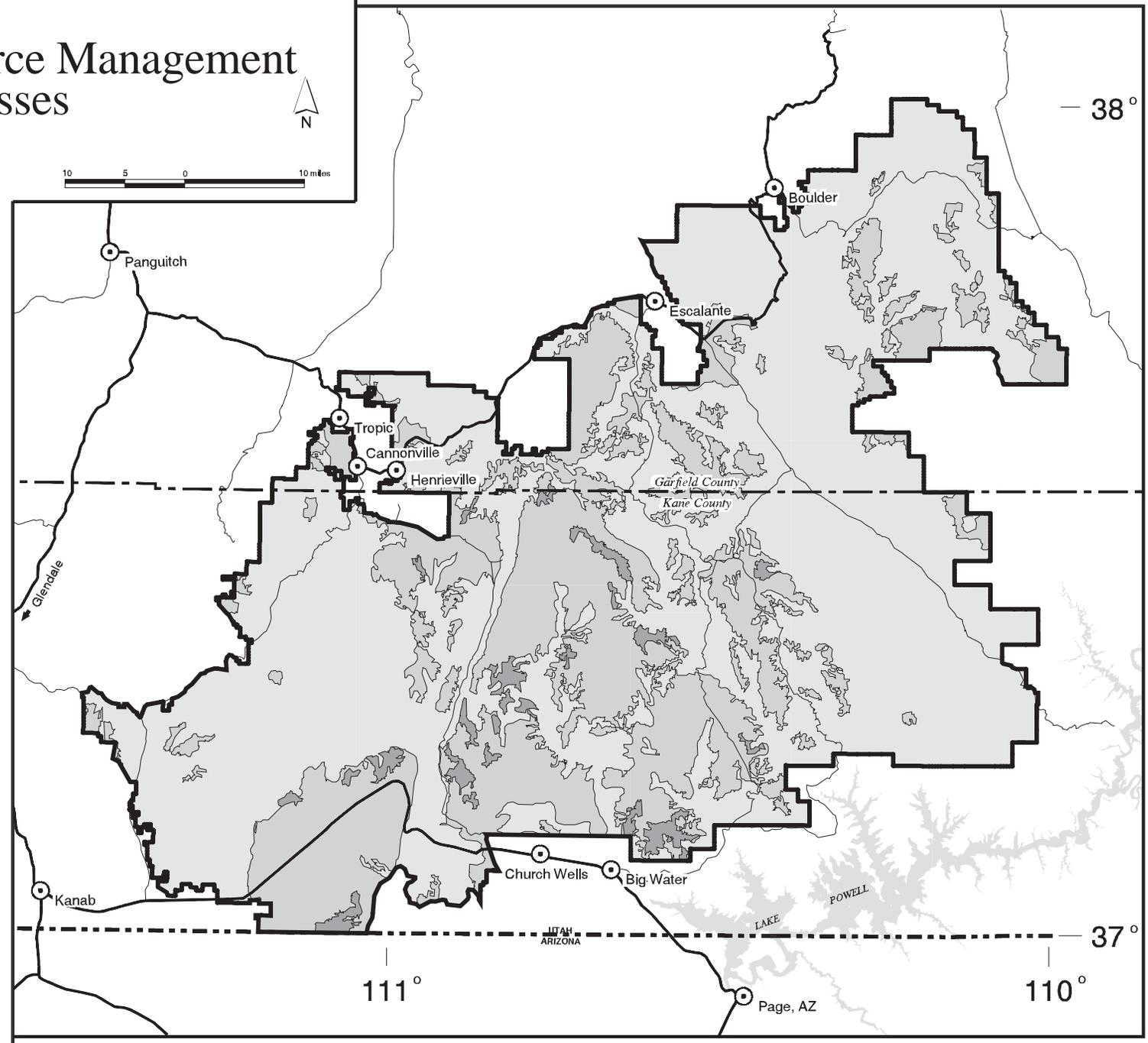


Location Map

Data has been gathered from a variety of sources and has been integrated to provide a planning context. The data shown outside the Monument may not have been verified. This map represents available information, and should not be interpreted to alter existing authorities or management responsibilities.



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Map 3.5: Wilderness Study Areas



10 5 0 10 miles

-  Principal Communities
-  Monument Boundary
-  Highways 89 & 12
-  Other Roads
-  Wilderness Study Area

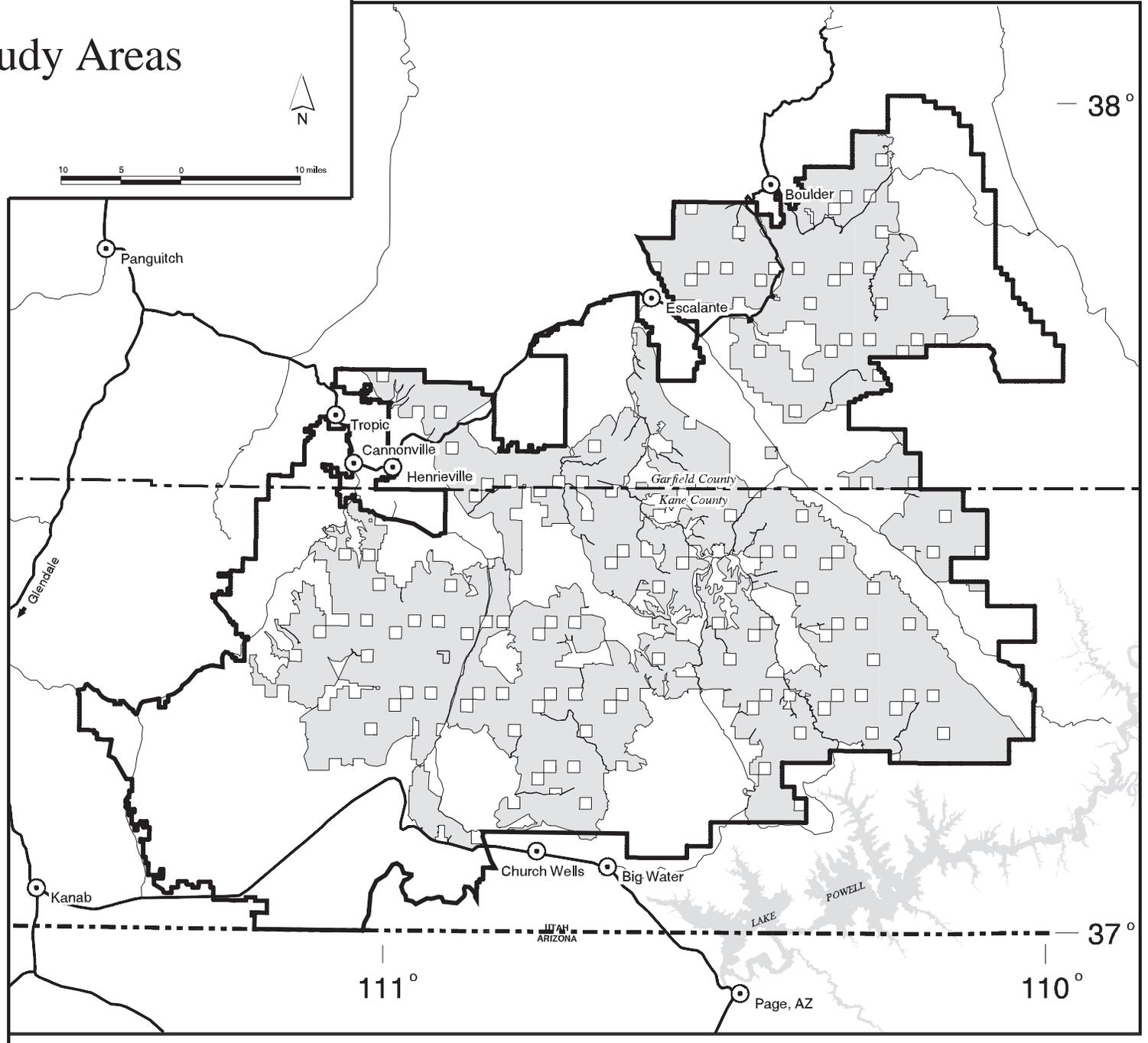


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Temporary, non-disturbing activities, as well as activities governed by valid existing rights, may generally continue in WSAs.

Actions allowed under the IMP will also be subject to other BLM laws and policies that govern the use of public land.

Outstanding Natural Areas (ONA) were created under the authority of the classification and Multiple Use Act (CMU) of 1964 (Appendix 18). Instant Study Areas (ISA) are lands that were previously classified as natural or primitive areas and were identified as ISAs under Section 603 of Federal Land Policy and Management Act (FLPMA). The ONAs became Instant Study Areas as part of the Wilderness Inventory process beginning in 1979. ISAs are equivalent to WSAs and are included in the acreage discussion of WSAs above.

WILD AND SCENIC RIVERS

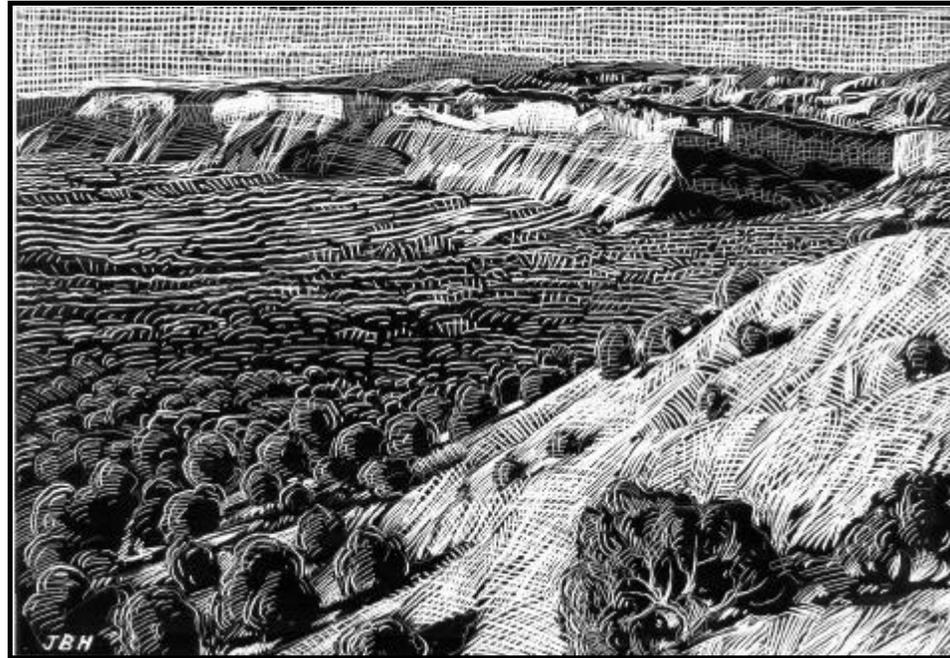
The Wild and Scenic Rivers Act of 1968, as amended, provides for protection of outstanding river resources. Section 5(d)(1) of the Wild and Scenic Rivers Act provides that wild and scenic river considerations be made during Federal agency planning. Either Congress, or the Secretary of the Interior, upon the nomination of the Governor of the State of Utah, may designate rivers as part of the National Wild and Scenic Rivers System.

BLM is responsible for making recommendations and completing appropriate environmental studies through the planning process. Pursuant to this mandate, the Monument planning team has completed an evaluation of river resources inside the Monument.

In 1994, BLM interdisciplinary teams gathered information regarding all river segments and watersheds in the Escalante and Kanab Resource Areas for consideration of river eligibility in the Escalante/Kanab Resource Management Plan (RMP). That RMP was not completed, but the Monument planning team has assessed the data gathered in 1994. In cooperation with the adjacent Federal agencies, the study area was expanded to include river segments that extended onto Dixie National Forest, Bryce Canyon National Park, and Glen Canyon National Recreation Area so that entire watersheds were evaluated. The water courses inventoried are shown on Map 3.6. The river segments that were found eligible are shown on Map 3.7 and Table 3.4. Potentially Eligible River Segments are described in Appendix 4.



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Map 3.6: Inventoried Wild and Scenic River Segments



- ⊙ Principal Communities
- ≡ Monument Boundary
- ≡ Inventoried River Segments

NOTE OF EXPLANATION:
This map highlights the main streams or rivers that were inventoried for eligibility. Tributaries and minor streams were inventoried but are not highlighted on this map for clarity.

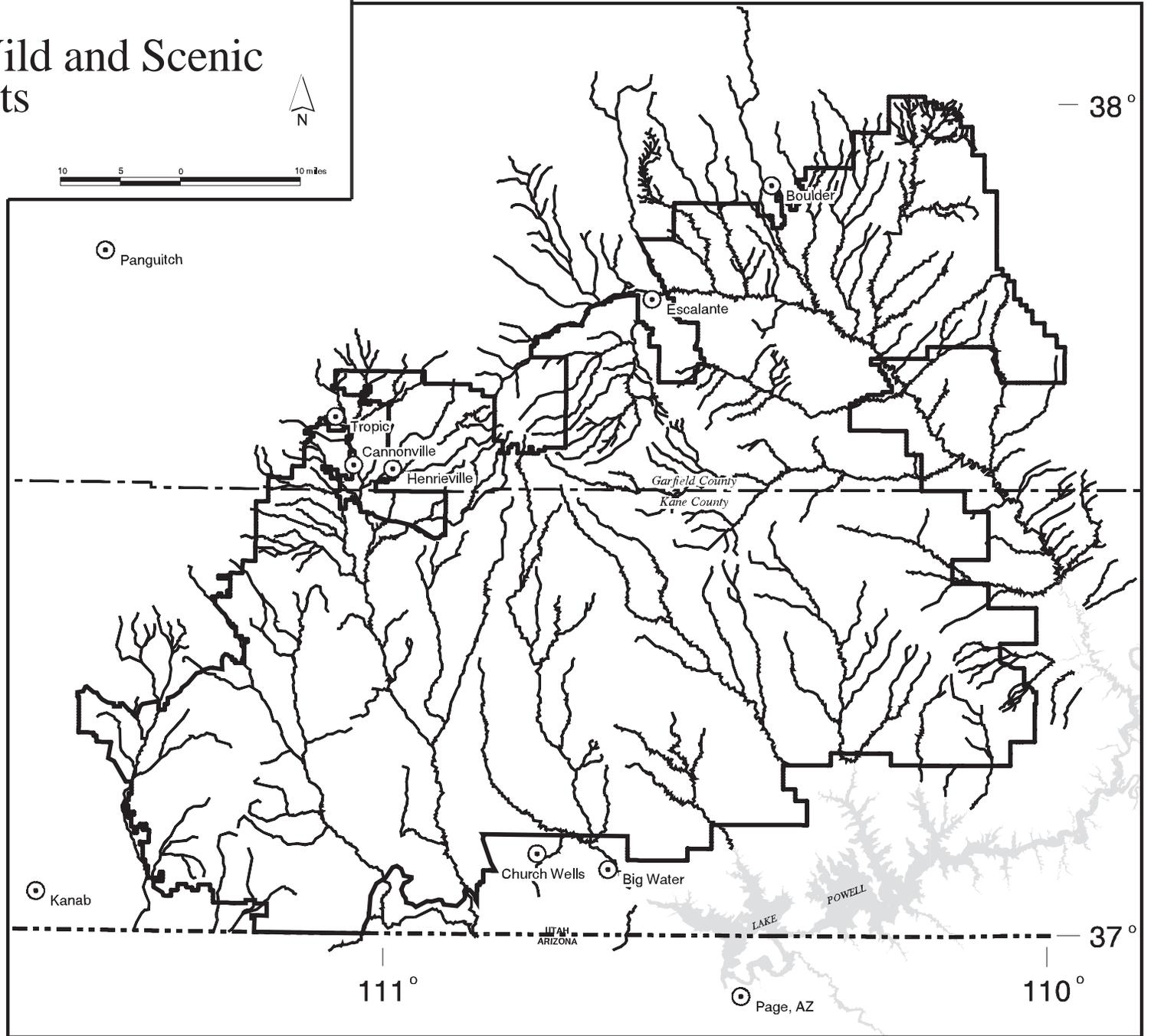


Location Map

Data has been gathered from a variety of sources and has been integrated to provide a planning context. The data shown outside the Monument may not have been verified. This map represents available information, and should not be interpreted to alter existing authorities or management responsibilities.



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Map 3.7: Eligible Wild and Scenic River Segments



- ⊙ Principal Communities
- ≡ Monument Boundary
- ≡ Eligible River Segments

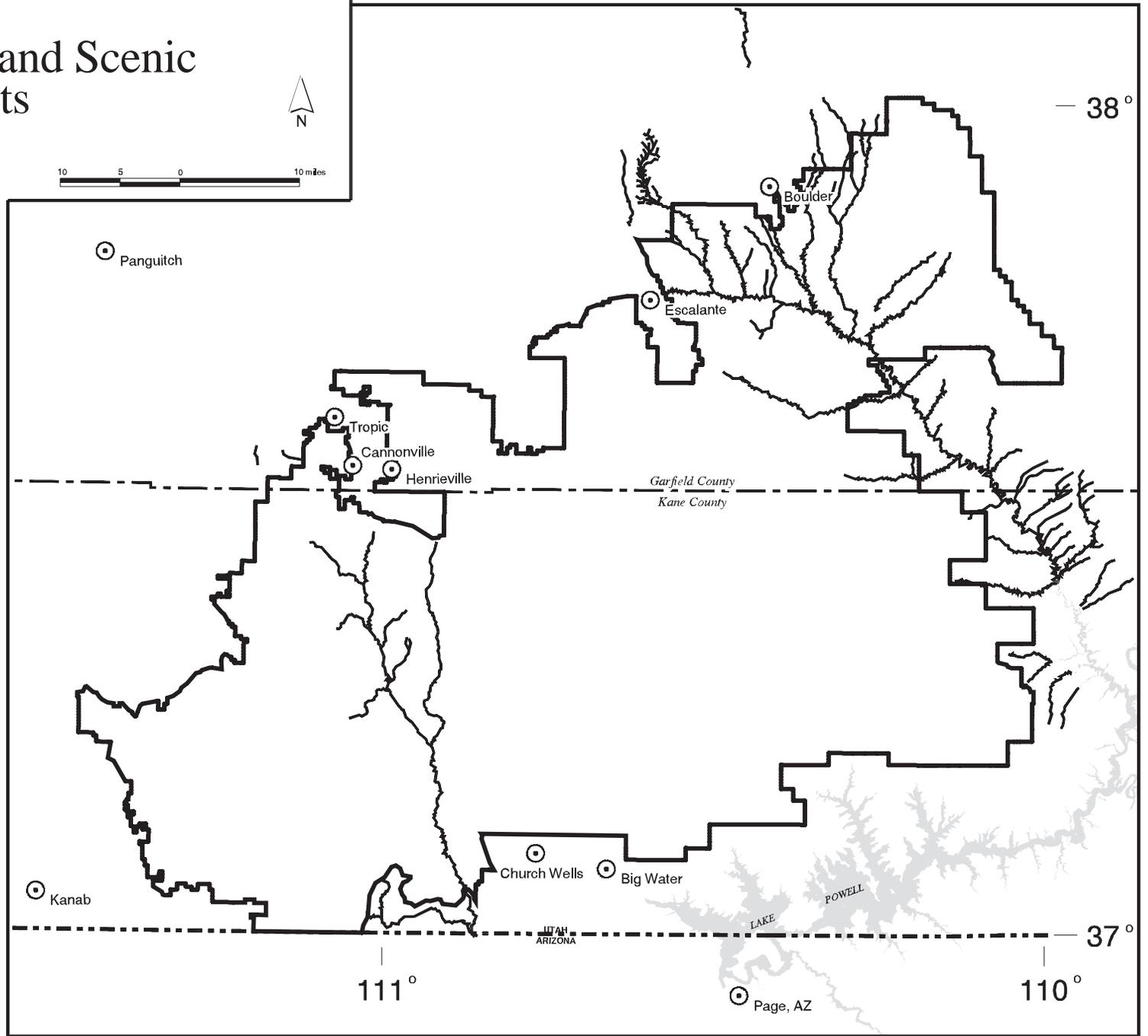


Location Map

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**Table 3.4
Eligible River Segments**

RIVER SEGMENT	SEGMENT DESCRIPTION	TENTATIVE CLASSIFICATION
Escalante River Basin		
Harris Wash	Tenmile Crossing (Hole-in-the-Rock Road) to Monument boundary	2.9 miles Scenic - Tenmile Crossing to Bighorn Wash 8.8 miles Wild - Bighorn Wash to unnamed road 2.8 miles Recreational - Road to west side of state section 1.2 miles wild - State section to Monument boundary
Lower Boulder Creek	Downstream side of State section to Escalante River	13.6 miles Wild
Dry Hollow Creek	Monument boundary to Lower Boulder Creek	4.3 miles Wild
Slickrock Canyon	Monument boundary to Deer Creek	2.8 miles Wild
Cottonwood Canyon	Monument boundary to Lower Deer Creek	4.4 miles Wild
Lower Deer Creek	Slickrock Canyon to Lower Boulder Creek	3.8 miles Recreational - Slickrock Canyon to Burr Trail 7 miles Wild - Burr Trail to Escalante River
The Gulch, Blackwater Canyon, Lamanite Arch Canyon, and Water Canyon	Monument boundary of the Gulch and the tributaries to Escalante River	11 miles Wild - Monument boundary to Burr Trail Road 0.6 miles Recreational - Along Burr Trail 13 miles Wild - Below Burr Trail 6.5 miles Wild - Black Water, Lamanite and Water Canyons
Steep Creek	Monument boundary to The Gulch including west tributary	8.9 miles Wild
Lower Horse Canyon	Outstanding Natural Area boundary to Escalante River	3.1 miles Wild
Wolverine Creek	Headwaters to top of road section Roaded section Bottom of road section to Lower Horse Canyon	2.5 miles Wild 1.3 miles Recreational 5.8 miles Wild
Little Death Hollow	Headwaters to top of road section Roaded section Bottom of road section to Escalante River	4.8 miles Wild 1.3 miles Recreational 8.7 miles Wild
Escalante River	Pine Creek confluence to Monument boundary	13.8 miles Wild - Pine Creek to Highway 12 1.1 miles Recreational - Highway 12 to east side of private land 19.2 Wild - Private land to Monument boundary

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RIVER SEGMENT	SEGMENT DESCRIPTION	TENTATIVE CLASSIFICATION
Lower Sand Creek and Willow Patch Creek	Sweetwater Creek to Escalante River	13.2 miles Wild
Mamie Creek and west tributary	Headwaters on Dixie National Forest to Escalante River	9.2 miles Wild
Death Hollow Creek	Monument boundary to Mamie Creek	9.9 miles Wild
Calf Creek	Headwaters to Escalante River	3.5 miles Wild - Headwaters to Lower falls 2.9 miles Scenic - Lower falls to campground 1.5 miles Recreational - Campground to Escalante River
Phipps Wash and tributaries	Top to Escalante River	6 miles Wild
Unnamed Tributary (West of Calf Creek)	Top to Escalante River	2.6 miles Wild
Twentyfive Mile Wash	Rat Seep Hollow to Monument boundary and unnamed wash on north side.	11.1 miles Wild
Paria River Basin		
Paria River including Deer Creek Canyon, Snake Creek, Hogeeye Creek, part of Kitchen Canyon, Starlight Canyon, and part of Cottonwood Creek	Little Dry Valley to downstream side of private property below Highway 89 (Paria segment extends into Henrieville Creek and Paria River Watersheds)	38.6 miles Recreational - Paria 5.1 miles Wild - Deer Creek 4.7 miles Wild - Snake 6.3 miles Wild - Hogeeye 1.2 miles Wild - Kitchen 4.9 miles Wild - Starlight 2.9 miles Recreational - Cottonwood Creek
Bull Valley Gorge	Little Bull Valley to Sheep Creek	5.9 miles Wild
Lower Sheep Creek	Bull Valley Gorge to Paria River	1.5 miles Scenic
Hackberry Creek	Headwaters to Cottonwood Creek	20.1 miles Scenic
Buckskin Gulch	Wilderness boundary to Paria River, includes WirePass	18 miles Wild
Lower Paria River	From where river leaves private land to Arizona State line	3.3 miles Recreational - Private land to wilderness boundary 4.9 miles Wild - Segment in wilderness

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COMMUNITIES AND ECONOMICS

Federal land management policy has played a major role in the development and stability of communities near the Monument. The 19th century view that public lands were to be privatized has evolved into the current policy that the public lands are to be retained and managed in a manner that will protect the quality of scientific, scenic, historic, ecological, environmental, air, water, and archaeological resources. This shift in policy has affected how communities achieve economic and social stability. Earlier utilization of public lands focused on natural resource extraction (including livestock grazing and mining), and has evolved into a recognition of aesthetic and scientific values (including recreation and research).

The designation of the Monument has given a new emphasis to the need for current county and community plans. Virtually every gateway community, as well as Kane and Garfield Counties, are proceeding with their own plan amendment or update to address the impacts of Monument designation. BLM has been coordinating with these local governments and providing financial assistance for these efforts.

The present populations of both counties can be characterized relative to the State as being small, sparsely distributed, increasing slowly, and relatively old. As of 1998, approximately 12,000 people live in the area. Both counties have among the lowest populations per square mile of any of the counties in Utah. The largest cities in the area are Kanab (4,400); Panguitch (1,500); and Escalante (1,000) (Appendix 19).

Population growth in the counties has generally been lower than the State average. In Garfield County, immigration has occurred in five of the past ten years. Kane County's population has been increasing at a faster rate than in Garfield County and migration has occurred in only two of the past ten years (Appendix 19).

The populations in both counties are among the oldest in the State. For example, the median age in Garfield County of 31.8 years is the sixth highest in the State, while Kane County is the eighth highest with a median age of 30.5.

These unique demographic characteristics are closely associated with the economic realities faced by both counties. The populations are small because there are relatively few employment opportunities. The populations are relatively old and migration is common because many of those aging into the labor force must leave to find work (Appendix 19).

Performance of the economies in Kane and Garfield County can be characterized as cyclical and sluggish compared to the vibrant performance of the State's overall economy in recent years. Both counties struggle with unemployment rates higher than the State average, per capita personal income lower than the state average, and a lack of employment diversity. For example, unemployment in Garfield County is currently the second highest in the State at 8.3 percent. Unemployment rates have been in the double digits in five of the past ten years. Per capita income in Garfield County is estimated to be \$16,900, just 83 percent of the State average. Kane County is faring better with an unemployment rate of 4.1 percent and per capita personal income of \$19,900, closer to the State average of \$20,400 (Appendix 19).

Many of the economic problems in both counties can be explained by a general lack of diversity in the economic structure. The area relies heavily on the economic performance of just four major industries: agriculture, government, timber, and tourism. The first three of these industries have been relatively constant or declining as a proportion of the total economy. While agriculture is an important economic resource to both counties, employment in agriculture has remained level, and at times has declined for many years. Employment in the timber industry has been cyclical and declining as sawmills have downsized and closed. Employment in local,

CHAPTER 3 - AFFECTED ENVIRONMENT

state, and Federal government has been increasing, but slowly. It is only in the tourism industry that employment growth has been sustained. In fact, Garfield and Kane County's dependence on the tourism industry has steadily increased (see Appendix 19).

The Economic Research Service of the U.S. Department of Agriculture has developed a "rural topology" system, which characterizes non-metropolitan counties sharing important economic and policy traits. The system characterizes each county as part of a prevailing economic and policy type. Garfield County is described as "government dependent" because over 25 percent of total income is generated by the government sector. It is also described as a "Federal lands" policy-oriented county, due to the large proportion of Federal lands in the county. Kane County is described as "service dependent"; since over 50 percent of total income comes from service activities. It is also considered a "Federal lands" policy-oriented county (U.S. Economics and Statistics Administration, 1997) (Appendix 19).

Tourism currently provides 40 percent of total employment in Kane County and 60 percent in Garfield County. Since 1990, spending by travelers has increased 8 percent per year in Garfield County, and 10 percent in Kane County, as compared to 5.9 percent statewide

(Utah Governor's Office of Planning and Budget, 1997) (Appendix 19).

Both counties have developed county-level economic development plans, and are part of the Southwestern Utah Economic Development District. These organizations have identified economic diversification as the primary need in both counties. Their major focus is on providing the physical infrastructure necessary to accommodate locally-grown businesses which complement the scenic surroundings. A secondary focus is providing adequate capital for local business owners (Five County Association of Governments, 1996, 1998).

While both counties recognize that their economic bases are shifting toward an "amenity" base, where major economic growth is centered on activities which capitalize on the scenic resources of surrounding public lands, they are also committed to fostering a diversified economic base which allows for compatible business development in every sector. They are especially interested in light manufacturing, which adds value to local natural and human resources (Garfield County, 1995; Kane County, 1993; Hecox, 1996).

VISITOR USE

The Monument is part of a larger multi-ownership complex which includes adjacent National Forest, National Parks, Bureau of Land Management lands, Utah State Parks, and the infrastructure of tourist services and facilities in the adjacent communities. The Monument is outstanding among America's last great places where solitude, unconfined experiences, and a sense of adventure still exist.

Visitor use in the area has been increasing steadily. Since 1981, visitation has increased almost three-fold at adjacent Bryce Canyon National Park and nearly doubled in Capitol Reef National Park (Utah Governor's Office of Planning and Budget, 1997). Visitation has doubled in the Escalante Canyons Areas. Visitor use peaks in April and May, and again in September and October.

The visitation figures in Table 3.5 were primarily obtained from the Recreation Management Information System (RMIS). Figures are provided to this system by resource area staff on a yearly basis. The 1980 and 1985 figures were obtained from a draft recreation activity management plan for the Escalante Canyons in 1990.

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**Table 3.5
RMIS Visitation Figures**

Year	Number of Visitors to Escalante Canyons	Number of Visitors to Kaiparowits Plateau	Number of Visitors to Grand Staircase
1980	11,600	Unknown	Unknown
1985	35,200	Unknown	Unknown
1994	373,200	Unknown	23,800
1995	384,800	Unknown	22,600
1996	456,400	Unknown	32,500
1997	659,500	3,700	42,000

While the figures in Table 3.5 are estimates based on road counters, trail registers and patrols, the Escalante Interagency Visitor Center reflects the most accurate visitor counts in the Monument (see Table 3.6). However, an informal interview conducted by Oregon State University students in 1997 found that only 40 out of 170 contacts stopped at the center.

The **Escalante Canyons** are world renowned for canyon backpacking and hiking opportunities. The quantity and variety of canyons, their accessibility, and water

availability makes this area distinctive from other canyon areas in the Southwest. Many groups and individuals have been hiking in this area for over 30 years. Organizations include universities, public schools, Boy Scouts, church groups, clubs, and environmental organizations. The canyons are also used by horseback riders.

**Table 3.6
Visitation Figures**

Escalante Interagency Visitor Center	
Year	Number of Visits
1992	5,000
1993	12,000
1994	14,000
1995	15,000
1996	16,000
1997	26,000

Also popular in the Escalante Canyons Region is Highway 12, one of the most Scenic Byways in the Nation, connecting Bryce Canyon National Park to the west with Capitol Reef National Park to the east. Burr Trail and Hole-in-the-Rock Road are State designated backways that are popular for scenic driving. The Circle Cliffs and Wolverine areas contain

a network of abandoned mining roads which provide four-wheel-drive, all-terrain vehicle (ATV), and mountain biking opportunities. Visitor use in this area is currently low.

While BLM provides camping at two small developed areas, most visitors camp in remote dispersed primitive areas.

The **Kaiparowits Region** is largely a remote, rugged, hostile environment to most visitors. There is very little water available. Winters are cold and summers hot. As such, most of the visitor use occurs along Smoky Mountain Road, which is a four-wheel-drive road connecting Big Water to Escalante. While the land itself is harsh, views of Lake Powell, Navajo Mountain, and other distant landscapes are spectacular. Four-wheel-driving and equestrian use are the predominant activities.

Unique to this physiographic region is Fiftymile Mountain. It is a large flat-topped mesa with piñon pine and juniper forests, some aspen groves and springs, edged by the Straight Cliffs, and accessed only by three non-motorized trails. It is popular for deer hunters, horseback riders, and some hikers.

The **Grand Staircase** region is best known for the trophy hunting of the Paunsaugunt mule deer herd. Antler hunting is also a popular activity. As such, the extreme

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southwest portion of the Grand Staircase is punctuated with sandy roads, also making them popular for ATV use and four-wheel-driving.

Cottonwood Wash Road is a State designated backway which connects Bryce Valley (to the north) with Highway 89 (to the south). Geology is the predominant feature and is popular with visitors and educational groups. Grosvenor Arch and The Cockscomb can be seen along this route. Skutumpah Backway is a two-wheel-drive high clearance route that connects Cottonwood Wash Road and Johnson Canyon Road, and is used as an access route to the Paria/Hackberry area. ATV use is moderate along this route.

The Paria/Hackberry Canyons area is non-motorized and is utilized somewhat by hikers. The lower Paria Canyon, located outside of the Monument in the Paria Canyon/Vermilion Cliffs Wilderness, is more known to hikers and is therefore more popular. Horseback riding is popular through Paria Canyon.

The movie industry “discovered” the area around Kanab in the 1920s and has continued to produce movies and television programs in the region. The Paria movie set was built in the 1960s, but was abandoned and is now a popular recreation destination.

There are no developed campgrounds in the Grand Staircase or Kaiparowits regions. A developed picnic area is located at the Paria movie set and a parking area at Grosvenor Arch.

Special Recreation Management Areas (SRMAs) are areas that require greater recreation investment, where more intensive recreation management is needed, and where recreation is a principal management objective. The Canyons of the Escalante and Paria/Hackberry Canyons are currently identified as SRMAs (Appendix 3).

For visitors, probable combinations of recreation activity, setting, and experience are expressed as recreation opportunities. Existing recreation experience opportunities are mapped based on the physical, social, and managerial setting. The physical setting is defined by the absence or presence of human sights and sounds (remoteness criterion), the size of the area, and the amount of modification caused by human activity. The remoteness criterion is based on distance from roads or trails and whether the trails are motorized or non-motorized. The social setting reflects the levels and types of contacts between individuals or groups. The managerial setting reflects the kind and extent of management services and facilities provided to support recreation use and the restrictions placed on peoples’ actions.

The Recreation Opportunity Spectrum (ROS) divides recreation opportunities into six classes. The six classes are: primitive (P), semi-primitive non-motorized (SPNM), semi-primitive motorized (SPM), roaded natural (RN), rural (R), and urban (U). Currently, 663,200 acres are categorized as primitive, 538,400 acres are categorized as semi-primitive non-motorized, 582,200 acres are categorized as semi-primitive motorized, 79,600 acres are categorized as roaded natural, and 11,500 acres are categorized as rural. Urban class experience opportunities, characterized by a highly modified environment, are not present in the Monument. Appendix 20 describes the ROS setting descriptions for classes present in the Monument.

In 1997, recreation fees were collected through concessionaire contracts and special recreation permits. A concessionaire, as part of a Forest Service contract, operated Calf Creek, Deer Creek, and Devils Garden recreation sites from April through September of 1997. There were 3,019 recreation use permits issued for these sites and \$11,385 worth of in-kind services provided by the concessionaire. BLM is currently managing those sites.

In 1997, 53 special recreation permits were issued with a total revenue of \$16,905, which is 3 percent of gross revenues. Commercial

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use comprises approximately 10 percent of the total recreation visits to the Monument. Special recreation permits increased in the Escalante Canyons from 11 in 1990 to 26 in 1994. Outfitter and guide permitted use areas are shown on Map 3.8. Table 3.7 includes a list of the numbers and types of outfitters operating in 1997.

**Table 3.7
Outfitters Operating in 1997**

Mountain Bicycle Outfitters	2
Backpacker (Overnight) Outfitters	22
Climbing Outfitter	1
Fishing Outfitters	2
Big Game Hunting Outfitters	10
Hiking/Walking (Day) Outfitters	5
Horseback Riding Outfitters	5
Llama Pack Trip Outfitter	1
Scenic Viewing Road Tours Outfitter	2
Viewing Cultural Sites Outfitter	1
Competitive event - the Outlaw Trail Ride	1

In addition, there have been over 50 new inquiries for commercial operations within

the Monument. Interim policy, established in January of 1998, determined that new permits will only be issued for one time events that do not exceed 14 days, are not surface disturbing, and do not violate Monument resources. This will be in effect until the Monument Management Plan is completed. In addition, group size in Wilderness Study Areas is limited to 12 people, including guide(s), and no more than 12 pack animals.

Currently, a Memorandum of Understanding between BLM and Glen Canyon National Recreation Area provides for administration of recreation use within the Escalante River canyon system from the town of Escalante to Lake Powell. The purpose of this agreement is to coordinate and promote the effective management of use on the Escalante River canyon system.

VISITOR FACILITIES

For the following discussion, facilities are defined as any structures built to serve a particular purpose. There are no existing BLM facilities associated with the Monument that support field work, museum curation, or laboratory preparation and analysis of scientific materials.

Currently, the Monument has administrative offices located in Escalante and Kanab. Visitor information centers are co-located in these

offices, and interpretive associations operate sales centers in them through cooperative agreements. The Paria Contact Station is a visitor information site, located east of Kanab on Highway 89. The Monument also has a visitor contact area inside the Anasazi State Park Visitor Center in Boulder, Utah.

In addition to visitor contact facilities, several other types of “developed” sites exist within the Monument. These include 2 small campgrounds (Calf Creek and Deer Creek), 4 historic sites, 3 picnic areas, 5 scenic overlooks along Highway 12, and 22 trailheads. There is also limited signing at intersections of main roads and at trailheads. For a detailed description of these facilities, refer to Appendix 21.

LAND USE PERMITS AND CLASSIFICATIONS

Agency policy has been for the BLM to allow most uses, as long as resources are not negatively impacted. This has usually required some kind of land use permit and review of the proposed use. The land use permits are monitored by BLM personnel for compliance with their terms and conditions. Most land use permits are issued under authorization of Title III of the Federal Land Policy and Management Act.

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Another authority is the Recreation and Public Purposes (R&PP) Act. Lands classified under the R&PP Act are segregated under the public land laws, including the mining laws. This act authorizes the sale or lease of public lands for recreational or public purposes to state and local governments and to qualified nonprofit organizations. There are currently 2 R&PP leases within the Monument, totaling 17.5 acres.

RIGHTS-OF-WAY

The Rural Electrification Agency was created in 1935 and Garkane Power Association was organized soon after. By 1939, electric power was sent from the generating plant at Hatch to Ruby’s Inn, Bryce Canyon National Park, Tropic, Cannonville, Henrieville, and Escalante. Electric power lines were not extended to Boulder until 1947, and on to Salt Gulch in 1953. Location of electric powerlines and other utility rights-of-way have historically been determined by ease of construction and accessibility.

There are numerous electric transmission and distribution lines within the Monument, as well as other rights-of-way (including telephone lines, pipelines, and irrigation ditches). There are no BLM-designated utility corridors within the Monument. Table 3.8 contains information on Rights-of-Way.

**Table 3.8
Rights-of-Way**

Number	Type	Miles/Acres
26	Electric powerlines	152.74 miles
2*	Power Substations	2.57 acres
7	Telephone Lines	32.69 miles
22	Pipelines	23.70 miles
1	Ditch	0.43 miles
1	Tunnel	1.05 miles
4**	Communication Sites	2.49 acres
1	Reservoir	3.15 acres
1	Memorial Site	5.00 acres
1	Storage Area	144.55 acres
4	Mineral Material Sites	270.61 acres
19	Unpaved Roads	30.19 miles
19***	Paved Roads	51.50 miles
<p>*These substations are authorized under the same right-of-way grant as their associated powerlines, not under separate authorizations. **Three of these rights-of-way are within the same communication site (Buckskin Mountain). ***These are different segments of four of the paved/hard surfaced roads in the Monument: Highway 89, Highway 12, Burr Trail, and Johnson Canyon Road.</p>		

The Monument also includes site-specific non-linear rights-of-way which accommodate microwave and transmitter sites, small reservoirs, springs, recreation facilities, and mineral material sites. There are three communication sites within the Monument: Top-of-the-Rocks (located 7 miles southeast of Escalante), Buckskin Mountain (located 13 miles west of Church Wells), and Fiftymile Bench (located 38 miles south of Escalante).

BLM policy is to “authorize all rights-of-way uses on public and Federal lands at the discretion of the authorized officer...” (BLM Manual 2800.06). These are authorized under Title V of FLPMA. However, rights-of-way are generally not granted in areas where threatened or endangered species, important archaeological resources, wilderness study areas, or other critical resources would be adversely affected.

WITHDRAWALS

The area in which facilities are located is sometimes protected by a withdrawal. A withdrawal is a formal land designation which has the effect of reserving land for a certain use. Withdrawals remove certain public lands from the operation of one or more of the public land laws, excluding lands from settlement, sale, location, or entry, including entry under the General Mining Laws.

Map 3.8: 1997 Outfitter and Guide Permitted Areas



- ⊙ Principal Communities
- ▭ Monument Boundary
- ▭ Outfitter Areas
- ▭ Kaiparowits Hunting Unit
- ▭ Paunsaugunt Hunting Unit
- ▭ Plateau Hunting Unit

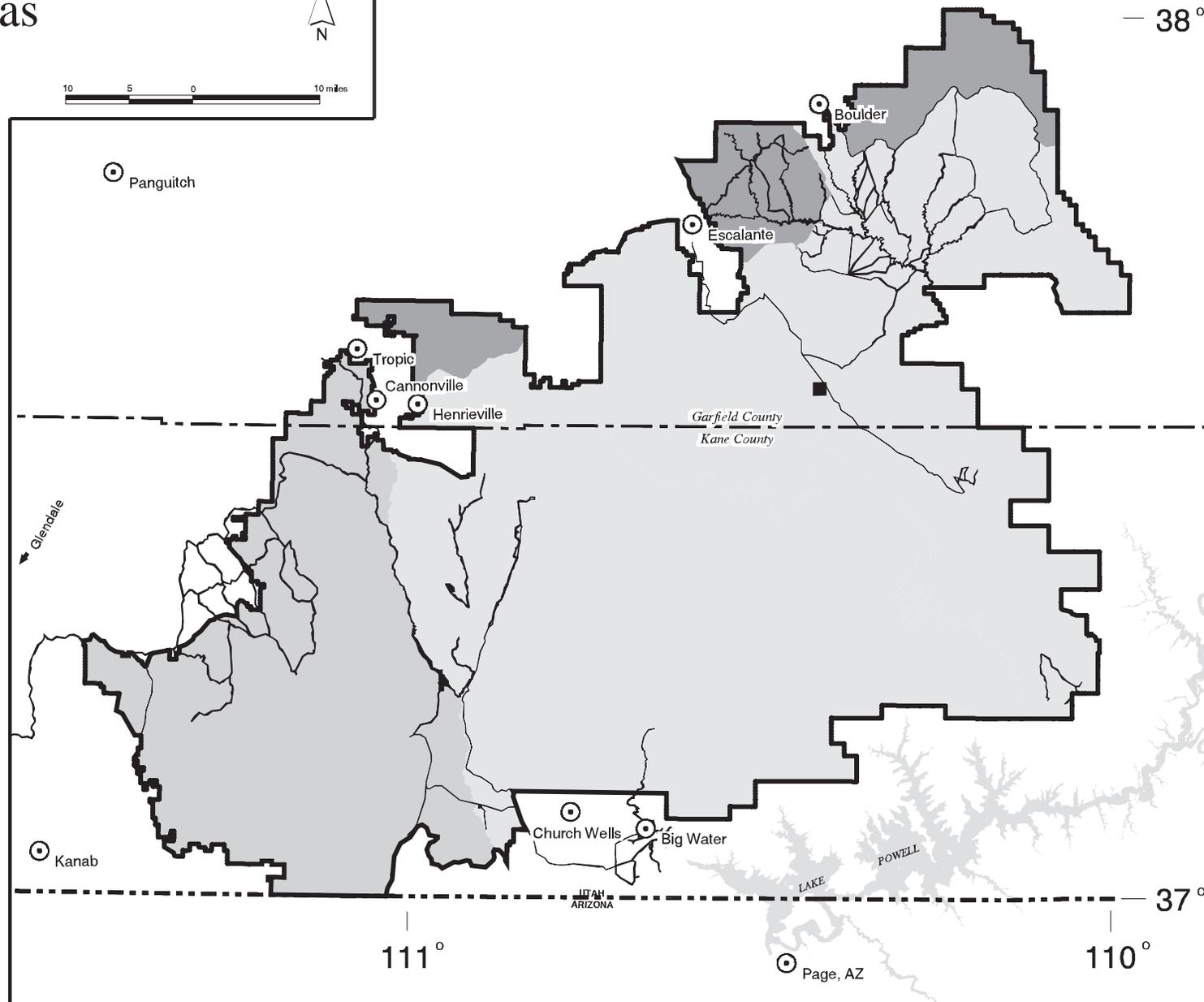


Location Map

Data has been gathered from a variety of sources and has been integrated to provide a planning context. The data shown outside the Monument may not have been verified. This map represents available information, and should not be interpreted to alter existing authorities or management responsibilities.



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Withdrawals remain in effect until specifically revoked.

Several types of withdrawals exist within the Monument. Table 3.9 summarizes all existing withdrawals within the Monument, as well as special classification areas.



Table 3.9
Withdrawals/Classifications

Number	Type	Acres
248	Public Water Reserves	12,035.25
10	Reclamation Withdrawals	17,496.00
3	Recreation Classifications	7,940.00
1	Withdrawal for FERC Project #2219	131.55
1	Withdrawal for FERC Project #2642	57.14
1	Wolverine Petrified Wood Area	1,520.00
1	Escalante Canyons ONA	1,160.00
1	Devils Garden ONA	640.00
1	N. Escalante Canyon ONA	5,800.00
1	The Gulch ONA	3,430.00
1	Phipps-Death Hollow ONA	34,300.00
1	Calf Creek Recreation Area	5,835.00
1	Deer Creek Recreation Area	640.00
1	Dance Hall Rock Historic Site	640.00

COAL

Coal beds contained in Cretaceous rocks of the Kaiparowits Plateau were first mined by settlers near Escalante in the late 1800s. Coal investigations were first reported by Gregory and Moore (1931). Energy companies became interested in development of Kaiparowits coal in the early 1960s as coal leases were obtained by 23 separate companies. Hundreds of coal test holes were drilled as plans were made to build a 5,000 megawatt coal-fired power plant on Fourmile Bench. The plans were scaled back in the early 1970s to a 3,000 megawatt plant and eventually dropped altogether because of economic and environmental concerns.

The Kaiparowits field (Map 3.9) is enclosed in Cretaceous rocks of the Straight Cliffs Formation. Hettinger and others (1996) estimated that the field contains 62 billion tons of original coal resource in-place in multiple coal horizons.

Two coal leaseholds, belonging to Pacificorp and Andalex Resources, Inc., cover about 54,000 acres within the Kaiparowits field. Pacificorp holds one coal lease consisting of approximately 18,000 acres, while the Andalex leasehold consists of 17 leases containing approximately 36,000 acres. The Pacificorp lease was suspended in 1992 because of its inclusion in two Wilderness

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Study Areas. Under a recent decision of the Interior Board of Land Appeals, seven of the seventeen leases in the Andalex leasehold are currently suspended. Exchange discussions between Andalex and the Department of Interior and Pacificorp and the Department of Interior have occurred.

OIL AND GAS

Some 85 active Federal oil and gas leases within the Monument cover more than 136,000 acres of Federal land (Map 3.10). In addition, nearly 43,000 acres of lands administered by SITLA within the Monument boundary have been leased for oil and gas (Utah School and Institutional Trust Lands Administration, 1998). Although the geology of the Monument and surrounding region is favorable for the accumulation of oil and gas, the only commercial quantities of oil found to date are at the Upper Valley field. To date, 48 wildcat (exploratory) wells have been drilled within what are now the boundaries of the Monument. These wells have all been capped and abandoned. The most recent wildcat was completed in November of 1997 by Conoco on a SITLA lease.

The Upper Valley oil field was discovered in 1964 by Tenneco, and has since produced nearly 26 million barrels of oil, mostly from the Permian Kaibab Limestone. Citation Oil & Gas Corporation is the current operator of

22 production wells and 11 water injection wells within the field. Five of the production wells and two of the injection wells are located within the Monument. Production from wells within the Monument represents about 27 percent of production from the total field. The oil accumulation at the Upper Valley field is unusual because it is displaced to the southwest flank of the Upper Valley anticline due to hydrodynamic drive in the Kaibab Formation (Sharp, 1978; Allin, 1993). The average monthly production from the field is about 20,000 barrels.

Conoco has completed its Reese Canyon State 32 (S32 T39S R5E) well, which was originally proposed to a total depth of 14,500 feet to test Cambrian and Precambrian rocks. The well was completed to a depth of 11,911 feet, reportedly encountering carbon dioxide (CO₂) within the Cambrian Tapeats Sandstone, and Muav Limestone (Utah Division of Oil, Gas, and Mining). Conoco's application was approved by the BLM to drill Reese Canyon Federal No. 2 (S5 T40S R5E), a proposed Cambrian and Precambrian test well with a projected total depth of 14,000 feet. After reviewing results of the Reese Canyon State 32 well, Conoco decided not to drill the Reese Canyon No. 2 well.

Conoco has submitted applications to the BLM to drill at several other locations in the Monument. The BLM has not, as yet, made a

determination on these applications. The BLM is currently preparing an environmental assessment for one of the five applications for permit to drill (APD). The BLM is beginning the analysis of several possible drill sites in the Circle Cliffs area under the National Environmental Policy Act (NEPA). The minerals are State owned and the Federal surface is managed by the BLM. The BLM is processing the rights-of-way for the drill sites and is assessing the effects of the activities.

In the Circle Cliffs region of the Monument, remnants of a large, pre-existing oil field can be seen as solid bitumen that impregnates pore spaces of rocks in the Torrey and Moody Canyon Members of the Triassic Moenkopi Formation. These types of hydrocarbon deposits are sometimes referred to as "oil-impregnated rocks" or "tar sands" which are terms used to describe a sedimentary rock impregnated with a very heavy, viscous crude oil (bitumen) that cannot be extracted by conventional methods. The western flank of the deposit lies entirely within the Monument, while the eastern flank lies mostly within Capitol Reef National Park (Ritzma, 1979, 1980).

The U.S. Congress passed the Combined Hydrocarbon Leasing Act (PL 97-78) in 1981, which provided for the combining of oil and gas leases with tar sand leases in certain specified areas containing the bulk of

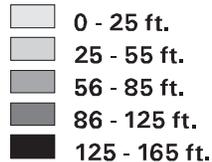
Map 3.9: Federal Coal Leases and Distribution of Total Coal in the Kaiparowits Coal Field

(after Hettinger and others, 1996)



- ⊙ Principal Communities
- ▬ Monument Boundary
- ▬ Highways 89 & 12
- ▬ Other Roads

COAL THICKNESS INTERVALS



▬ Federal Coal Leases

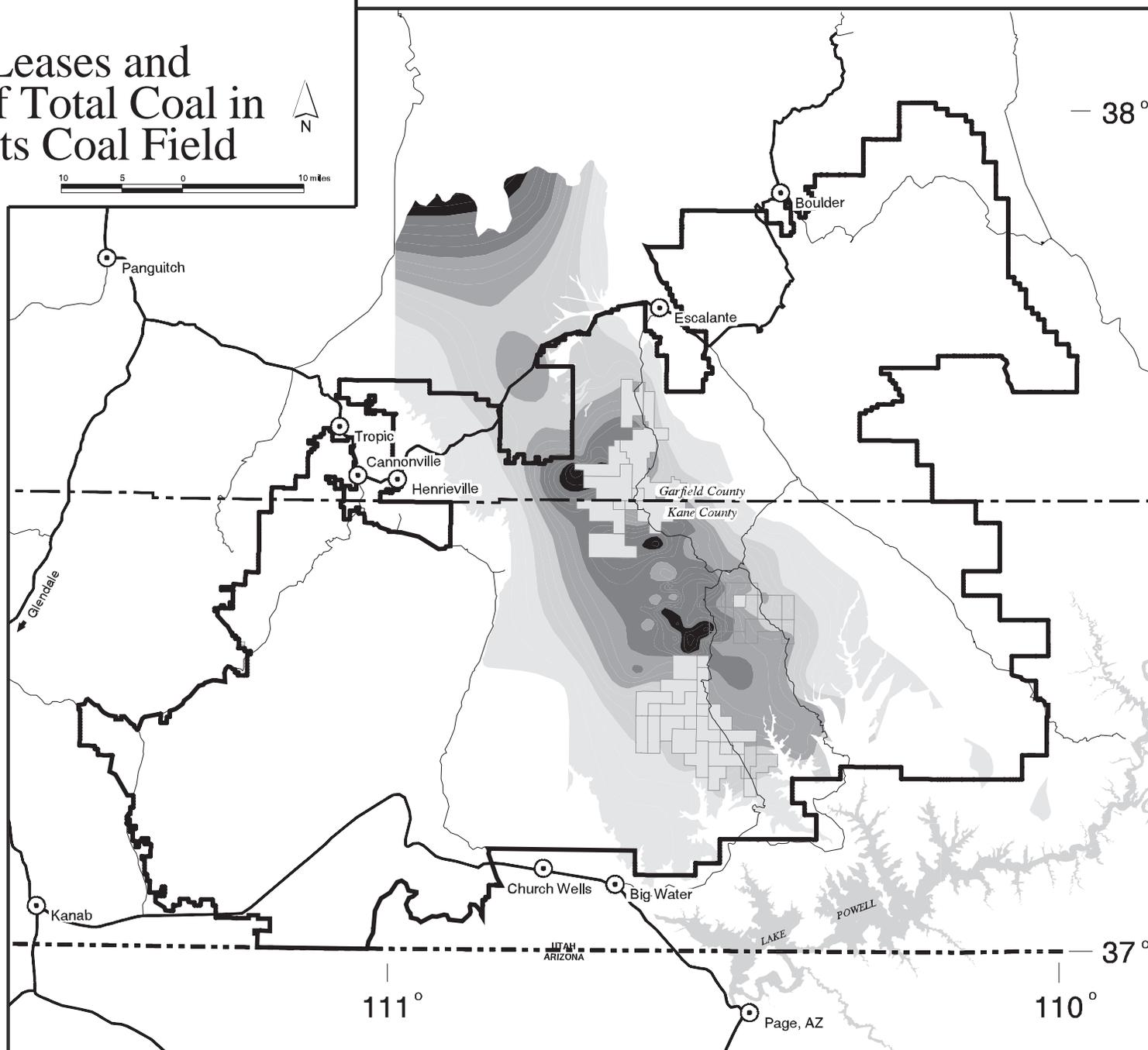


Location Map

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Map 3.10: Principal Geologic Folds, Oil and Gas Wells and Federal Oil and Gas Leases

(after Montgomery, 1984)

-  Principal Communities
-  Monument Boundary
-  Highways 89 & 12
-  Other Roads
-  Producing Oil Well
-  Oil and Gas Shows
-  Oil Shows
-  Gas Shows
-  Dry & Abandoned
-  Fault: U-up D-down
-  Anticline
-  Oil/Gas Leases

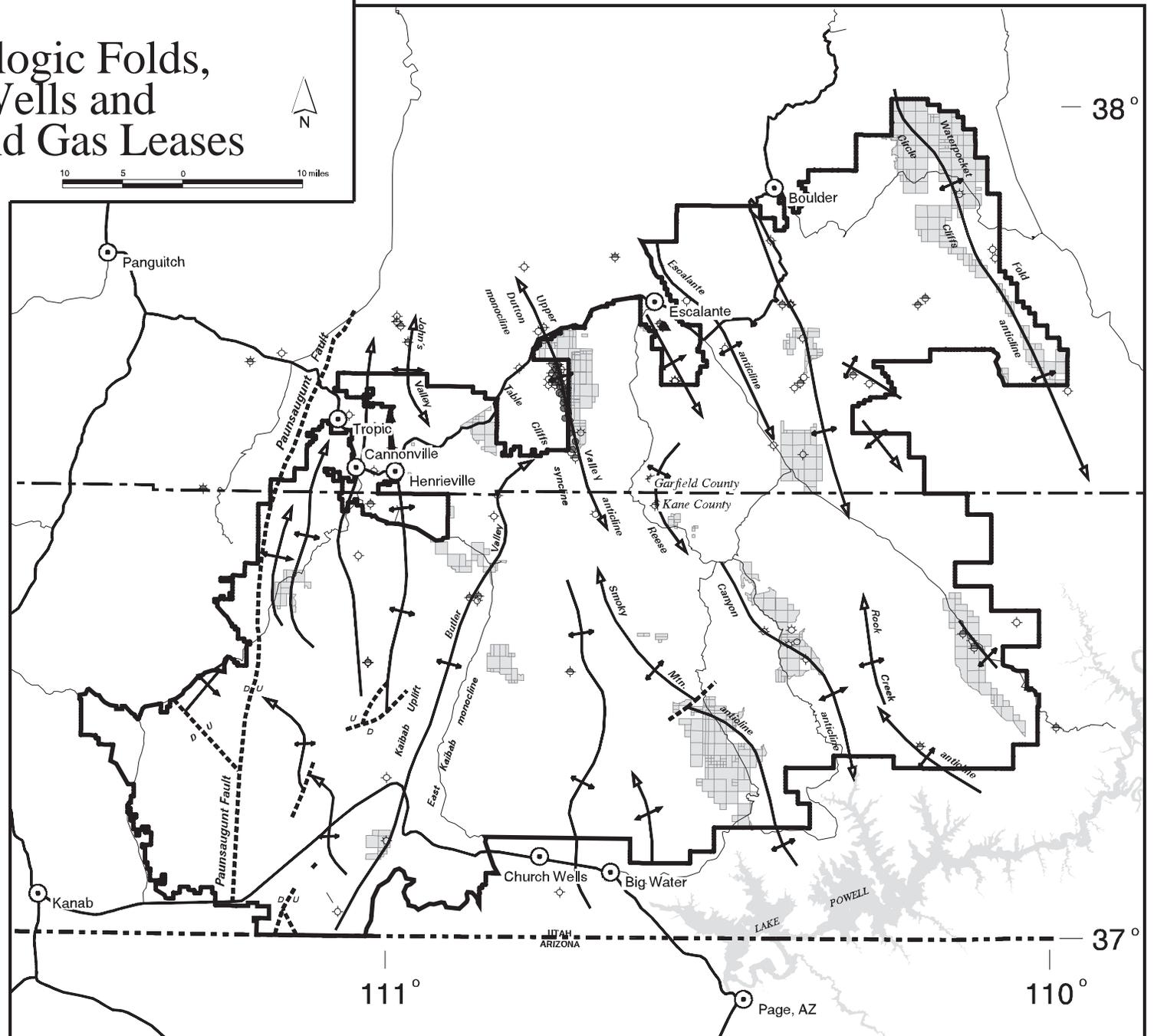


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Federally owned tar-sand. Subsequently, the Circle Cliffs area was designated as an STSA, or Special Tar Sand Area. Presently, there is one Combined Hydrocarbon Conversion Lease Application still pending in the Circle Cliffs area of the Monument. This application consists of 35 conventional oil and gas leases involving over 34,600 acres (Lopez, written communication, 12/22/97).

MINERALS

Various types of metallic-mineral deposits are known to be present in the Monument. Most of these are small and low-grade. Manganese was mined in the 1940s from the Petrified Forest Member of the Chinle Formation. This was taken from the Manganese King Mine on the north side of Kitchen Corral Wash. Total production was about 300 to 400 tons of ore containing 40 percent manganese (Buranek, 1945; Haven and Agey, 1949; Baker et.al., 1952; Doelling and Davis, 1989). Manganese is also found at the Van Hamet prospect located a few miles southeast of Escalante. The manganese occurs as lenticular pods and concretions in sandstone of the Jurassic Carmel Formation (Doelling, 1975).

Uranium associated with vanadium or copper is present within the Moenkopi, Chinle, and Morrison Formations. The Chinle and Moenkopi-hosted occurrences are in the

extreme northeast portion of the Monument in the Circle Cliffs and in the southwestern part of the Monument near the Kaibab uplift and The Cockscomb. Morrison-hosted uranium occurrences are found along Fiftymile Bench. Mines that produced more than 200 pounds of uranium concentrate were developed within the Chinle Formation in the Circle Cliffs.

Anomalous gold values have been reported for Permian to Jurassic sedimentary rocks over much of southeastern Utah, particularly in the Chinle and Wingate Formations and in the Navajo Sandstone (Butler et.al., 1920; Gregory and Moore, 1931; and Phillips, 1985). Lawson (1913) reported several early unsuccessful attempts to mine the gold in the Chinle Formation at Paria by hydraulic methods.

Copper, often with associated lead, zinc, and silver, occurs in sedimentary host units in four separate areas within the Monument. The Rock Springs, Ridge Copper, and Bullet Shaft deposits are located south of Kodachrome Basin. These deposits lie on the east side of the north-plunging Kaibab anticline (Kaibab Uplift) and occur in the Jurassic Thousand Pockets Tongue of the Page Sandstone. Workings consist of surface pits, shallow shafts, and short adits. The Ridge Copper and Bullet Shaft were mined for copper but the Rock Spring deposit was mined mostly for lead (Doelling and Davis, 1989).

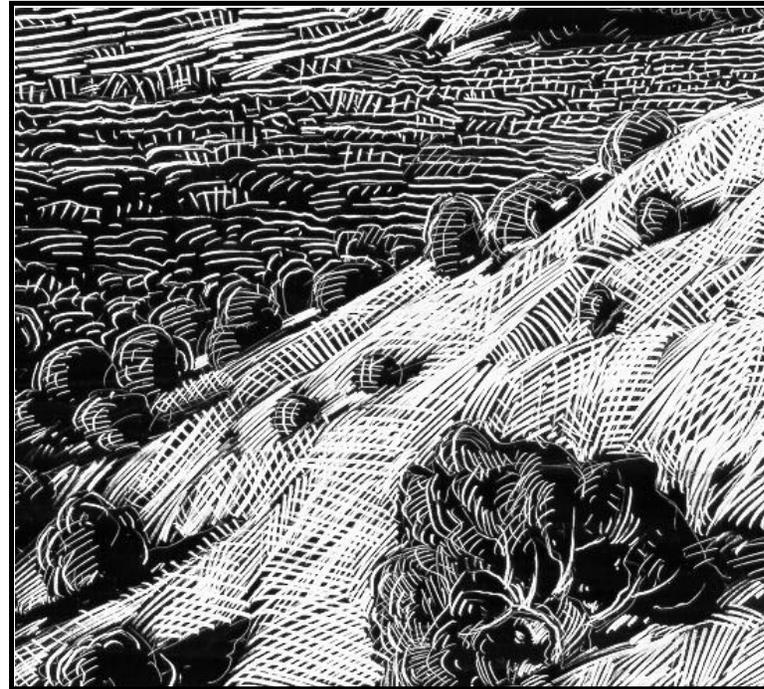
A number of heavy-mineral fossil placer deposits containing titanium and zirconium minerals are present in the John Henry Member of the Cretaceous Straight Cliffs Formation of the Kaiparowits Plateau. The deposits occur in a belt extending southward from Dave Canyon, which lies just south of Escalante, to Sunday Canyon, just west of Fiftymile Mountain. The deposits are fossil beach placers containing variable amounts of the minerals ilmenite, zircon, monazite, magnetite, rutile, and silicates (Dow and Batty, 1961).

There are 71 mining claims registered with the BLM inside the Monument boundary. These were established prior to Monument designation. The closed claim is under appeal. Presently, eight mining operations are permitted through the Utah Division of Oil, Gas and Mining (DOG M) (Burns, DOGM, written communication, 1/6/98). Six of these mining operations are on BLM administered lands and two are on Utah School and Institutional Trust Lands. One of the operations on Trust Lands is classified as "suspended." A proposed titanium-zirconium operation, permitted by DOGM but subject to BLM approval, has been disapproved because of Wilderness Study Area restrictions. Mining of gem-quality alabaster (a fine-grained form of gypsum) is permitted through DOGM at five locations within the Monument. One operation is for

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mining titanium-zirconium. Table 3.10 shows a listing of the DOGM-permitted operations.

Mineral materials generally include sand and gravel, clay, rip-rap, topsoil, and some forms of specialty stone. BLM regulations allow for the non-exclusive disposal of mineral materials by the establishment of community pits or common-use areas. The permittee is required to pay a proportional share of the reclamation costs, and the BLM does the reclamation. Free-use disposal of mineral materials is allowed to any Federal, or state agency, unit, or subdivision, including municipalities, or to non-profit organizations. There are 11 locations within the Monument where mineral materials have been excavated for public purposes.



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**Table 3.10
Utah Division of Oil, Gas and Mining (DOG M) Permitted Operations**

DOG M ID	Status	Name	Operator	Commodity	Township	Range	Section
S0170039	Active	Long Gulch II	Southwest Stone	alabaster/gypsum	36S	4E	6, 7
S0170041	Active ¹	Calf Canyon	3R Minerals	titanium-zirconium	36S	3E	17
S0250009	Suspended ²	Tetla	Harry Greenwald	petrified wood	43S	4W	2
S0250015	Active	Big Dry Valley	Paul Lamoreaux	alabaster/gypsum	38S	1W	19, 20
S0250016	Active	Butler Valley	Alpine Gem & Minerals	alabaster/gypsum	38S	1W	20, 27, 34, 35, 36
S0250017	Active	Stonehedge	Southwest Stone	alabaster/gypsum	39S	1W	1
S0250019	Active	Low Down 1	Southwest Stone	alabaster/gypsum	38S	1W	27, 28
S0250022	Active ²	U-429	3R Minerals	titanium-zirconium	39S	5E	32

1 - DOGM permit classified as "active" but BLM has not approved plan of operations
2 - Located on Utah School and Institutional Trust Lands



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LIVESTOCK GRAZING

The history of livestock grazing in the area that now includes the Monument dates back to the 1860s. The number of cattle, sheep, and horses increased rapidly until the early 1900s. During this period, livestock grazing became a regulated and permitted activity on National Forests. Non-forest Federal land was treated as a “commons” in which those who moved their stock onto the range first each season secured the use of new forage growth. Stock from across the region were brought in to graze during the winter months, and many animals were left on the range year-round. During this period of unregulated use, rangeland resources and ecological conditions experienced significant harm from overgrazing. Overgrazing resulted in changes to vegetation communities, especially at lower elevations that were used for winter grazing. Control of the winter ranges did not occur until 1934 with the passage of the Taylor Grazing Act. During the following years, regulations pertaining to operators, allotments, kind and number of livestock, and season-of-use were established on public land.

In 1946 the Bureau of Land Management was established. During the late 1950s and early 1960s, range surveys were completed to determine the capacity of the land for grazing.

Following these surveys, decisions on forage were adjudicated and livestock numbers on most allotments were reduced. A Federal court agreement on April 11, 1975 required the BLM to prepare Grazing Environmental Impact Statements on public grazing lands over a ten-year period. To comply with this agreement, the Kanab/Escalante Grazing Environmental Impact Statement was prepared in 1981 and adjustments in number and season of use occurred using this data. Grazing use within the region has significantly decreased from the peak in the early part of this century.

The Proclamation establishing the Monument states that “existing grazing use shall continue to be governed by applicable laws and regulations other than the proclamation.” Livestock grazing is managed under the regulations contained within 43 CFR 4100, which provides uniform guidance for administration on the public lands (exclusive of Alaska). BLM instruction memos, information bulletins, and handbooks provide additional guidance on implementation of the grazing regulations. The current range management direction for the Monument is contained in the Interim Guidance issued by the BLM. This guidance states that livestock grazing within the Monument is permitted, pursuant to the terms of existing permits and leases. Utah BLM has adopted Standards and

Guidelines for Rangeland Health that are to be applied to all BLM rangeland management decisions in Utah including the Monument, pursuant to 43 CFR 1600 and 43 CFR 4180. These Standards and Guidelines were adopted in 1997 in order to carry out the Fundamentals of Rangeland Health, developed by the Secretary of the Interior on February 22, 1995 (Refer to Appendix 7).

Livestock use is permitted across the Monument at different times and seasons throughout the year. However, this use does not occur everywhere in the Monument or necessarily in the same areas every year. Season-of-use is largely determined by elevation. Generally, the lower elevation allotments are grazed during the winter, the mid-elevation allotments are grazed primarily during the spring/fall season, and the high elevation allotments are used in the summer. The Escalante Canyons are typically grazed during the dormant (fall/winter) season. This allows for growing season rest of the riparian vegetation. The majority of livestock permittees do not graze on the Monument year-round. Most operators have their livestock on non-Monument lands at least part of the year. There is inadequate private land base in the local area to support current livestock levels without the use of Federal grazing lands at least part of the year. There are approximately 175,000 acres of Utah

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School and Institutional Trust Administration Lands within the Monument. Most of these lands are grazed in conjunction with the BLM allotments through exchange of use agreements. The permittees pay the State for the grazing use on these lands, while the BLM administers the grazing on these state lands.

There are 73 separate grazing allotments within the Monument. Currently, 93 permittees are authorized to graze horses and cattle on the Monument. The authorized active use for the 1996-1997 grazing year was 75,684 Animal Unit Months (AUMs). Total licensed AUMs is 108,066. Livestock grazing is authorized, and occurs, within Wilderness Study Areas on the Monument. Rangeland management activities in WSAs are administered under guidelines in the Interim Management Policy for Lands under Wilderness Review. This policy outlines minimum data requirements and maximum acceptable impacts for range developments and livestock grazing increases. There are 18 allotments in the Monument whose boundaries partially or largely cross into adjacent Federal lands. The BLM administers grazing on these other Federal lands through Interagency Memorandums of Understanding. These other Federal lands are located within Glen Canyon National Recreation Area, Capitol Reef National Park, and Dixie National Forest. There are

currently 6 grazing allotments within the Monument that do not have grazing permits attached to them and are not being grazed.

Allotment Management Plans (AMP) or other activity plans are developed for individual allotments. These plans include terms and conditions to achieve specific resource condition objectives. They also provide for a monitoring program to evaluate the effectiveness of management actions in achieving those objectives. Appendix 22 displays the allotments which have AMPs. Management objectives for individual allotments change over time. This helps to determine the level of intensity with which those allotments are managed in terms of planning, monitoring, and investments in range improvement projects. In order to describe the level of management required, each allotment has been placed in one of three categories. This process is referred to as Allotment Categorization and is comprised of: Improve (I), Maintain (M), and Custodial (C). The categorization of allotments into these categories is not dependent solely on a rangeland condition rating, but also reflects such factors as potential conflicts between resource uses, potential productivity on the allotment, and amount of Monument lands comprising the total acres of the allotment. Appendix 22 provides the category each allotment is placed in and the factors which describe the categorization process.

Part of the livestock management program on the Monument includes monitoring of the rangeland resources in order to determine progress toward meeting identified objectives. This involves the orderly collection, analysis, and interpretation of resource data from permanently established plots within allotments. The results of this monitoring help to determine the trend of vegetative communities. Trend is the direction of change in ecological status, or some other resource value rating, observed over time. This is usually described as being upward (higher rating), downward (lower rating), or static (no apparent trend). Appendix 23 summarizes the trend by allotment from the available monitoring data. The level of permitted grazing use on the Monument has decreased significantly over time. The season of use, or amount of time per year that livestock are grazing the Monument, has also decreased. These factors, in combination with rest rotation and deferred rotation grazing systems, have resulted in rangeland conditions improving over the last several decades.

Installation, use, maintenance, and/or modification of range improvements are often authorized through Cooperative Agreements. Range improvements are constructed to achieve livestock management objectives. The two types of range improvements are non-structural and structural. Non-structural

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range improvements include acreage of seedings and prescribed burn areas. Structural range improvements include: fences, corrals, stock trails, cabins, cattle guards, and water developments such as pipelines, wells, troughs, and reservoirs. Title to structural or removable improvements must be shared by the United States and cooperator(s) in proportion to the actual amount of the respective contribution to the initial construction. A cooperative agreement conveys no right, title, or interest in any lands, or resources held in the United States.

TRANSPORTATION AND ACCESS

There are two major highways which pass through the Monument: U.S. Highway 89 and State Route 12. Both are major traffic arteries bringing visitors to the Monument. These routes are popular for travelers going to regional destinations such as Grand Canyon National Park, Lake Powell, Glen Canyon National Recreation Area, Bryce Canyon National Park, Capitol Reef National Park, and Zion National Park. From west to east, US 89 traverses the Monument beginning about 10 miles east of Kanab and exits the Monument about 6 miles west of Big Water. New Paria is the only community within the Monument along US 89, although Kanab, Johnson Canyon, Church Wells, Big

Water, and Page (Arizona) are located near the Monument along US 89. SR 12 runs through Tropic, and goes through the communities of Cannonville, Henrieville, Escalante, and Boulder.

There are six State Backways in and around the Monument, including Burr Trail, Hole-in-the-Rock, Smoky Mountain, Cottonwood Wash, Paria River Valley, and Posey Lake.

Most motorized recreation use occurs on existing routes. There are two undesignated informal, locally used off-highway vehicle play areas: Little Desert, located 1.5 miles east of Escalante (S12 & 13 T35S R2E), and Twentymile Sand Pile, located just southwest of Hole-in-the-Rock Road near Harris Wash (S30 T37S R5E). Earlier planning documents in effect designated 64,619 acres (4 percent) as closed, 256,802 acres (15 percent) as limited, and 1,363,477 acres (81 percent) access open. No new designations have been made since the Monument was established (Map 3.11).

A total of 220 miles of trails, routes and undesignated historic trails are identified for visitor use. Only 6 miles of developed interpretive trails or trail easements are currently maintained. The Lower Calf Creek Falls trail is a self-guided interpretive trail. Proposed segments of the Great Western Trail are within the Grand Staircase portion

of the Monument. A Memorandum of Understanding calls for cooperation and coordination of programs and activities associated with the Great Western Trail between the Great Western Trail Association, Forest Service, BLM, National Park Service, and the States of Utah, Idaho, Wyoming, and Arizona.

Over 15,000 acres of private land inholdings are scattered throughout the Monument in parcels ranging from 2.7 acres to 640 acres. Utah School and Institutional Trust lands were granted to the State of Utah by the Federal government at the time of statehood, for the purpose of supporting public schools. The State of Utah was granted four sections per township (generally sections 2, 16, 32 and 36). Over 175,000 acres of School Trust lands are now inholdings inside the Monument. Federal law requires that reasonable access be provided to non-Federal inholdings. Many of these inholdings currently have an access route to them, but some do not.

Vehicle/wildlife collisions are a problem on U.S. Highway 89 east of Kanab. From 1989-1996, Utah Department of Transportation recorded 126 mule deer vehicle collisions along this highway (Messer, 1997). Utah State University, in cooperation with the Utah Department of Transportation, has installed warning signs to help inform the public of the spring and fall deer migrations.

Map 3.11: Off-highway Vehicle Designations



10 5 0 10 miles

- ⊙ Principal Communities
- ▬ Monument Boundary
- ▬ Highways 89 & 12
- ▬ Other Roads
- Open
- Limited Use
- Closed



Location Map

Data has been gathered from a variety of sources and has been integrated to provide a planning context. The data shown outside the Monument may not have been verified. This map represents available information, and should not be interpreted to alter existing authorities or management responsibilities.



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