CHAPTER 3
AFFECTED ENVIRONMENT

INTRODUCTION

This section describes the existing condition of resources in the planning area that may be impacted by changes in grazing management. The understanding of these resources serves as the baseline for analysis, including determining the impacts of the various alternatives on resources. Resource descriptions are only depicted in as much detail as needed to analyze the effects of proposed actions.

GENERAL SETTING

Land Ownership

The planning area includes approximately 2,168,726 acres of Federal land in south-central Utah, mainly within the GSENM, but including portions of NPS lands, lands administered by the Kanab Field Office (Map 2) and the Arizona Strip BLM. Approximately 68% of the planning area is in Kane County, with approximately 31% in Garfield County, with less than 1% occurring in Coconino County, AZ.

The planning area is primarily surrounded by other Federal lands. Dixie National Forest borders the planning area to the north, Capitol Reef National Park and 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 south of Cannonville, Utah is surrounded by lands within the planning area.

Transportation and Access

There are two major highways which pass through the planning area: U.S. Highway 89 and Utah State Route (SR) 12. Both are major traffic arteries bringing visitors to the GSENM and regional destinations such as Grand Canyon National Park, Lake Powell, Bryce Canyon National Park, Capitol Reef National Park, and Zion National Park. From west to east, US 89 traverses the planning area beginning about 10 miles east of Kanab east to the town of Big Water near the Arizona State line. Utah SR 12, a Scenic-Byway, runs west to east through Tropic, Cannonville, Henrieville, Escalante, and Boulder. There are six State Scenic-Backways in and around the planning area including Burr Trail, Hole-in-the-Rock, Smoky Mountain, Cottonwood Wash, Paria River Valley, and Posey Lake.

Transportation needs of permittees was assessed during the evaluation process, and some additional access requirements were noted (Appendix 1).

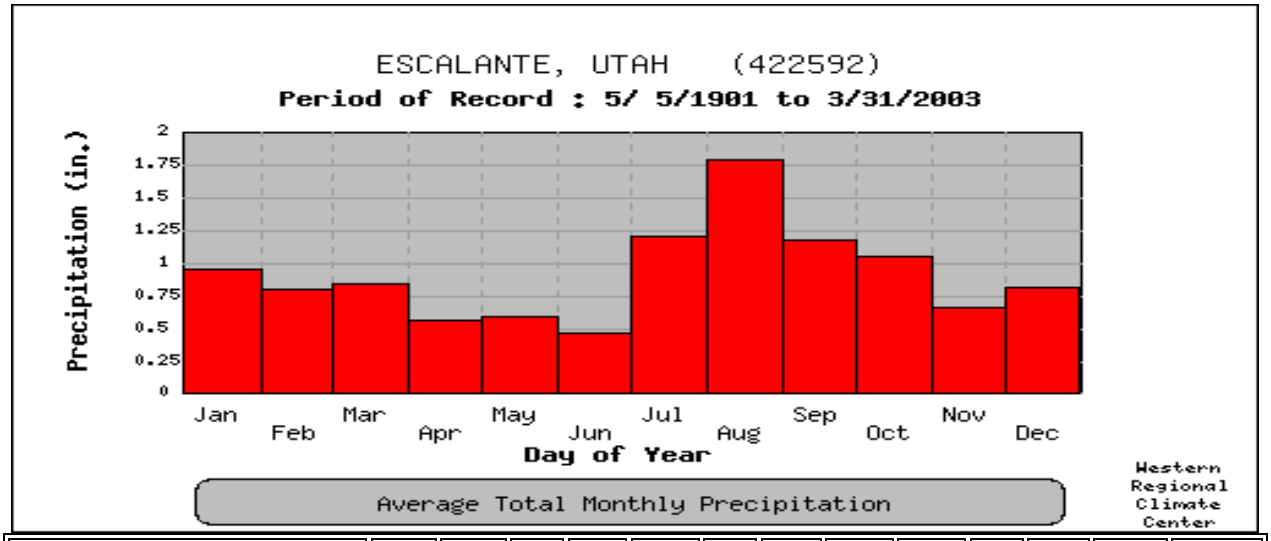
Climate

The climate in the planning area is classified as semiarid. Annual precipitation ranges from 13 inches in the Grand Staircase area to about 8 inches in the lower Escalante desert. The area experiences a bimodal precipitation pattern, with peaks in the summer and winter. During the summer months of July, August, and September, precipitation comes to the area by way of thunderstorms as part of the North American Monsoon. These thunderstorms tend to advance northward out of Arizona, producing isolated, but often heavy, storms. Because of the way these thunder cells form, it is common for one area to receive heavy rain, while just a few miles away, no precipitation occurs. During the winter months, precipitation mainly falls as snow, with some

rain showers in the valleys. These winter storms advance into the region from out of the northwest portion of the United States and are much more widespread than summer storms. A series of tables (Table 3-1, Table 3-2, and Table 3-3) provided by the Western Regional Climate Center depict monthly average precipitation and temperatures for three towns surrounding the planning area.

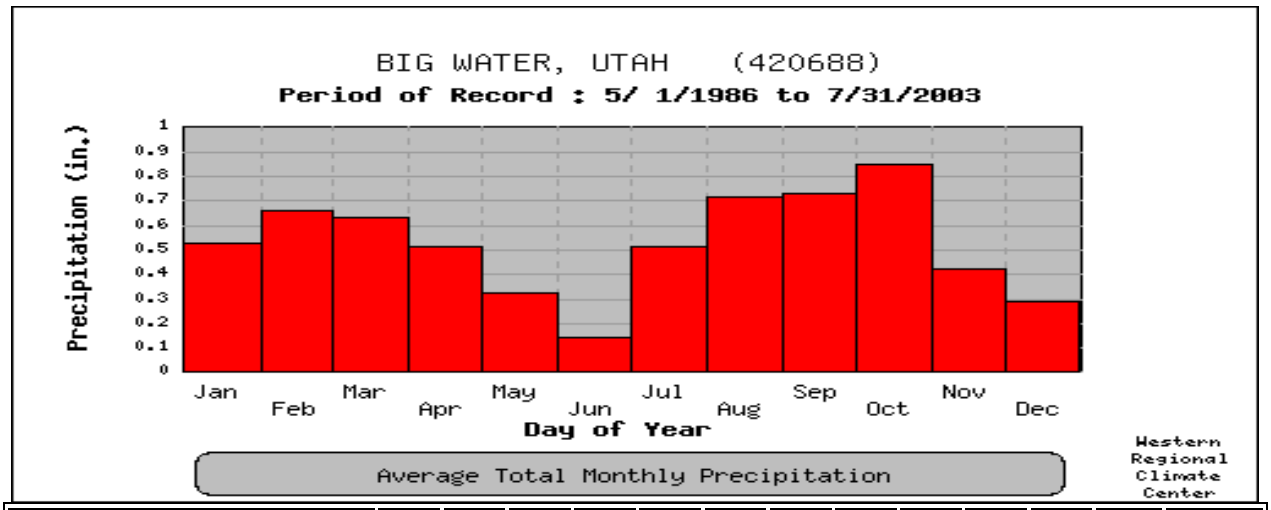
Summertime temperatures range from the mid to upper 90s°F during the day and drop to the 60s°F overnight. During the winter, temperatures in the lower 40s°F are common during the daytime with nighttime lows often between 10-20°F.

Table 3-1 Average Monthly Precipitation and Temperature - Escalante, Utah (422592)



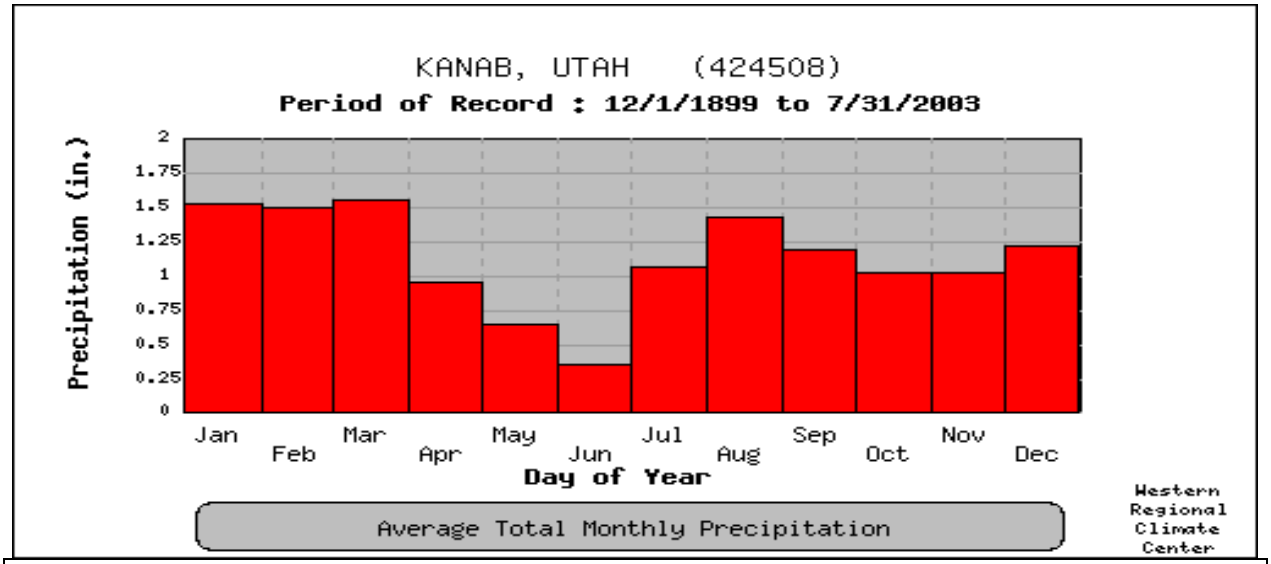
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Average Max. Temperature (F)	40	46	55	63	73	84	89	86	78	67	53	42	65
Average Min. Temperature (F)	14	20	26	33	40	47	54	53	44	35	24	16	34
Average Total Precipitation (in.)	0.94	0.80	0.84	0.57	0.60	0.46	1.20	1.82	1.16	1.05	0.65	0.81	10.89

Table 3-2 Average Monthly Precipitation and Temperature – Big Water, Utah (420688)



	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Average Max. Temperature (F)	47	54	65	75	84	95	100	96	88	75	59	47	74
Average Min. Temperature (F)	24	29	36	43	50	60	66	65	56	44	32	23	44
Average Total Precipitation (in.)	0.50	0.69	0.61	0.45	0.31	0.15	0.52	0.71	0.71	0.83	0.43	0.29	6.19

Table 3- 3 Average Monthly Precipitation and Temperature - Kanab, Utah (424508)



	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Average Max. Temperature (F)	47	52	591	68	77	87	93	90	84	72	59	49	70
Average Min. Temperature (F)	22	26	30	36	43	50	58	57	50	40	30	23	39
Average Total Precipitation (in.)	1.52	1.50	1.53	0.96	0.63	0.35	1.07	1.43	1.20	1.02	1.04	1.22	13.48

CHAPTER 3
AFFECTED ENVIRONMENT

LIVESTOCK GRAZING

History

Livestock grazing in the area dates back to the 1860s with the number of cattle, sheep, and horses increasing rapidly until the early 1900s. Grazing use within the region has since substantially decreased from its peak in the early part of the 20th Century. Livestock grazing became a regulated and permitted activity on National Forests in the decade prior to World War I. In contrast, 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 harm from overgrazing, especially at lower elevations 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, replacing the Grazing Service as manager of grazing on public range. 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 order 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 of livestock occurred as a result.

The Proclamation establishing the Monument portion of the planning area states that ". . . existing grazing use shall continue to be governed by applicable laws and regulations other than the proclamation." Interim Guidance issued by the BLM, states that grazing within GSENM is permitted, pursuant to the terms of existing permits and leases. Utah BLM adopted Standards and Guidelines for Rangeland Health in 1997 that are to be applied to all BLM rangelands in Utah, pursuant to 43 CFR 1600 and 43 CFR 4180. (Refer to Appendix 8).

Livestock use is permitted at different times and seasons throughout the 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 during the spring/fall season, and the high elevation allotments in the summer. The majority of livestock permittees do not graze year-round. Most operators have their livestock on non-BLM lands (such as Forest System land, private base property and state lease) at least part of the year.

Approximately 175,000 acres within GSENM were formerly administered by the State of Utah School and Institutional Trust Lands Administration (SITLA). These lands were exchanged between the State of Utah and the Federal government in 1998. Most of the former State lands transferred to the BLM are grazed in conjunction with the original BLM allotments through exchange of use agreements. Some of the transferred lands are fenced square miles that are managed as individual allotments. In accordance with the Congressional legislation authorizing

the exchange, the former State grazing permits shall be managed under their original (State issued) terms and conditions until their scheduled expiration.

Allotments

Allotments are areas of land designated and managed for the grazing of livestock. Lands which are not currently designated for livestock grazing are closed areas. There are 82 separate grazing allotments within the planning area and sixteen closed areas (See Appendix 1 for a complete description of each allotment). Currently, 92 permittees are authorized to graze horses and cattle. The authorized active use is 76,457 Animal Unit Months (AUMs). Total permitted AUMs (active and suspended) are 106,138.

Table 3-4 Current Grazing Allotments

Alvey Wash	Deer Springs (State)	Long Canyon	Sink Holes
Big Bowns Bench	Dry Valley	Lower Cattle	Slick Rock State
Big Horn	Dry Valley (State)	Lower Hackberry	Soda
Black Ridge	First Point	Lower Warm Creek	South Fork
Black Rock	Five Mile Mountain	Main Canyon (State)	Swallow Park
Black Rock (State)	Flood Canyon**	Mollies Nipple	Timber Mountain
Boot	Ford Well	Moody	Upper Cattle
Boulder Creek	Fortymile Ridge	Moyle C Johnson (State)	Upper Hackberry
Bull Run (State)	Granary Ranch	Mud Springs	Upper Paria
Bunting Trust*	Hall Ranch	Neaf	Upper Warm Creek
Calf Pasture	Haymaker Bench	Nipple Bench	Varney Griffin
Circle Cliffs	Headwaters	Pine Creek	Vermilion
Clark Bench	Hells Bellows	Pine Creek (State)	Wagon Box Mesa
Cockscomb	Johnson Canyon	Pine Point	Wahweap
Collet	Johnson Lakes	Rock Creek-Mudholes	White Rock
Cottonwood	Johnson Point	Round Valley	White Sage
Coyote	King Bench	Roy Willis	Wide Hollow
Death Hollow	Lake	Rush Beds	Willow Gulch
Deer Creek	Lake Powell	School Section	Wire Grass
Deer Range	Last Chance	Second Point	
Deer Spring Point	Locke Ridge (State)	Second Point (State)	

Note: * See Johnson Canyon in Appendix 1; ** See Johnson Lakes in Appendix 1.

In addition to the allotments listed above, the following unallotted, closed or forage reserve areas will be considered in this document: Antone Flat, Flag Point, Little Bowns Bench, and Phipps.

All or portions of sixteen allotments have been closed to livestock grazing by previous land use plan decisions (Table 3-5).

Table 3-5 Areas closed to Livestock Grazing by Previous Land Use Plan Decisions

Allotment / Pasture		Decision Date	Management (minor/major)
Lower Calf Creek		1964	BLM
Harvey's Fear		MFP 1981	NPS/BLM
Muley Twist		MFP 1981	NPS/BLM
Navajo Bench		MFP 1981	NPS/BLM
Spencer Bench		MFP 1981	BLM/NPS
Rock Creek	Dry Rock Creek Pasture	MFP 1981	NPS/BLM
Rock Creek	Middle Rock Creek Pasture	MFP 1981	NPS
Rattlesnake Bench		MFP 1981	BLM
Escalante River		LUP Amendment 1999	NPS/BLM
McGath Point		LUP Amendment 1999	BLM
Big Bowns Bench	River Pasture	LUP Amendment 1999	BLM
Phipps	River Pasture	LUP Amendment 1999	BLM
Deer Creek	River Pasture	LUP Amendment 1999	BLM
Deer Creek	Cottonwood Pasture	LUP Amendment 1999	BLM
Saltwater Creek		LUP Amendment 1999	BLM
Steep Creek		LUP Amendment 1999	BLM

Lower Calf Creek (pasture) was closed as a result of the construction of the Calf Creek Recreation site and Campground in 1964. The trail to the lower falls is used almost daily year-round and often has hundreds of visitors hiking to the falls during high use periods. This is the highest concentrated recreation use area in the planning area.

The Harvey's Fear, Navajo Bench and Spencer Bench areas are located on a relatively narrow "mid" bench between the top of Fiftymile Mountain and Lake Powell. They surround the southern tip of Fiftymile Mountain. These areas are extremely difficult to access due to cliffs both above and below. Limited access, water, and forage make these areas unsuitable for grazing. It is unclear when these areas were initially closed to grazing. The 1980 Grazing EIS and subsequent 1981 Management Framework Plan (MFP) both recommend continuing the closure.

The Muley Twist area located in the far northeast corner of the planning area was closed to livestock grazing due to management decisions associated with Capital Reef National Park.

The Dry Rock Creek and Middle Rock Creek pastures (Rock Creek-Mudholes Allotment) were closed by decision in the MFP due to slope and topography, lack of access, and limited forage. Dry Rock Creek, the larger area, has largely been cut off from other areas due to Lake Powell.

Rattlesnake Bench was closed by decision in the MFP due to suitability issues including access, terrain, limited forage, and lack of water.

The river pastures on the Escalante (Phipps, Big Bowns Bench, and Deer Creek), the Escalante River, McGath Point, Salt Water Creek, Steep Creek and Cottonwood pasture (Deer Creek Allotment) areas were all closed to livestock grazing by plan amendment in 1999. The primary reason for closure was to eliminate resource use conflicts between recreational users and livestock. The Escalante and its tributary canyons receive very high use from both day and overnight hikers. The canyon bottom areas are primary travel routes and use areas. The closures

also benefited riparian and upland vegetation, water quality and wildlife dependent on available forage. In the years since these closures, recreational use has continued to increase substantially and riparian vegetation has noticeably increased.

The Little Bowns Bench Allotment, Phipps Pasture (Phipps Allotment) and Wolverine Pasture (Deer Creek Allotment) were designated as grass banks in a 1999 plan amendment. The grass banks forage could be used in times of loss of forage elsewhere due to drought, fire, or disease.

Grazing in Wilderness Study Areas
Livestock grazing is authorized, and occurs, within Wilderness Study Areas within the Planning area. Rangeland management activities in WSAs are administered under guidelines in the Interim Management Policy for Lands under Wilderness Review (IMP H-8550-1).

Allotment Management
As part of this evaluation, management direction for livestock grazing will be proposed for individual allotments within this planning area (Appendix 1). It should be noted that the BLM will continue to develop and issue Annual Operating Plans to the permittee to specify actions which are required to implement existing Allotment Management Plans (AMPs), along with specific grazing actions to be taken within the operating year.

Range Improvements
Range improvements are constructed to achieve livestock management objectives. The two types of range improvements are non-structural and structural. Non-structural improvements include seedings and other vegetative treatments. Structural range improvements include: fences, corrals, stock trails, cabins, cattle guards, and water developments such as pipelines, wells, troughs, and reservoirs. Range improvements are authorized through either a Cooperative Range Improvement Agreement or a Range Improvement Permit. Most range improvements are authorized through cooperative agreement and prior to the 1995 grazing regulations have shared ownership in proportion to the actual amount of the respective contribution to the initial construction. Ownership of projects constructed after 1995 are held in the name of the United States except for removable projects which can be authorized under a Range Improvement Agreement. Maintenance of structural range improvement projects are generally the permittees and for non-structural projects is the BLMs.

Rangeland Monitoring
Range management is an adaptive process, where ongoing grazing is appraised through monitoring, then modified, and then re-appraised. Grazing system effectiveness can be determined through monitoring. The two main concerns in determining effectiveness are assessing whether or not the level of use is sustainable and if other resource objectives are being met. Vegetation vigor is affected by grazing by both domestic animals and wildlife. Improper grazing practices, such as excessive utilization or improper timing and frequency, reduce plant vigor thus decreasing the plant's ability to reinitiate growth after grazing has occurred and after periods of dormancy as well as recovering after periods of stress, such as drought. Utilization measurements estimate the amount of current years vegetation that is removed during a grazing period. The measurements do not indicate whether this use has a negative or positive effect on the forage resource, hence vegetative community trend is monitored to determine if site specific

vegetative objectives are being met. For our purposes, trend is identified as a transition toward or away from management goals or Desired Plant Community (DPC). The Utah Standards and Guidelines are written toward management of DPC, not Potential Natural Community (PNC). PNC may, however, be the objective on much of the lands the Monument administers.

The BLM has an ongoing monitoring program in the planning area with several decades of collected data. The specific data, by allotment, is given in Appendix 1.

Range Monitoring Methods

Utilization

The Key Forage Species method is used to measure utilization in the planning area. Allowable use levels set by the Kanab/Escalante MFPs are 50% to 60% on grasses and forb species and 40% of current year's growth on browse species. Some AMPs allow up to 70% use in seeded areas. The larger number was set where rangeland seedings were available, since the seeded species could withstand a higher level of grazing use, and for some winter ranges. Utilization is measured using key species (referred to as Key Forage Species), which may vary by allotment or pasture. Utilization measurements are estimates of plant use and an allotment was determined to be within its allowable utilization level if the average measurements on all key species were within 10% of the standard. If one or more key species had an average utilization level that exceeded the allowable level by more than ten percent, the allotment was judged as being above the standard. If utilization on all key species was more than 10% below the allowable level, the allotment was judged as being below the standard.

Trend

There are two different methods that are used to monitor long term trend within the planning area. One is called the photo plot method and the other is called frequency. There are numerous photo plot and frequency studies located throughout the planning area. Both methods provide information as to the species trend of the observed plant community.

Rangeland Health Indicators

"Interpreting Indicators of Rangeland Health" Technical Reference 1734-6, 2000 was used as a key method for assessing range condition along with other monitoring studies. The assessment technique depends on comparing the area being assessed with an undisturbed reference site or, if one is not available, to range ecological descriptions. Eighteen (seventeen required, and one optional) qualitative indicators are rated based on that indicator's degree of departure from the ecological site description and/or ecological reference area. The summation of the qualitative factors results in a "snapshot" appraisal of range condition.

It should be noted that the Rangeland Health Indicator method is just that, i.e., a series of indicators. The methodology is not qualitative, and is not intended to provide either range trend or be the sole support for management decisions. It is primarily designed to provide a preliminary evaluation, identify areas at risk of degradation, give early warning of potential problems and to communicate range conditions between manager and interested publics.

Range Monitoring Data

Utilization

Thirty seven allotments, covering 33% of the planning area, were above the utilization standard. Eight allotments, or 7% of the area, were below. Twenty-one allotments, or 56% of the area, were within the standard. Data was not collected on 17 allotments, or 4% of the area. The results for individual allotments are listed in Table 3-6. These utilization levels are a general indication as to the level of use being made on these allotments.

Table 3-6 Utilization Monitoring Summary

Allotment	Utilization		Allotment	Utilization
Alvey Wash	Above		Lower Cattle	Above
Big Bowns Bench	Above		Lower Hackberry	In Range
Big Horn	Above		Lower Warm Creek	In Range
Black Ridge	Above		Main Canyon (State)	No Data
Black Rock	Above		Mollies Nipple	In Range
Black Rock (State)	No Data		Moody	In Range
Boot	Above		Moyle C. Johnson	No Data
Boulder Creek	Below		Mud Springs	In Range
Bull Run (State)	No Data		Neaf	Above
Calf Pasture	Below		Nipple Bench	In Range
Circle Cliffs	In Range		Phipps	No Data
Clark Bench	In Range		Pine Creek	Below
Cockscomb	No Data		Pine Creek (State)	Above
Collet	Above		Pine Point	Below
Cottonwood	In Range		Rock Creek-Mudholes	Above
Coyote	Above		Round Valley	In Range
Death Hollow	Above		Roy Willis	No Data
Deer Creek	Below		Rush Beds	In Range
Deer Range	Above		School Section	Above
Deer Spring Point	Above		Second Point	Above
Deer Spring Point (State)	No Data		Second Point (State)	Above
Dry Valley	In Range		Sink Holes	Above
Dry Valley (State)	No Data		Slick Rock (State)	No Data
First Point	Above		Soda	Above
Five Mile Mountain	Above		South Fork	No Data
Ford Well	Above		Swallow Park	Above
Fortymile Ridge	In Range		Timber Mountain	Above
Hall Ranch	No Data		Upper Cattle	In Range
Haymaker Bench	No Data		Upper Hackberry	Below
Headwaters	In Range		Upper Paria	In Range
Hells Bellows	Above		Upper Warm Creek	Below
Johnson Canyon	Above		Varney Griffin	No Data
Johnson Lakes	Above		Vermilion	Above
Johnson Point	Above		Wagon Box Mesa	Above
King Bench	In Range		Wahweap	In Range
Lake	In Range		White Rock	Above
Lake Powell	No Data		White Sage	Above
Last Chance	In Range		Wide Hollow	Above
Locke Ridge (State)	Above		Willow Gulch	Below
Long Canyon	Above		Wiregrass	No Data

Trend

Approximately 21% of the allotments have a downward trend, 35% have a static trend, and 35% have an upward trend. There are 17 allotments on which trend studies have never been established. Tend monitoring data is summarized in Table 3-7.

Table 3-7 Trend Monitoring Summary

Allotment Name	1980 Trend	Current Trend		Allotment Name	1980 Trend	Current Trend
Alvey Wash	Static	Static		Long Canyon (new)		Static
Big Bowns Bench	Static	Static		Lower Cattle	Static	Upward
Big Horn		Downward		Lower Hackberry		Static
Black Ridge		Downward		Lower Warm Creek	Static	Static
Black Rock	Static	Upward		Main Canyon (State)		
Black Rock (State)				Mollies Nipple	Static	Downward
Boot	Static	Upward		Moody	Static	Static
Boulder Creek	Poor	Static		Mud Springs	Static	Downward
Bull Run (State)				Neaf	Static	
Calf Pasture	Static	Upward		Nipple Bench	Static	Static
Circle Cliffs	Static	Upward		Pine Creek	Static	
Clark Bench	Static	Upward		Pine Creek (State)		
Cockscomb	Static			Pine Point		Upward
Collet	Declining			Rock Creek -Mudholes	Static	Upward
Cottonwood	Static	Upward		Round Valley	Static	Static
Coyote	Static	Downward		Roy Willis		
Death Hollow	Static	Downward		Rush Beds	Static	Upward
Deer Creek	Static	Static		School Section	Declining	
Deer Range	Declining			Second Point		Static
Deer Springs Point	Static	Static		Second Point (State)		
Deer Springs (State)				Sink Holes	Static	Static
Dry Valley	Static			Slick Rock (State)		
Dry Valley (State)				Soda	Static	Upward
First Point	Static	Static		South Fork		
Five Mile Mountain	Static			Swallow Park		Static
Ford Well	Static	Upward		Timber Mountain	Static	Static
Fortymile Ridge	Static	Downward		Upper Cattle	Static	Static
Hall Ranch				Upper Hackberry	Static	Upward
Haymaker Bench	Static			Upper Paria		Static
Headwaters	Up	Upward		Upper Warm Creek	Static	Static
Hells Bellows	Declining			Varney Griffin		
Johnson Canyon	Static	Downward		Vermilion	Static	Downward
Johnson Lakes	Static	Static		Vermilion (State)		
Johnson Point	Declining	Static		Wagon Box Mesa	Static	Upward
Johnson, Moyle C.				Wahweap	Static	Static
King Bench	Static	Static		White Rock	Static	Downward
Lake	Static	Upward		White Sage	Declining	
Lake Powell				Wide Hollow	Static	Upward
Last Chance	Static	Downward		Willow Gulch	Static	Static
Locke Ridge (State)		Static		Wiregrass		

Note: indicates information not available.

Rangeland Health Indicators

The Rangeland Health Indicators worksheet assesses seventeen required indicators and one optional. The eighteen indicators evaluated represent a degree of departure from either the ecological site description or an ecological reference area. Together, the indicators survey

soil/site stability, hydrological function, and biotic community integrity. A five-point summary rating was assigned to each assessment point ranging from "none to slight departure" from the ecological reference (a '5') to "extreme departure" from ecological reference (a '1'). Monitoring of Rangeland Health Indicators was done in 1999, 2002, and 2003. Five hundred and five sites were monitored in the 2002-2003 period. The summary results shown in the following tables list, by allotment, the number of sites and their rating broken down into the three rated categories of indicators – biological (Table 3-8), hydrological (Table 3-9) and soils (Table 3-10). The eighteenth, optional, indicator for biological crusts was also rated, with the results in the Biological Soil Crust section under Vegetation.

Table 3-8 Biological Indicators

ALLOTMENT	1	2	3	4	5	ALLOTMENT	1	2	3	4	5
Alvey Wash		2	3	9	4	Long Canyon					
Antone Flat				1		Lower Cattle			3	1	
Big Bowns Bench		1	3	6	2	Lower Hackberry			1	1	
Big Horn			4	9		Lower Warm Creek				3	
Black Ridge			1	2		Main Canyon (State)					
Black Rock			3	2		Mollies Nipple		5	13	18	2
Black Rock (State)						Moody			1	4	1
Boot						Moyle C Johnson (State)					
Boulder Creek				3	1	Mud Springs			2	4	
Bull Run (State)				1		Neaf					
Calf Pasture						Nipple Bench			9		
Circle Cliffs	1	3	3	5	9	Phipps			1	5	
Clark Bench			2	8	1	Pine Creek					1
Cockscomb				1		Pine Creek (State)					
Collet			1			Pine Point				1	
Cottonwood		2	7	12	8	Rock Creek-Mudholes/State			1	10	
Coyote	2	2	4	9		Round Valley		1	2	4	
Death Hollow			2	2	1	Roy Willis				1	
Deer Creek			1	3	2	Rush Beds				2	
Deer Range			2	2	1	School Section					
Deer Spring Point						Second Point					
Deer Spring Point (State)						Second Point (State)					
Dry Valley			2	1		Sink Holes			1	2	
Dry Valley (State)						Slick Rock (State)					
First Point						Soda		1	6	3	
Five Mile Mountain			1	3	2	South Fork					
Ford Well				2		Swallow Park			2	3	
Fortymile Ridge		1	5	3		Timber Mountain					1
Hall Ranch						Upper Cattle			6	11	4
Haymaker Bench				2	1	Upper Hackberry			3	12	1
Headwaters	1	2	13	16	2	Upper Paria		3	14	19	9
Hells Bellows						Upper Warm Creek			2	2	
Johnson Canyon			1	1		Varney Griffin		1		2	
Johnson Lakes			3	2		Vermilion		2	10	21	1
Johnson Point						Wagon Box Mesa				2	5
King Bench			2	6	1	Wahweap				2	
Lake		1	4	5	1	White Rock				1	
Lake Powell				1		White Sage					
Last Chance			3	11	2	Wide Hollow					
Little Bowns Bench				2	1	Willow Gulch				3	
Locke Ridge (State)						Wire Grass			4	2	

Table 3-9 Hydrological Indicators

ALLOTMENT	1	2	3	4	5	ALLOTMENT	1	2	3	4	5
Alvey Wash			3	13	2	Long Canyon					
Antone Flat					1	Lower Cattle				4	
Big Bowns Bench			4	6	2	Lower Hackberry				1	1
Big Horn			2	9	2	Lower Warm Creek				2	1
Black Ridge				3		Main Canyon (State)					
Black Rock				5		Mollies Nipple		2	11	23	2
Black Rock (State)						Moody				3	3
Boot						Moyle C Johnson(State)					
Boulder Creek				2	2	Mud Springs			3	2	1
Bull Run (State)					1	Neaf					
Calf Pasture						Nipple Bench			5	4	
Circle Cliffs		5	2	4	10	Phipps				4	2
Clark Bench			2	6	3	Pine Creek					1
Cockscomb				1		Pine Creek (State)					
Collet			1			Pine Point				1	
Cottonwood			8	12	9	Rock Creek-Mudholes			1	7	3
Coyote	1	1	5	9	1	Round Valley			2	3	2
Death Hollow			1	3	1	Roy Willis				1	
Deer Creek				5	1	Rush Beds				1	1
Deer Range		1	2	1	1	School Section					
Deer Spring Point						Second Point					
Deer Spring Point (State)						Second Point (State)					
Dry Valley			3			Sink Holes				1	2
Dry Valley (State)						Soda			4	6	
First Point						Slick Rock (State)					
Five Mile Mountain			1		5	South Fork					
Ford Well				2		Swallow Park			2	2	1
Fortymile Ridge			5		4	Timber Mountain				1	
Hall Ranch						Upper Cattle			2	16	3
Haymaker Bench				1	2	Upper Hackberry			4	9	3
Headwaters	1	4	10	14	5	Upper Paria		5	16	13	11
Hells Bellows						Upper Warm Creek				4	
Johnson Canyon				2		Varney Griffin		1		2	
Johnson Lakes			1	4		Vermilion		3	12	16	3
Johnson Point						Wagon Box Mesa				5	2
King Bench			1	7	1	Wahweap				2	
Lake			3	8		White Rock			1	0	
Lake Powell				1		White Sage					
Last Chance			2	9	5	Wide Hollow					
Little Bowns Bench				1	2	Willow Gulch				1	2
Locke Ridge (State)						Wire Grass			3	3	

Table 3-10 Soil Indicators

ALLOTMENT	1	2	3	4	5	ALLOTMENT	1	2	3	4	5
Alvey Wash		1	1	12	4	Long Canyon					
Antone Flat					1	Lower Cattle			4		
Big Bowns Bench			6	4	2	Lower Hackberry				1	1
Big Horn			2	7	4	Lower Warm Creek			1	2	
Black Ridge			1	1	1	Main Canyon (State)					
Black Rock			1	4		Mollies Nipple		2	9	22	5
Black Rock (State)						Moody				4	2
Boot						Moyle C Johnson (State)					
Boulder Creek			1	2	1	Mud Springs			2	1	3
Bull Run (State)				1		Neaf					
Calf Pasture						Nipple Bench		1	4	4	
Circle Cliffs		5	3	6	7	Phipps			1	3	2
Clark Bench			2	7	2	Pine Creek				1	
Cockscomb				1		Pine Creek (State)					
Collet			1			Pine Point				1	
Cottonwood			9	11	9	Rock Creek-Mudholes			2	6	3
Coyote		3	7	5	2	Round Valley			3	2	2
Death Hollow		1		3	1	Roy Willis			1		
Deer Creek				6		Rush Beds				2	
Deer Range		1	2	1	1	School Section					
Deer Spring Point						Second Point					
Deer Spring Point (State)						Second Point (State)					
Dry Valley			2	1		Sink Holes				1	2
Dry Valley (State)						Slick Rock (State)					
First Point						Soda			7	4	
Five Mile Mountain			1	1	4	South Fork					
Ford Well				1	1	Swallow Park			3	1	1
Fortymile Ridge			6	3		Timber Mountain				1	
Hall Ranch						Upper Cattle		1	1	14	5
Haymaker Bench				1	2	Upper Hackberry			4	8	4
Headwaters	1	5	7	16	5	Upper Paria		5	17	13	10
Hells Bellows						Upper Warm Creek				3	1
Johnson Canyon			1	1		Varney Griffin		1		2	
Johnson Lakes			2	3		Vermilion		3	12	14	5
Johnson Point						Wagon Box Mesa				4	3
King Bench			1	6	2	Wahweap				2	
Lake			4	7		White Rock			1		
Lake Powell				1		White Sage					
Last Chance		1	2	7	6	Wide Hollow					
Little Bowns Bench				2	1	Willow Gulch				1	2
Locke Ridge (State)						Wire Grass			3	3	

CHAPTER 3
AFFECTED ENVIRONMENT

RANGELAND HEALTH STANDARDS

The information gathered through rangeland monitoring, trend and utilizations studies, rangeland health indicator assessments, and resource assessments by staff specialists is used to evaluate whether or not allotments are meeting the Standards for Rangeland Health and Guidelines for Grazing Management developed by the BLM and the Utah Resource Advisory Council. There are four Rangeland Health Standards: (1) upland soils, (2) riparian and wetland areas, (3) desired species, and (4) water quality (see Appendix 8 for expanded discussion).

The Standards assessments are determined on an allotment-by-allotment basis. Where an allotment is assessed as not meeting one or more Standards, an additional determination must be made as to whether existing livestock grazing practices are a causal factor and/or whether changes to existing livestock grazing practices are required (see Appendix 11 for expanded discussion). The allotment evaluation found that nine allotments were not meeting one or more Rangeland Health Standards due to existing livestock grazing. It was additionally determined that existing livestock management needed to be changed on the nine allotments in order for them to meet Standards in the future. Several allotments failed Standard 4 (water quality) due to natural conditions unrelated to livestock grazing. The allotments with livestock grazing as a causal factor for not meeting Standards incorporate 446,938 (19%) acres of the planning area (see fold out Map 20). Table 3-11 depicts which of the Standards were not met for each of the nine allotments.

Table 3-11 Allotments Evaluated as Not Meeting Standards for Rangeland Health Due To Existing Livestock Grazing

Allotment	**Evaluation Standard Not Met**				**Determination; Grazing a cause for not meeting Standard(s)**	**Determination; Existing grazing management changes needed in order to meet Standard(s)**
	1	**2**	**3**	**4**		
Collet		X	X		Yes	Yes
Death Hollow		X			Yes	Yes
Ford Well		X			Yes	Yes
Soda	X	X			Yes	Yes
Mollies Nipple	X	X	X		Yes	Yes
Rock Creek-Mudholes		X			Yes	Yes
School Section			X		Yes	Yes
Upper Paria	X	X			Yes	Yes
Vermilion	X	X	X	X	Yes	Yes

While several allotments have springs or stream reaches which did not meet Utah Division of Water Quality standards, in all but one of these allotments were there causal factors for non-attainment unrelated to livestock grazing. Only in the Vermillion allotment did a spring fail water quality standards with livestock being a major factor. It should be noted that even though this spring failed water quality standards, the State of Utah has not determined that it should be elevated to the 303(d) list as partially or not supporting its beneficial use.

CHAPTER 3
AFFECTED ENVIRONMENT

VEGETATION

The planning area is located along the western boundary of the Colorado Plateau physiographic province in south-central Utah. The vegetation communities and flora of the Colorado Plateau are sufficiently distinct and uniform to be recognized as their own ecologically-based land area or eco-region. Within the Colorado Plateau eco-region, variations in climate, geology, topography, and influences from adjacent eco-regions have resulted in localized differences in vegetation and species composition.

Despite its immense area and remoteness, the planning area has a long history of botanical exploration and a relatively well-documented flora. Over the past seven decades, 958 vascular plant taxa have been documented. It is estimated that the area may contain as many as 1,100 taxa of vascular plants, representing approximately 50% of the flora of the Colorado Plateau floristic region and 30% of the flora of Utah. Seventy one percent of the flora (684 taxa) consists of relatively common species that are common across western North America. Another 18% of the flora (178 taxa) is comprised of species that are endemic to the Colorado Plateau or immediate vicinity.

The lower stairs of the Grand Staircase (Chocolate and Vermilion cliffs) and the vicinity of Lake Powell have been described as part of the "Dixie Corridor" and contain a number of Mohave or Sonoran desert species that reach the northern edge of their range along the Virgin and Colorado River watersheds in southern Utah. These species include Whipple's cholla, Mexican manzanita, Turbinella live oak, Anderson's wolfberry, Creosote bush, and Desert rue. In addition, the Dixie Corridor has an unusually high concentration of local endemics restricted to Navajo sand dunes (Welsh's milkweed, Escarpment milkvetch), Moenkopi clay flats (Kane breadroot, Meager camissonia, Atwood's pretty phacelia), and Chinle badlands (Gumbo milkvetch, Murdock's evening primrose, Chinle chia, and Kanab thelypody). Many of these endemics are listed as Threatened, Endangered, or BLM Sensitive.

Buckskin Mountain south of US Highway 89 and west of the Cockscomb contains the only extensive outcrops of Paleozoic and early Mesozoic limestone bedrock found on the Monument and represents the northernmost extension of the Grand Canyon Plateaus floristic element. This region has relatively few endemics compared to the adjacent Canyonlands or Mohave Desert areas, but represents the northern boundary for several species including Chestnut milkvetch, Fern bush, Darrow's buckwheat, and Jones' false cloakfern.

The flora and vegetation of the Skutumpah Plateau, White Cliffs, and Canaan and Boulder mountains are influenced by their proximity to the Utah High Plateaus eco-region. These montane uplands serve as a corridor for migration of members of the Rocky Mountain floristic element, but also act as an effective barrier to desert species from the Great Basin region. In addition, this extension of the Utah High Plateaus region contains endemic species include MacDougal's aletes, Zion draba, Breaks draba, Canaan daisy, Zion daisy, Panguitch buckwheat, Paria breadroot, and Smooth penstemon.

CHAPTER 3
AFFECTED ENVIRONMENT

VEGETATION CLASSIFICATION

The vegetation classification adopted for the purpose of this EIS is modified from the Utah Gap Analysis Project. Similar vegetation types (such as pinyon, juniper, and Pinyon-juniper) have been combined for greater simplicity and clarity. This classification consists of major upland and wetland vegetation types, each of which is summarized in the following table.

Table 3-12 Vegetation Classification

Vegetation Type	Acres	% of Study Area	Definitions
Aspen	426	0.02	Deciduous forest dominated by Quaking aspen. Often associated with Douglas-fir, Ponderosa pine, Mountain snowberry, and Saskatoon serviceberry.
Barren Rock Outcrop	617,892	27	Sand, rock, salt flats, playas, and lava fields largely devoid of vegetation.
Blackbrush	269,382	12	Shrubland dominated by Blackbrush. Associated species include Hopsage, Green Ephedra, Shadscale, and Broom snakeweed.
Desert Shrub	166,882	7	Shrublands dominated by Shadscale, Mat atriplex, Fourwing saltbush, Winterfat, Mormon tea, Horsebrush, Rubber rabbitbrush, and Broom snakeweed. Associated species include Greasewood, Big sagebrush, and Blackbrush. Includes UT Gap types Salt Desert Scrub and Greasewood.
Evergreen Forest	646	0.03	Common species of the evergreen plant community include White fir, Bigtooth maple, Mountain lover, and Fendler's meadow rue.
Grassland & Meadow	39,310	2	Perennial and annual grasslands or dry herbaceous meadows with low to no shrub cover. Primary grass species include Indian ricegrass, Bluebunch wheatgrass, Sandberg bluegrass, Crested wheatgrass, Needle-and-Thread grass, Sand dropseed, Galleta, Purple three-awn, and Blue grama. Primary forb species include Yarrow, Larkspur, Balsamroot, and Golden aster. Associated shrub species (if present) include Big sagebrush, Fourwing saltbush, Shadscale, and Utah juniper. Includes UT Gap types Grassland, Dry Meadow, and Desert Grassland.
Mountain Shrub	271	0.01	Deciduous shrubland dominated by Alder leaf mountain mahogany, Cliffrose, Bitterbrush, Utah serviceberry, Chokecherry, Mountain snowberry, and Greenleaf manzanita. Associated species include Big sagebrush, Gambel oak, and Quaking aspen. Includes UT Gap types Mountain Mahogany and Mountain Shrub.
Oak Woodland	6,868	0.30	Deciduous shrubland dominated by Gambel oak or Shrub live oak. Associated species include Big sagebrush, Utah juniper, Pinyon, and Ponderosa pine.
Pinyon-Juniper Woodland	966,709	42	Low to medium elevation conifer woodlands dominated by Pinyon pine and Utah juniper. Associated shrubs include Dwarf mountain mahogany, Big sagebrush, Blackbrush, and Gambel oak.

Table 3-12 Vegetation Classification (Cont.)

Vegetation Type	Acres	% of Study Area	Definitions
Ponderosa Pine/ Douglas-fir	26,550	1	Medium to high elevation conifer forests dominated by Ponderosa pine and Douglas-fir. Includes UT Gap types Spruce-Fir, Ponderosa Pine, Mountain Fir, Spruce-Fir/Mountain Shrub, Mountain Fir/Mountain Shrub, and Ponderosa Pine/Mountain Shrub.
Riparian	11,898	0.51	Streamsides, seeps, washes, hanging gardens, or saturated floodplains dominated by trees, shrubs, forbs, or graminoids. Dominant trees and shrubs include Fremont cottonwood, Coyote willow, Whiplash willow, Yellow willow, Water birch, Box-elder, Salt-cedar, and Squawbush. Dominant herbaceous and graminoid species include sedges, Arctic rush, Common reed, reedgrass, willow-herb, and clover. Hanging gardens are specialized wet seeps or springs found in alcoves of cliffs dominated by columbine, Scratchgrass, Bundle panicgrass, Helleborine, and Maidenhair fern. Includes UT Gap types Mountain Riparian, Lowland Riparian, and Wet Meadow.
Sagebrush Grassland	190,668	8	Shrubland dominated by Big sagebrush or Black sagebrush, or a mix of sagebrush and perennial grasses including Indian ricegrass, Bluebunch wheatgrass, Sandberg bluegrass, Crested wheatgrass, Needle-and-Thread, Sand dropseed, Galleta, and Blue grama. Associated species include Utah juniper, Pinyon, Rubber rabbitbrush, Green rabbitbrush, Broom snakeweed, Bitterbrush, Fourwing saltbush, and Winterfat. Includes UT Gap types Sagebrush and Sagebrush/Perennial Grass.
Seedings	5,768	0.25	Range seeding areas traditionally dominated by introduced pasture grasses such as Crested wheatgrass and Russian wildrye. Rehabilitated seedings composed of a mixture of introduced and native species with shrubs, forbs, and grasses included.
Urban/Agriculture/ Disturbed	13,752	0.59	Residential, agricultural zones, or heavily disturbed areas that fall within the EIS boundaries.

FORESTS AND WOODLANDS

Aspen

Forests dominated by Quaking aspen are a minor vegetative community. Small stands of aspen are located on the summit of Fiftymile Mountain and have been reported along Death Ridge and the slopes of Canaan Peak near the Dixie National Forest boundary. These communities are usually found on benches with perched water tables or ravines associated with springs. Most stands occur in deep, sandy loam or clay loam soils with high organic carbon and nitrogen. Quaking aspen is typically the dominant tree species present, accounting for 20-40% of total canopy cover. Other commonly associated species include Bigtooth maple, Gambel's oak, Mountain snowberry, Woods' rose, Big sagebrush, Rubber rabbitbrush, Muttongrass, Cheatgrass, and Silvery lupine. Aspen stands intergrade with adjacent mountain brush, oak, and sagebrush meadow communities on Fiftymile Mountain. Despite their limited extent, aspen woodlands are relatively species-rich, averaging 43 species per 1,000 square meters (NREL unpublished data). At least 100 plant taxa have been documented from 6 aspen stands on

Fiftymile Mountain and 204 taxa from the Monument flora are known to occur in aspen communities in Utah.

Recent studies in (Anderson 2007) indicate that aspen stands on Fiftymile Mountain are slowly progressing towards DPC standards.

Rangeland Health Assessments
Because Quaking aspen make up such a small component of the vegetation in the planning area, no rangeland health sites were assessed.

Evergreen Forest
This uncommon plant community typically occurs in mesic sites on steep lower slopes with northern aspects or in narrow canyons and ravines. Because of the inaccessibility, few impacts have affected this community type. Understory species are site specific but are dominated by native cool season grasses and forbs typical of more mesic sites. Common species of the Evergreen Forest plant community include White fir, Bigtooth maple, Mountain lover, and Fendler's meadow rue.

Rangeland Health Assessments
Because Evergreen Forest communities are such a small component of the planning area, no rangeland health sites were assessed.

Oak Woodland
Oak woodlands are dominated by Gambel's oak or consist of mixed forests of Gambel's oak, Pinyon pine, Utah juniper, or Ponderosa pine. Turbinella live oak and Shinnery oak are included as dominants in oak woodlands, but occur only sporadically and do not constitute dominant cover. Oak woodlands are often found on sandy loam soils on benches or terraces, but may also occur on shallow slopes of sandstone channel derived from the Carmel Formation. These communities are most abundant along the White Cliffs and Skutumpah Terrace in the Grand Staircase subregion, but also occur intermittently along the east flank of Fiftymile Mountain (Kaiparowits subregion) and other high elevation plateaus. Common understory species in oak woodlands include Mountain mahogany, Bigtooth maple, Utah serviceberry, Big sagebrush, and Mountain snowberry. Oak communities average 35 plant species/1,000 square meters and provide habitat for at least 173 plant taxa.

Rangeland Health Assessments
Only four rangeland health assessments were conducted and all were rated as "slight to moderate" or "none to slight" departures from reference conditions.

Pinyon-Juniper Woodlands
Woodlands and forests dominated by Pinyon pine and Utah juniper constitute the most common vegetation type. Pinyon-juniper woodlands are especially abundant on the high tablelands and rocky sandstone slopes of the Kaiparowits Plateau, Circle Cliffs, Escalante Canyons, Vermilion Cliffs, and White Cliffs where they occur on shallow sand, loam, clay, shale, hardpan, or stony soils. These woodlands are characterized by an open canopy (the tree crowns rarely touch) and relatively low stature. Although usually codominant, Utah juniper tends to be more abundant

than Pinyon pine at lower elevations and in drier or cooler sites. Common associated species include Big sagebrush, Utah serviceberry, Roundleaf buffaloberry, Rubber rabbitbrush, Ephedra, Broom snakeweed, Bitterbrush, Gambel's oak, Blue grama, Indian ricegrass, Needle-and-thread grass, Muttongrass, and Sand dropseed. Species richness within undisturbed Pinyon-juniper woodlands averages 27-32 taxa per 1,000 square meters.

Pinyon-juniper woodlands are intergraded with adjacent sagebrush, oak, Ponderosa pine/Douglas-fir, and aspen communities. Stands with a high density of oak or manzanita typically have higher species richness (35-37 taxa/1,000 square meters) than typical Pinyon-juniper or mixed Pinyon-juniper/sagebrush communities. Disturbed Pinyon-juniper stands have high cover of cheatgrass and other exotics in their understory and markedly reduced species diversity. Pinyon-juniper stands have been chained, burned, or chemically treated to create open areas for seeding with Crested wheatgrass, Russian wildrye, and other perennial bunchgrasses to create forage.

Throughout the West, there has been an increase of pinyon and, especially, juniper in shrublands over the last century. The mechanisms for this shift in the planning area are largely unknown, but several factors are probably involved. Some researchers have suggested that the introduction of grazing in the late 1800's resulted in a decline in grasses and other fine fuels, which reduced fire frequency and allowed tree density to increase. Decreased grass cover may also have allowed shrub density to increase, and since pinyon and juniper use shrubs as nurse plants, more shrubs facilitated an increase in trees. However, in the planning area, current research shows that fire return intervals may have been very long, perhaps on the order of hundreds of years. Studies on the Monument and in Grand Canyon show that pinyon and juniper have increased even in the absence of grazing, which suggests that climate also plays a role in Pinyon-juniper stand expansion in the planning area.

Determining the proper vegetative characteristics of Pinyon-juniper woodlands in the planning area is problematic. It is not understood how anthropogenic disturbances have altered the landscape, and there is a great deal of natural variability in understory composition, structure, and dynamics. In general, however, Pinyon-juniper woodlands probably had a more savanna-like appearance in the past, especially in deeper soils. It is likely that understories were dominated by a mix of cool season perennial bunchgrasses and warm season grasses. Warm season grasses often predominate today, especially in areas where late spring grazing or prolonged drought has reduced cool season species.

Rangeland Health Assessments
Most of the 192 rangeland health assessments in Pinyon-juniper communities rate as none to slight departure from reference conditions.

Ponderosa pine/Douglas-fir
Forests dominated by Ponderosa pine or Douglas-fir occur sporadically in shady, cool, slickrock canyons, along montane streams, and on the rims and north-facing slopes of high elevation slickrock mesas in the White Cliffs and Canaan Peak regions of the Monument. Ponderosa pine is the more widely distributed of the two species, with Douglas-fir limited mostly to mesic canyon bottoms, higher elevations, or more calcareous substrates. Prior to the onset of fire

suppression, Ponderosa pine forests often had an open, savanna-like understory dominated by patches of Greenleaf manzanita and bunchgrasses adapted to acidic soils produced from abundant needle debris. Fire suppression has altered competitive relations. Communities are now denser with understory shrubs and trees and more susceptible to outbreaks of Mountain pine beetle or catastrophic crown fires following drought. Lower elevation stands may intergrade with mountain brush, aspen, and Pinyon-juniper communities. Ponderosa pine/Douglas-fir communities average nearly 30 plant taxa per 1,000 square meters and provide potential habitat for about 35% of the area's flora.

Rangeland Health Assessments
This community is not a large component of the planning area and no rangeland health assessments were conducted.

SHRUBLANDS AND GRASSLANDS

Blackbrush

Blackbrush is the dominant shrub species over extensive areas on the southern flanks of the Kaiparowits Plateau and the south end of the Hole-in-the-Rock Road. These communities occur on non-saline sandy or stony loams of old pediment slopes and terraces with caliche layers. Grasses such as Galleta, Three-awn, or Indian ricegrass may co-occur with Blackbrush on sites where the calcic layer is deep, but are sparse to absent where the calcic layer approaches the surface. Sites with deep sandy soils may also be co-dominated by Green Ephedra. Blackbrush sites with shallow soils may have well-developed biological soil crusts, although these may be diminished in areas with high levels of surface disturbance. Blackbrush is more drought tolerant than sagebrush, but less so than Shadscale, Fourwing saltbush, and most other dominant shrubs of desert shrubland communities. Desert shrub species are also favored on finer-grained soils and more alkali sites. Blackbrush communities typically have low species richness, averaging 24 taxa per 1,000 square meters.

Rangeland Health Assessments
In the planning area, the blackbrush community had the highest percentage of sites of all communities except seedings that showed moderate, moderate to extreme, and extreme departures from reference conditions (soil - 54%; hydrology - 35%; biotic integrity - 50%). Common problems include soil erosion, exotic invasion, loss of species composition.

Desert Shrub

Desert shrublands are the most heterogeneous local vegetation type. Desert shrublands include any dry, low elevation, upland habitat dominated by shrubby species other than sagebrush or Blackbrush. The dominant shrub species vary, but most frequently are members of the Goosefoot Family (Chenopodiaceae). Desert shrublands typically have low vegetative cover, with individual shrubs being widely spaced. Grass cover is variable, depending on soil properties and disturbance history, but typically is comprised of Galleta, Three-awn, Alkali sacaton, Indian ricegrass, Western wheatgrass, or Blue grama. Desert shrublands occur widely across the Kaiparowits Plateau from the Cockscomb to Lake Powell, and in sandy habitats in the Grand Staircase and Escalante Canyons subregions. Desert shrublands are the second largest vegetation type in the area. Sites dominated by desert shrub species average 27 taxa/1,000 square meters, while communities with higher grass cover typically have 29 taxa/1,000 square

meters. More than 470 local plant species are known or suspected to occur within these Desert shrub communities.

Low elevation desert shrublands with well-drained clay soils and a dry climate (less than 7 inches of annual precipitation) are frequently dominated by Shadscale. Common associated species include Bud sagewort, Fourwing saltbush, Gardner's saltbush, Green rabbitbrush, Grayia, Winterfat, Galleta, Indian ricegrass, Bottlebrush squirreltail, Alkali sacaton, and Desert needlegrass. Shadscale stands typically are relatively open with low to moderate cover of perennial grasses. Shadscale may be codominant with Bud sagebrush on rocky, calcareous alluvium along the southern flanks of the Kaiparowits.

Mat saltbush forms a distinct community on barren, fine-textured clays of the Tropic Shale from the Paria River to Lake Powell. Some Mat saltbush communities are subject to invasion by undesirable weedy exotics, such as Red brome, Cheatgrass, Mediterranean barley, African mustard, and Russian thistle.

Sandy, well-drained sites at low elevations are often dominated by Fourwing saltbush, Green Ephedra, Cutler Ephedra, Sand sagebrush, Resinbush, Rubber rabbitbrush, Sand dropseed, yucca, Indian ricegrass, and Dune scurfpea. These communities typically have low cover and wide interspaces between shrubs. Purple sage occasionally forms small stands intermixed with Sand sagebrush in deep sand dunes east of the Hole-in-the-Rock Road, but is otherwise a minor vegetation type.

Communities dominated by Winterfat and cool season grasses occur sporadically in the Kaiparowits region on shallow to deep, sandy or alkaline soils. This species is highly palatable (especially in winter) and may be tolerant of heavy browsing in favorable habitats.

Valley bottoms with poorly drained alkaline clay soils with a high water table are often dominated by Greasewood or Torrey's seepweed. Greasewood communities may lack an herbaceous understory or have up to 20% cover of Desert saltgrass, Western wheatgrass, Bottlebrush squirreltail, and Foxtail barley. With or without disturbance, these stands are susceptible to invasion by Red brome, Cheatgrass, Halogeton, and Prickly lettuce. Greasewood is highly tolerant of water-saturated and oxygen-depleted soils and enjoys a competitive advantage over other desert shrub species and sagebrush in sites that are permanently or intermittently flooded. The species is capable of resprouting following fire, but is vulnerable to water stress and drought.

Permanent wetlands of Baltic rush, Desert saltgrass, Scratchgrass, Common threesquare bulrush, or Torrey's spikerush are often interspersed with desert shrublands where the water table reaches the surface (at least seasonally). Desert wetlands are vulnerable to invasion by non-native and inedible shrub and graminoid species ranging from Tamarisk and Russian olive to Copperweed and Rabbitsfoot grass.

Rangeland Health Assessments

Many of the Rangeland Health assessments showed moderate, moderate to extreme, or extreme departures from reference conditions (soils - 26%; hydrology -18%; biotic integrity - 34%).

Common problems are mostly biotic and include shifts in species composition and increased exotics. Soil loss and soil erosion were also often seen in these assessments.

Grassland and Meadow

The floristic composition of grasslands varies depending on elevation, soil moisture, and climate, but all grasslands share a predominance of annual or perennial graminoids or forbs and low cover of shrubs and trees. The most abundant species in grassland communities include Indian ricegrass, Bluebunch wheatgrass, Sandberg bluegrass, Crested wheatgrass, Needle-and-Thread, Sand dropseed, Galleta, Purple three-awn, Black grama, and Blue grama. Grassland communities intergrade with desert shrub and sagebrush grasslands on dry, upland sites at lower elevations and with mountain brush, aspen, and Pinyon-juniper woodlands at higher elevations. Grass or forb-dominated communities along streams, seeps, and other wetlands are considered under riparian vegetation. Area grasslands average 24-30 plant taxa per 1,000 square meters and provide habitat for as many as 160 plant species.

Seedings of Crested wheatgrass, Russian wildrye and other exotic grasses occur sporadically throughout the area. These seedings were usually established within sagebrush grasslands or Pinyon-juniper communities to augment existing forage.

Rangeland Health Assessments

A majority of the rangeland health assessments showed moderate, moderate to extreme, or extreme departures from reference conditions (soils - 34%; hydrology - 24%; biotic integrity - 39%). Common issues at these sites include; shifts in species composition, reduced soil surface resistance to erosion, invasion of exotics, and increased bare ground.

Mountain Shrub

Mountain shrublands are found primarily on open, rocky sites in valley bottoms or foothills slopes. Dominant species include Utah serviceberry, Mountain snowberry, and Chokecherry in mesic sites with high snow accumulation, and Alder-leaf mountain mahogany, Cliffrose, Bitterbrush, and Greenleaf manzanita in rockier or less fertile sites. Several mountain shrub species are capable of Nitrogen fixation and may be better adapted to nutrient poor sites than other shrubs or trees. Mountain shrub communities may intergrade with aspen, sagebrush, Ponderosa pine/Douglas-fir, or Pinyon-juniper communities, but always lack a closed tree canopy. Most mountain shrub species are adapted to fire and will resprout if burned. Periodic fire is a factor in the persistence of mountain shrub stands or their establishment in burned sagebrush, oak, Ponderosa pine, or Pinyon-juniper communities. Species richness is often high in mountain shrub stands, averaging 34 taxa/1,000 square meters. Nearly 300 taxa are known or potentially occur in this vegetation type.

Rangeland Health Assessments

Sites dominated by this community were not common in the planning area. Only two sites were assessed, and both showed “slight to moderate” or “none to slight” departures from reference conditions.

Sagebrush Grassland

Vegetation dominated by Big sagebrush or other sagebrush species replaces desert shrub at higher elevation sites with greater precipitation (>7 inches) and are the third most extensive plant community in the area after Pinyon-juniper woodlands and desert shrublands. Sagebrush stands occur throughout the area on loamy bottomlands in broad valleys, lower slopes, mesa tops, and stabilized sand dunes. Several different sagebrush communities can be recognized depending on whether Basin big sagebrush, Wyoming big sagebrush, Sand sagebrush, or Black sagebrush are dominant, but all share a common physiognomy characterized by a sparse to dense shrub canopy of sagebrush interspersed with other shrubs, biotic soil crusts, perennial or annual grasses, and forbs. Species richness may be low within sagebrush stands, especially where disturbance has been high. More than 450 plant species have been recorded in sagebrush habitats on the area.

Big sagebrush is the most widespread local sagebrush species. Basin big sagebrush is the typical form along washes and valley bottoms and in sites with rich, sandy-loam soils. Wyoming big sagebrush is also frequent, especially in clay-rich or gravelly loam sites. Mountain big sagebrush has been reported from cooler, high elevation plateaus along Skutumpah Road, but these stands may actually consist of atypically short forms of Basin big sagebrush. Common shrubs associated with Big sagebrush grasslands include Gray horsebrush, Rubber rabbitbrush, Grayia, Fourwing saltbush, Ephedra, Bitterbrush, or Winterfat. Important grass species include cool season perennials such as Thickspike wheatgrass, Western wheatgrass, Indian ricegrass, Bottlebrush squirreltail, Sand dropseed, Muttongrass, and Needle-and-thread.

Small stands dominated by Black sagebrush occur on rocky mesa tops or sites with shallow soils (often with a caliche layer) along Skutumpah Terrace and small knolls north of US Highway 89. Sand sagebrush may be co-dominant with other desert shrub species (especially Fourwing saltbush and Green Ephedra) in stabilized sand dunes in the western third of the area and in the Escalante Canyons subregion. Bigelow's sagebrush replaces Big sagebrush on steep, rocky sandstone slopes in the Vermilion Cliffs region, but is rarely abundant enough to constitute its own community type.

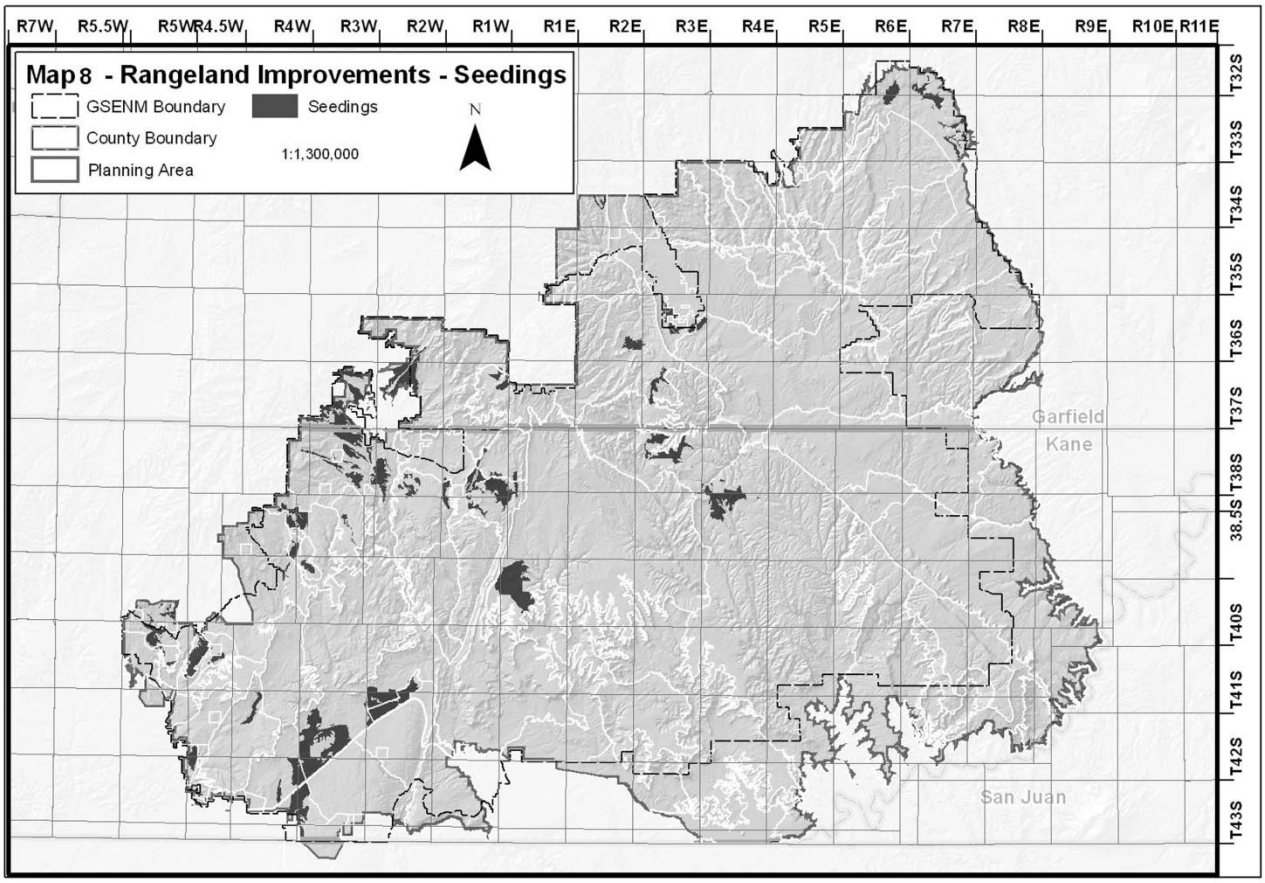
Rangeland Health Assessments

Of all the sites in the rangeland health assessment, sagebrush grassland seedings had the highest percentage of sites that showed moderate, moderate to extreme, or extreme departures from reference conditions (soil - 73%; hydrology - 65%; biotic integrity - 69%). By far the greatest resource issues are reduction in biological soil crust, shift in functional/structural groups, increased soil erosion, and bare ground.

Seedings

The majority of these areas designated as Seedings were formerly sagebrush grassland or Pinyon–juniper Woodland vegetation types that were converted to grasslands containing both native and non-native desirable grasses. Though a relatively minor component of BLM administered lands in this area, these seedings provide a valued forage base for livestock and wildlife throughout the Monument. Most of these seedings were established under cooperative agreement with grazing permittees**.** Commonly seeded species included crested wheatgrass, pubescent wheatgrass, alfalfa and Russian wildrye. Current treatment of seedings includes both

native and introduced species and a mix of shrubs, forbs, and grasses. For seeding locations see Map 8.



Rangeland Health Assessments

Soils, hydrology, and biotic integrity showed similar ratings in rangeland health analyses of seedings. Sites that showed moderate, moderate to extreme, and extreme departures from reference conditions (soils – 70%; hydrology – 69%; biotic integrity 70%) had concerns with soil stability, desirable species composition, seeded species die-off, and weed invasion.

WETLANDS

Riparian habitats include forest, shrub, graminoid, and forb-dominated vegetation types associated with rivers, streams, springs, seeps, and ephemeral wetlands. These communities are often exceedingly small in area, but are generally high in plant species richness, averaging 33-50 taxa per 1,000 square meters and provide habitat for nearly 60% of the vertebrates and 30% of the plant species in the area.

The upper Escalante River Sub-basin is characterized by deep, shady canyons, mesic soils, and perennial stream flows. These reaches support riparian woodlands and shrublands dominated by Fremont cottonwood, Narrowleaf cottonwood, Coyote willow, Black willow, Box elder, and Water birch with a rich understory of native forbs and perennial graminoids including Western goldenrod, Yellow monkeyflower, White virgin's-bower, willowherb, Common scouring rush, Canada wildrye, Baltic rush, Torrey's rush, and Panicled bulrush. Flooding events strongly influence the distribution of riparian vegetation by reshaping stream channels, scouring existing sand and gravel bars, and depositing new sediment. Frequent disturbance also leaves these areas susceptible to invasion by non-native trees, forbs, and graminoids. Tamarisk, Russian olive, Quackgrass, Redtop, Kentucky bluegrass, Red clover, White sweetclover, and more than 30 other non-native species have become widely established along the Escalante River and its tributaries, and in some places have displaced native vegetation.

The upper portions of the Paria River Sub-basin consist of a mosaic of shrub thickets interspersed with marshes and wet meadows dominated by graminoids and forbs. Fremont cottonwood and Blue spruce also occur sporadically along the margins of the creeks but do not form extensive stands. The major shrub species are Coyote willow, Yellow willow, Water birch, Silver buffaloberry, and Spreading rabbitbrush. Tamarisk and Russian olive occur infrequently except where the streams have been dewatered (upland shrub species are also moving into these sites). Wetter areas are dominated by dense stands of Baltic rush, Common threesquare bulrush, spikerush, Analogue sedge, Woolly sedge, and Nebraska sedge.

Intermittent streams draining the Kaiparowits Sub-basin Paria, Kanab, and lower Escalante Sub-basins originally consisted of Fremont cottonwood woodlands, Coyote or Yellow willow thickets, or open, wet alkaline meadows of Desert saltgrass, Scratchgrass, Baltic rush, and Common threesquare bulrush. In many reaches, cottonwood and willow communities have been invaded or replaced by dense stands of Tamarisk, often resulting in a decrease in overall plant species richness. Wet meadows have also been impacted by exotics, including Tamarisk, Cheatgrass, Water polypogon, and Rabbitsfoot grass.

Desert springs and seeps occur sporadically across the planning area, usually along contacts between porous sandstones and less permeable rock. Large springs and seeps are often dominated by small patches of Fremont cottonwood or Coyote willow, although these communities are often displaced by Tamarisk or Russian olive. Smaller seeps with alkaline soils are often vegetated by Baltic rush, Scratchgrass, Common threesquare bulrush, or Desert saltgrass or have become dominated by Tamarisk and Quackgrass.

Hanging gardens are one of the more unique wetland types in the Colorado Plateau region. These communities are typically associated with seeps or springs located in shady alcoves or

cliffs where cool temperatures prevent surface water from evaporating quickly. Hanging gardens are often dominated by Maidenhair fern, Helleborine, Bundle panicgrass, and Golden sedge, although 40 other plant species have been documented from them. Several rare species have been documented from hanging gardens in Glen Canyon NRA (such as Alcove death camas, Cave primrose, Zion pretty shooting star, and Canyonlands sedge), but they do not occur within the planning area.

Another uncommon wetland feature is sand seeps found in association with sand swales carved out of sandstone bedrock. Sand seeps are derived from precipitation of the current year (rather than permanent springs) and originate only in wet years at the contact between loose sand and bedrock. When moist, these sites support small communities dominated by uncommon annual or biennial forbs and graminoids, including Hairy mimetanthe, Cottonbatting cudweed, Religious daisy, and Minute rush. Larger sand seeps may support perennial plants, such as Nebraska sedge and Baltic rush. Sand seeps are most prevalent in the deep Navajo blowsands topping the Vermilion Cliffs east of Johnson Canyon.

Rangeland Health Assessments

140 springs and seeps and 444 miles of streams were assessed as part of the data collection phase of this EIS. Thirty-two of these spring and seep sites rated as either Functioning-at-Risk with a downward trend or as Non-Functioning. The most common issues that caused springs and seeps to rate below PFC were lack of water and lack of vegetative cover to protect and armor soils.

Fifteen percent of stream miles assessed were rated Non-Functioning or Functioning-at-Risk with a downward trend. The two most frequent problems by far are the lack of adequate riparian vegetation to protect streambanks and channel instability problems that presented as eroding banks and headcuts.

THREATENED, ENDANGERED, and SENSITIVE PLANTS

Three plant species listed as Endangered or Threatened under the Endangered Species Act (ESA) are found in the planning area, Jones' cycladenia, Kodachrome bladderpod and Ute ladies' tresses (Table 3-19). See Map 9 for a general location of these species. Three other federally listed species (Siler's pincushion cactus, Welsh's milkweed and Navajo sedge) are known from just outside the boundaries of the planning area.

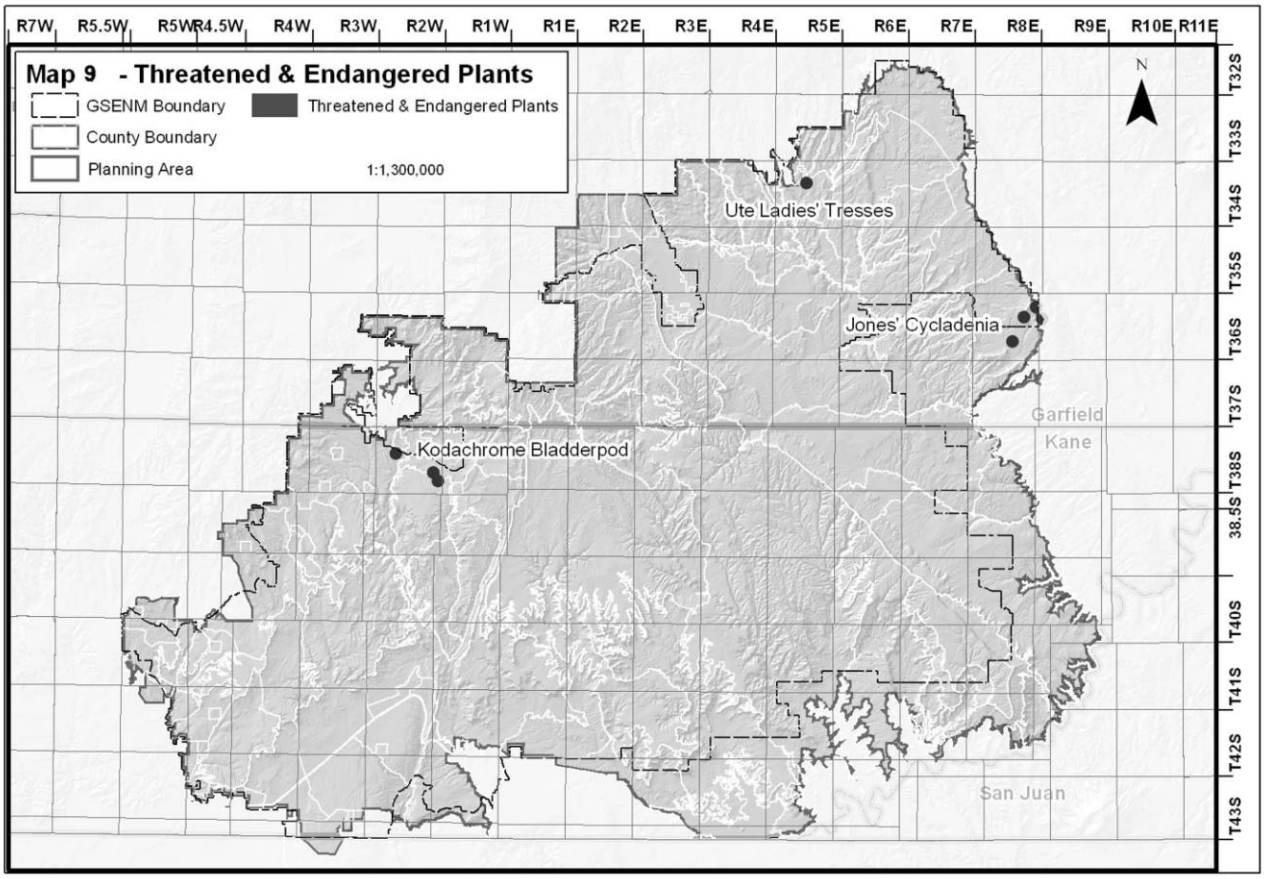


Table 3-13 Threatened and Endangered Plant Species

Species	Family	Legal Status	Comments
Jones' cycladenia *Cycladenia humilis* var. *jonesii*	Apocynaceae	Threatened	Restricted to steep, sparsely vegetated slopes of Chinle shales below sheer cliffs of Wingate Sandstone in the Circle Cliffs region of GSENM and adjacent Glen Canyon NRA and Capitol Reef NP (Death Hollow, Moody, and Wagon Box Mesa Allotments and unallotted lower reach of the Escalante River Allotment). Potentially threatened by lack of pollinators and poor seed production. Impacts from livestock grazing have not been observed due to absence of forage and water and poor accessibility of most occupied sites. UT-CDC status = Rare.
Kodachrome bladderpod *Lesquerella tumulosa*	Brassicaceae (Cruciferae)	Endangered	Restricted to barren, whitish, slate-clay knolls of the Paria River Member of the Carmel Formation on GSENM lands south of Kodachrome State Park (Dry Valley, Upper Hackberry, and Upper Paria Allotments). Listed as Endangered in 1987 due primarily to threats from off-road vehicle recreation. Not browsed by livestock, but may be trampled where animals congregate or trail. UT-CDC status = Rare.
Navajo sedge* *Carex specuicola*	Cyperaceae	Threatened	Found in seeps and springs on steep cliffs of Navajo sandstone and in hanging gardens. The surrounding vegetation is Pinyon-juniper woodland at elevations from 1740 to 1824 meters. Threats to this species include dewatering for livestock, trampling by livestock, and grazing by livestock. This species is known from the south and east of the Monument but no populations have been identified in the planning area. UT-CDC status = Rare
Siler's pincushion cactus* *Pediocactus sileri*	Cactaceae	Threatened	Known from vicinity of GSENM on BLM Kanab FO lands. Potential habitat occurs on exposures of the Shnabkaib or Middle Red members of the Moenkopi Formation north of US Hwy 89 on GSENM lands. Potentially threatened by trampling by livestock and over-collection for the horticultural trade. UT-CDC status = Rare
Ute ladies' tresses *Spiranthes diluvialis*	Orchidaceae	Threatened	Found in moist (but not flooded) stream terraces and abandoned channels along Deer Creek in the King Bench Allotment. Population has remained approximately stable since monitoring began in 1990. Site is managed as winter pasture for livestock, with cattle removed well before plants emerge in the spring or flower. Grazing at this site may be beneficial in reducing woody shrub cover from replacing open, wet meadow habitat favored by this species. UT-CDC status = Rare.
Welsh's milkweed* *Asclepias welshii*	Asclepiadaceae	Threatened	Endemic to partially stabilized to shifting red sand dunes derived from Navajo Sandstone in the Coral Pink Sand Dunes and Sand Cove/Coyote Buttes areas. Potential habitat may occur on dunes west of Johnson Canyon and at the south end of the Cockscomb. Occasionally grazed by livestock, but herbivory is not considered a substantial threat under current levels of use (US Fish and Wildlife Service 1987). UT-CDC status = Rare.

*Not currently known from GSENM, but potential habitat is present within the Monument.

Jones' cycladenia (*Cycladenia humilis* var. *jonesii*) is known from nine populations in the Circle Cliffs/Wolverine region of GSENM and adjacent areas of Glen Canyon National Recreation Area and Capitol Reef National Park. Due to poor accessibility and lack of water and forage, populations of Jones' cycladenia are not susceptible to livestock grazing.

Kodachrome bladderpod (*Lesquerella tumulosa*), listed Endangered, is restricted to sparsely vegetated whitish slate-clay outcrops of the Paria River Member of the Carmel Formation on the

east side of the Paria River southeast of Cannonville. Due to its low, matted growth form, Kodachrome bladderpod is not vulnerable to herbivory from cattle, but plants could suffer trampling mortality if grazing use is heavy or concentrated within its limited range. Demographic monitoring from 1997-2001 showed a high degree of mortality in 2000-2001, possibly from the recent drought.

One population of Ute ladies' tresses (*Spiranthes diluvialis*) occurs within the planning area in moist but not flooded terraces and abandoned stream channels in the Deer Creek watershed. The Deer Creek area is grazed by cattle during the winter but animals are removed well before flowering begins in July and August. Studies in Wyoming and Colorado have found that *S. diluvialis* populations respond favorably to reductions in competing plant cover that may arise from winter (but not summer) grazing practices. One small patch of *S. diluvialis* at the head of Deer Creek Canyon appears to be in decline due to an increase in vegetative cover.

Siler's pincushion cactus (*Pediocactus sileri*) is not known to occur within the planning area. Areas of suitable habitat have been surveyed but no populations have been located. Although this species may be impacted by trampling associated with concentrated grazing, detailed analysis of impacts will not be conducted at this time.

Navajo Sedge (*Carex specuicola)* has not been located within the planning area. While sensitive to dewatering from range improvements, no improvements will be implemented as result of this plan amendment. Future improvement implementation is proposed, but none of the proposals involve dewatering. Impacts on Navajo Sedge will be assessed in future, site specific, analysis when projects may impact it are proposed.

Under BLM Manual 6840, the State Director may designate plant species found on public lands as "Sensitive" if these species are at risk of becoming extirpated or listed as Threatened or Endangered under the ESA due to agency actions. The BLM Utah State Office last revised its official list of state Sensitive plant species in January 2003 (USDI Bureau of Land Management 2003). Presently, 16 Sensitive plant taxa are known and 2 additional species may potentially occur in the planning area (Table 3-20). The status, distribution, and threats to each of these species are summarized below. In general, most of these species are edaphic endemics restricted to sparsely vegetated sites with specialized (and often harsh) soil or bedrock characteristics.

Table 3-14 BLM Sensitive Plant Species

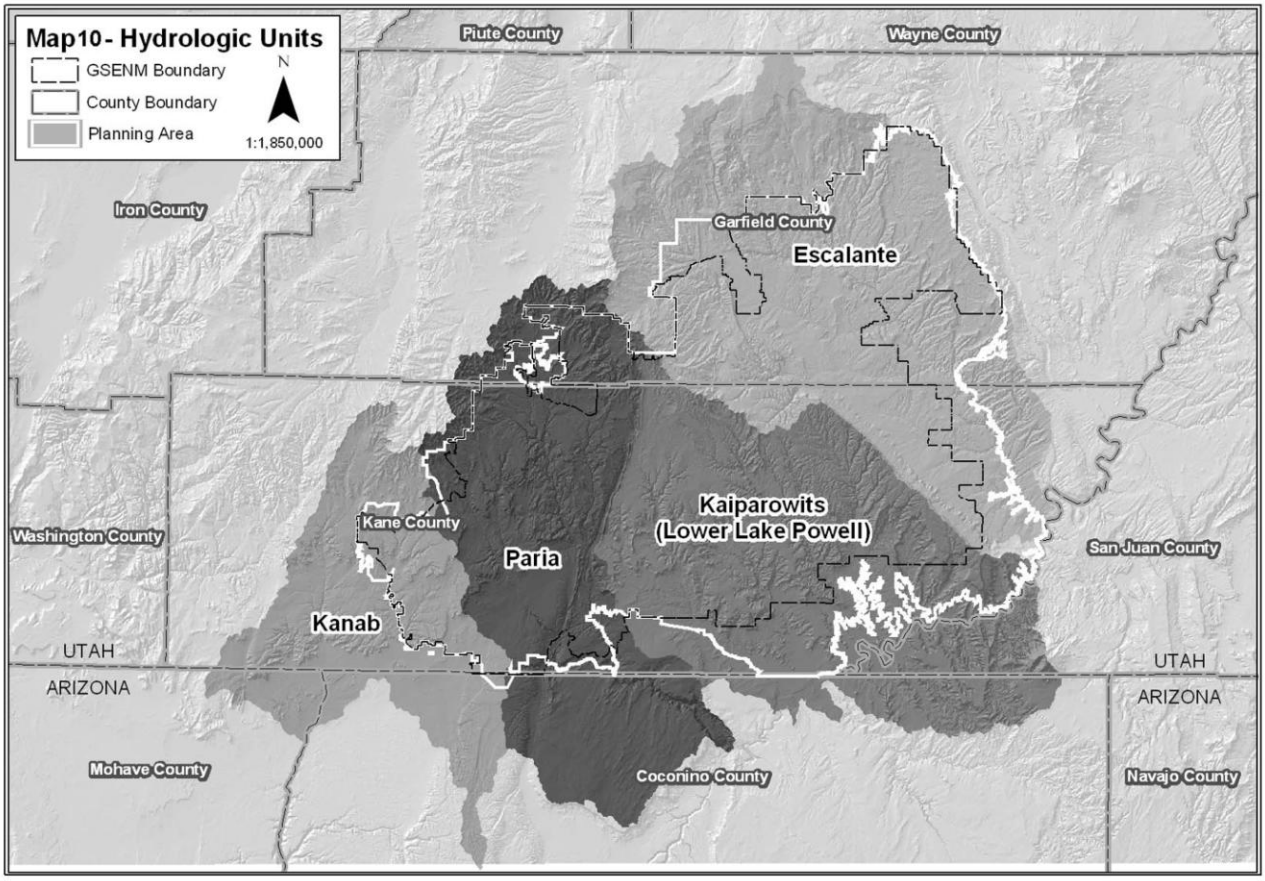
Species	Family	Comments
Atwood's pretty phacelia Phacelia pulchella *var.* atwoodii	Hydrophyllaceae	Locally abundant in wet years on gypsiferous knolls of Moenkopi Formation along the US Hwy 89 corridor and Skutumpah roads. One report from Horse Mountain on the Kaiparowits Plateau may represent var. *sabulonum.* Known from at least 8 main populations (Black Rock, Cockscomb, Cottonwood, Headwaters, Mollies Nipple, and Vermilion allotments). Populations are strongly correlated with well-developed biological soil crusts on gypsum-rich soils. Primary threats may be from soil disturbance and competition from weedy annuals. UT-CDC status = Rare.
Chinle chia Salvia columbariae *var.* argillacea	Lamiaceae (Labiatae)	Recently described Utah endemic restricted to Chinle shale barrens in and near Zion National Park planning area. Known from only 2 populations in the Kitchen Corral Wash area (Mollies Nipple allotment). Sparsely vegetated habitat attracts little use from livestock due to lack of forage and water, but could be negatively impacted by trampling. UT-CDC status = Rare.
Chinle evening-primrose Oenothera murdockii	Onagraceae	Recently described Utah endemic. Restricted to 4-5 sites on barren slopes and outwash fans of the Chinle Formation in the Kitchen Corral Wash and Paria townsite areas (Cottonwood and Mollies Nipple allotments). Habitat supports little forage and receives low use by livestock. One colony in Kitchen Corral Wash may be expanding into a disturbed two-track that exposes bare shaley soils. UT-CDC status = Rare.
Cronquist's phacelia Phacelia cronquistiana	Hydrophyllaceae	Known from 4 confirmed populations worldwide, all within Kane County, Utah. One occurrence is found in the Ford Well allotment on gypsum-rich soils of the Carmel Formation. Threats are poorly defined, but may include livestock trampling. Sparsely vegetated gypsum soils receive little livestock use. UT-CDC status = Rare.
Cutler's lupine Lupinus caudatus *var.* cutleri	Fabaceae (Leguminosae)	According to Welsh and Atwood (2002), the entire range of var. *cutleri* in Utah is limited to the vicinity of the Cockscomb. Little is currently known of the distribution, abundance, or threats to this taxon across its range in Utah, Arizona, and New Mexico. Known from at least 4-5 populations in the Cockscomb, Clark Bench, and Headwaters Allotments and in the BLM Arizona Strip Field Office's Coyote Allotment. UT-CDC status = Additional Data Needed.
Gumbo milkvetch Astragalus ampullarius	Fabaceae (Leguminosae)	Restricted to barren outcrops of the Chinle Formation in Kane and Washington counties, UT and northern Arizona. Currently known from 11 populations (Cockscomb, Cottonwood, Mollies Nipple, and Vermilion allotments) and 24 populations in southern Utah. Local populations occur primarily along the base of the Vermilion Cliffs from Flag Point to the Cockscomb. Habitat of this species has little forage or water available and receives minimal use by livestock. UT-CDC status = Watch.
Hole-in-the-Rock prairie-clover Dalea flavescens *var.* epica	Fabaceae (Leguminosae)	Not currently known, but potential habitat present in sandy blackbrush or desert shrub habitats or slickrock areas in the Escalante Canyons east of the Hole-in-the-Rock Road. This taxon may be only a minor variant of typical *D. flavescens* with an abnormally thick flower spike. UT-CDC status = Taxonomic Problems.
Kanab thelypody Thelypodiopsis ambigua *var.* erecta	Brassicaceae (Cruciferae)	Endemic to southern Utah and northern Arizona. Known from three populations in the Seaman Wash, Petrified Hollow, and Kitchen Corral Wash areas (Mollies Nipple and Vermilion allotments). Found in desert shrub and Pinyon-juniper communities on clay soils derived from Chinle shales. Potential impacts from livestock are not known. UT-CDC status = Rare.

Table 3-14 BLM Sensitive Plant Species (cont.)

Species	Family	Comments
Kane breadroot Pediomelum epipsilum	Fabaceae (Leguminosae)	Endemic to southern Kane County, Utah and adjacent northern Arizona. Known from 8-9 populations on barren outcrops of reddish clay soils derived from the Moenkopi Formation along US Hwy 89 from Seaman Wash to Kitchen Corral Wash (Mollies Nipple, Vermilion, and White Sage allotments). Appears to be tolerant of moderate surface disturbances that reduce competing vegetation cover. Does not seem to favor sites with well-developed biological soil crusts. UT-CDC status = Rare.
Lori's columbine Aquilegia loriae	Ranunculaceae	Described as a new species in 2001 and thought to be endemic. Currently known from 7 extant populations in the White Cliffs and upper Wahweap drainage (Calf Pasture, Headwaters, Swallow Park, Upper Paria, and Vermilion allotments). Occurs primarily in hanging gardens and narrow, shady sandstone canyons, many of which are inaccessible to livestock. UT-CDC status = Rare.
Paria iris Iris pariensis	Iridaceae	Known only from the type collection from West Clark Bench, on the Bunting Well Allotment. Not relocated since 1976 despite several recent attempts. Some taxonomists have questioned whether this species is distinct, or just an unusual variant of *Iris missouriensis.* Iris species in general are toxic or unpalatable to livestock and are often increasers. Loss of wetland habitat may be the primary threat to this species. UT-CDC status = Historic (presumed extinct or only known historically throughout range).
Sandloving penstemon Penstemon ammophilus	Scrophulariaceae	Widely distributed in deep Navajo sand dunes in the White Cliffs, with at least one disjunct population in Navajo dunes associated with slickrock in the Escalante Canyons area. Known from at least 12 populations in the Antone Flat, Deer Spring Point, Granary Ranch, Johnson Canyon, Locke Ridge, Mollies Nipple, Second Point, Swallow Park, and Vermilion allotments. Threats appear low due to poor accessibility of many populations and a paucity of forage and water for grazing. UT-CDC status = Rare.
Slender camissonia Camissonia exilis	Onagraceae	Small and readily overlooked annual forb restricted to gypsiferous outcrops with well-developed biological soils crusts derived from the Moenkopi and Carmel formations. Known from approximately 17 populations (Black Rock, Cockscomb, Cottonwood, Dry Valley, Ford Well, Mollies Nipple, Swallow Park, Upper Paria, Vermilion, and White Sage) in the vicinity of US Hwy 89 and the Skutumpah Road. Threatened primarily by degradation of biotic soil crust habitat and replacement by exotics. UT-CDC status = Rare.
Smoky Mountain mallow Sphaeralcea grossulariifolia *var.* fumariensis	Malvaceae	Recently described variety limited to the southern Kaiparowits Plateau and Buckskin Mountain. Found primarily on thermally-altered outcrops of the Straight Cliffs or Morrison formations. Known from only 10 main populations, 9 of which are in the Last Chance, Nipple Bench, Rock Creek-Mudholes, Upper Warm Creek, and Wiregrass allotments. UT-CDC status = Rare.
Spiny gilia Gilia latifolia *var.* imperialis	Polemoniaceae	Restricted to alluvial terraces and rocky benches derived from the Straight Cliffs Formation at the south end of the Kaiparowits Plateau. Currently known from 14 populations in the Cottonwood, Last Chance, Nipple Bench, and Upper Warm Creek allotments. Some populations are found in roadbeds through dry washes. UT-CDC status = Rare.
Tropic goldeneye Viguiera soliceps	Asteraceae (Compositae)	Annual restricted to barren gray clay flats and knolls of the Tropic shale at the south base of the Kaiparowits Plateau from Cottonwood Wash to Lake Powell. Known from 13 main populations in the Cottonwood, Coyote, Last Chance, and Wiregrass allotments. Populations may number in the hundreds of thousands during wet years but be absent in drought periods. Main threats are from habitat degradation and impacts by off-highway vehicles. UT-CDC status = Rare.
Utah spurge Euphorbia nephradenia	Euphorbiaceae	Endemic to barren gray clay slopes of the Tropic Shale in central and southern Utah. Known only from 3-4 populations at the south end of the Kaiparowits Plateau in the Cottonwood allotment. Mostly threatened by trampling and habitat degradation associated with off-highway vehicle recreation. UT-CDC status = Rare.

RIPARIAN AND WATER RESOURCES

The planning area encompasses portions of four broad hydrologic subbasins (Map 10), all of which are part of the Colorado River system. The Escalante River system 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 subbasin (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 planning area, the Kanab Creek subbasin (includes Johnson Wash and its tributaries) drains into the Grand Canyon. Altogether, there are approximately 2,500 miles of stream channels and washes. Less than 10% of these are perennial streams and primarily include the upper reaches of the Escalante River, the Paria River, and Last Chance Creek.



Rangeland Health Standard 4 states that the BLM will comply with water quality standards established by the State of Utah.

The Utah State Division of Water Quality (the State) assesses the quality of its surface water resources to protect it for beneficial uses, including drinking, fishing, boating, irrigation, stock watering, and supporting aquatic wildlife. Water samples are collected from streams/springs on a regular basis and then analyzed to determine whether they meet numeric criteria for defined beneficial uses. Based on the results of that analysis the State defines the waters as fully supporting, partially supporting, or non-supporting of its beneficial uses. If a water body is determined to be partially supporting or non-supporting, section 303(d) of the Clean Water Act requires that the state place the waterbody on a list of "impaired" waters [(303(d) list] and prepare an analysis called a Total Maximum Daily Load (TMDL).

Table 3-15 GSENM Water Quality Monitoring Sites

Site	Storet Number
Henrieville Wash at Town	4951890
Henrieville Wash at Highway 12	4951900
Upper Valley	4951980
North Creek	4954630
Paria River at Kodachrome	4951860
Paria River at Highway 12	4951870
Escalante River at Weir	4954660
Escalante River at Calf Creek	4954240
Calf Creek at Escalante River	4954210
Deer Creek	4954080
The Gulch at Long Canyon	4954100
Sheep Creek	5994340
Willis Creek	5994350
Escalante River at Lake Powell	5952740
Coyote Gulch at Glen Canyon NRA Boundary	5994240
Escalante River above Harris Wash	5994210
Harris Wash above Escalante River	5994190
Little Valley Wash Spring	5994630
Tibbet Canyon Spring	5994560
Wesses Canyon Spring	5994580
Paria River at Highway 89	4951850
Paria River at Old Town Site	5994550
Lower Coyote Spring	5994570
Wahweap Creek	5994530
Last Chance at Road Crossing	5994520
Deer Spring Wash	5994650
Kanab Creek at Falls	4951830
Seaman Wash	5994590
Neaf Spring	5994420
Millcreek above Diversion	5994740
Thompson Creek	5994790

CHAPTER 3
AFFECTED ENVIRONMENT

Rangeland Health Standard 2 states that riparian and wetland areas are in properly functioning condition and that stream channel morphology and functions are appropriate to soil type, climate, and landform.

"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 exhibit vegetation or physical characteristics reflective of permanent surface or subsurface water. Riparian areas are divided into two categories, lotic and lentic. Lotic sites have flowing water and are linear in extent, streams are an example of this category. Lentic sites have pooled or standing water, examples are springs, marshes, and wet meadows. Other 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.

The BLM has completed a Proper Functioning Condition (PFC) assessment for riparian areas within the planning area. The PFC method is a qualitative field evaluation that analyzes a riparian-wetland area's capability and potential; the PFC assessment is not an ecological rating of vegetation communities. The three components of a riparian-wetland area assessed during PFC are: (1) vegetation, (2) landforms/soils, and (3) hydrology. Based on the condition of these components, each riparian area is placed in one of four categories: Proper Functioning Condition (PFC), Functional-At-Risk (FAR), Non-Functional (NF), or Unknown. Streams and springs determined to be functioning at risk can be further subdivided by trend and contributing factors. An example of a contributing factor is diversion of water from a stream for irrigation. The dewatering of a stream or spring can reduce the vigor and continuity of riparian vegetation and result in a poor PFC rating.

Riparian-wetland areas are functioning properly when energy associated with high water flows is dissipated by adequate vegetation, landform, or large woody debris. This dissipation 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. Proper functioning condition reflects the interactions among geology, soil, water, and vegetation.

PFC assessment data were used to document the factors preventing streams and springs from attaining or trending towards proper functioning condition. Causative factors were documented, such as direct impacts of range management (dewatering caused by water developments, heavy livestock grazing, and heavy livestock trampling/trailing), indirect impacts of grazing (headcutting, exotic vegetation establishment, upstream conditions, watershed conditions), and/or factors not related to range management (non-BLM water diversions, roads, recreation impacts). Multiple factors may affect a single site, since several direct impacts may occur at a given location and indirect impacts may stem from direct impacts (e.g., heavy trampling may lead to development of headcuts).

Table 3-16 Decision Area Riparian Condition Summary

Functional Status	Trend	Standard 2	Miles Evaluated (Lotic)	% of Miles	Number of Sites (Lentic)	%
Proper Functioning Condition	N/A	**PASS**	221.05	49.7	56	40.00
Functioning at Risk	Upward	**PASS**	73.07	16.4	17	12.14
	Not Apparent	**PASS**	83.33	18.7	22	15.71
	Downward	**FAIL**	35.24	7.9	31	22.14
Non Functioning	N/A	**FAIL**	32.09	7.2	14	10.00
Total			**444.78**		**140**	

PARIA RIVER SUBBASIN

The Paria River Subbasin is roughly 640,000 acres in size and drains the Grand Staircase and Kaiparowits physiographic regions. The Paria River is perennial from below the town of Cannonville downstream to below the confluence of Cottonwood Creek, intermittent to the Colorado River. The upper reaches of the Paria River are intermittent and often diverted for irrigation of agricultural lands in the Tropic/Cannonville area. A transbasin diversion from the East Fork of the Sevier brings additional irrigation water into the Paria Basin. The Paria River has a bimodal hydrograph with a moderate peak in stream flows occurring in March from snowmelt and a second peak in flows occurring in the late summer from monsoonal thunderstorms. The Paria River is an extremely flashy system. Other streams in the Paria River Subbasin that are perennial for some portion of their length include Willis Creek, Henrieville Creek, Deer Creek, and Sheep Creek.

Paria River Subbasin Water Quality

The beneficial uses in the Paria Watershed are:

- ✓ Class 2B - Protected for secondary contact recreation such as boating, wading, or similar uses,
- ✓ Class 3C - Protected for nongame fish and other aquatic life, including the necessary aquatic organisms in their food chain,
- ✓ Class 4 - Protected for agricultural uses including irrigation of crops and stockwatering.

The State has identified the following two reaches of the Paria River as not meeting the total dissolved solids (TDS) numeric standard and therefore not supporting beneficial use Class 4. They have been placed on the 303(d) list by the State:

1. Paria River from the confluence with Rock Springs Creek to the headwaters,
2. Paria River from the Utah/Arizona border upstream to the confluence with Cottonwood Creek.

Sources of elevated levels of total dissolved solids, commonly referred to as salinity, include erosion from marine shale geology. The Paria River Subbasin does contain exposures of marine shale (Tropic Shale and Carmel Formations) in the headwaters of the watershed. The TMDL analysis conducted by the State concluded that high TDS concentrations are primarily a natural

feature of the environment and BLM-permitted activities are a minor contributor to TDS loading (UDWQ, 2006, Paria River Watershed Management Plan, Awaiting EPA approval).

Paria River Subbasin Watershed Health

A number of uplands rangeland health sites have been sampled within the Paria River Subbasin and these sites can provide insight into the overall condition of the watershed. In particular, the summary ratings for soil stability and hydrologic function are useful. The Technical Reference 1734-6, Interpreting Indicators of Rangeland Health, defines soil stability as "the capacity of the site to limit redistribution and loss of soil resources by wind and water" and hydrologic function as "the capacity of the site to capture, store, and safely release water from rainfall, run-on . . . and to recover this capacity following degradation." (pg 7). Please refer to the vegetation section for a description of the rangeland health protocol. Summary soil and hydrologic ratings for the Paria and its watersheds provide information on upland health and are displayed in the following table. A summary rating of '5' indicates that the sample site matches what is expected for that ecological site description whereas a '1' indicates extreme departure from what is expected for the sample site (see Appendix 11).

Table 3-17 Upland Rangeland Health Ratings for Sites with in the Paria River Subbasin

Watershed	Soil Stability Rating						Hydrologic Function Rating					Total Number of Assessments
	1	2	3	4	5		1	2	3	4	5	
Cottonwood	0	0	8	9	8		0	0	7	10	8	25
Middle Paria	0	0	6	18	11		0	0	6	17	12	35
Sheep Creek	0	2	11	6	2		0	1	11	6	3	21
Upper Buckskin	0	3	17	28	10		0	3	17	30	8	58
Upper Paria	0	3	13	15	7		0	4	13	15	6	38
Paria Total	0	8	55	76	38		0	8	54	78	37	177

KAIPAROWITS SUBBASIN

The Kaiparowits Subbasin comprises several watersheds that drain into Lake Powell and are very similar geologically and climatically (this subbasin is also referred to as the Lower Lake Powell Subbasin). Wahweap Creek and Last Chance Creek are the main streams in the Kaiparowits Subbasin and are perennial only along portions of their length. There has not been any gauging of streams in this area but it can be surmised from observations that stream flows slow to a trickle during summer months and yet can flash to a torrent during late summer monsoons. Of the approximately 1.1 million acres within the Kaiparowits Subbasin, approximately 743,300 acres occur within the planning area. Of the acreage within the planning area, 62.7% is administered by GSENM, 32% is administered by GCNRA, 5% is owned by the State, and 0.3% is privately owned.

Kaiparowits Subbasin Water Quality

The State Division of Water Quality has determined that the beneficial uses for the Kaiparowits watersheds are:

- ✓ Class 2B - Protected for secondary contact recreation such as boating, wading, or similar uses,
- ✓ Class 3B -, Protected for warm water species of game fish and other warm water aquatic life, including the necessary aquatic organisms in their food chain,
- ✓ Class 4 - Protected for agricultural uses including irrigation of crops and stockwatering.

The State has not indicated that any of the waterbodies in the Kaiparowits Subbasin are impaired.

Kaiparowits Subbasin Watershed Health

A number of uplands rangeland health sites have been sampled within the Kaiparowits Area. Summary soil and hydrologic ratings are displayed in the following table. A summary rating of '5' indicates that the site matches what is expected for that site whereas a '1' indicates extreme departure from what is expected for the site.

Table 3-18 Upland Rangeland Health Ratings for Watersheds within the Kaiparowits Subbasin

Watershed	Soil Stability Rating						Hydrologic Function Rating					Total Number of Assessments
	1	2	3	4	5		1	2	3	4	5	
Croton Canyon	0	0	1	7	3		0	0	1	7	3	11
Last Chance Creek	0	1	1	11	6		0	0	2	11	6	19
Lower Wahweap Creek	0	3	12	9	5		1	2	11	11	4	29
Portion of Aztec Creek	0	0	3	6	2		0	0	3	6	2	11
Portion of West Canyon	0	0	1	0	0		0	0	0	1	0	1
Upper Wahweap Creek	1	5	8	12	3		1	3	10	13	2	29
Warm Creek	0	1	4	10	1		0	0	4	11	1	16
Kaiparowits Total	1	10	30	55	20		2	5	31	60	18	116

CHAPTER 3
AFFECTED ENVIRONMENT

ESCALANTE RIVER SUBBASIN

The Escalante River Subbasin is 1.3 million acres (including approximately 880,000 acres within the planning area) in size and drains from the Aquarius Plateau and Boulder Mountain to Lake Powell. As a result of the high elevation headwaters, the Escalante River has a typical snowmelt hydrograph with a peak in flows in late May or early June. The largest recorded flow at the Escalante River stream gauge near Escalante topped out at 4,550 cubic feet per second (cfs) and was caused by a monsoonal thunderstorm on August 24, 1998. At that same gauge site, the two-year flood frequency is 789 cfs and flows drop down to less than one cfs during the summer. Water is diverted above the town of Escalante into the Wide Hollow Reservoir and used for irrigation. Flows recover in the downstream direction due to inputs from Pine Creek, Death Hollow, Sand Creek, Calf Creek and Boulder Creek. Flows from Boulder Creek are also diverted near the town of Boulder for irrigation purposes. Four percent of the subbasin is privately owned lands, 0.5% is State lands, 25% are Dixie National Forest lands, 19% are Park Service lands and the remaining 51.5% are BLM administered lands.

Escalante River Subbasin Water Quality

The State Division of Water Quality (the State) has determined that the beneficial uses for the upper Escalante River (upstream from and including Boulder Creek):

- ✓ Class 2B - Protected for secondary contact recreation such as boating, wading, or similar uses,
- ✓ Class 3A - Protected for cold water species of game fish and other cold water aquatic life, including the necessary aquatic organisms in their food chain,
- ✓ Class 4 - Protected for agricultural uses including irrigation of crops and stockwatering.

The remaining watersheds (the Escalante and tributaries downstream from the Boulder Creek confluence) have been assigned the following beneficial uses:

- ✓ Class 2B - Protected for secondary contact recreation such as boating, wading, or similar uses,
- ✓ Class 3C - Protected for nongame fish and other aquatic life, including the necessary aquatic organisms in their food chain.
- ✓ Class 4 - Protected for agricultural uses including irrigation of crops and stockwatering.

The upper reach of the Escalante River, from the confluence with Boulder Creek to the headwaters, has been placed on the 303(d) list based on high stream temperatures. The TMDL analysis prepared by the State indicates that causes of temperature impairment include natural hydrologic and climatic conditions, flow depletion upstream from the Monument, and altered riparian and streambank conditions (UDWQ, 2006, Escalante River Watershed Management Plan, Awaiting EPA approval).

Escalante River Subbasin Watershed Health

Summary soil and hydrologic ratings provide information on the state of upland health by subwatershed and are displayed in the following table. A summary rating of '5' indicates that

the site matches what is expected for that site whereas a '1' indicates extreme departure from what is expected for the site.

Table 3-19 Uplands Rangeland Health Ratings for Sites within the Escalante River Subbasin

Watershed	Soil Stability Rating						Hydrologic Function Rating					Total Number of Assessments
	1	2	3	4	5		1	2	3	4	5	
Boulder Creek	0	0	2	13	10		0	0	1	14	10	25
Harris Wash	0	2	3	23	10		0	0	6	27	5	38
Headwaters	0	1	0	3	3		0	1	0	2	4	7
Horse Canyon	0	6	11	25	16		0	5	7	26	20	58
Fortymile Gulch	0	0	10	5	1		0	0	4	12	0	16
Moody Creek	0	0	0	5	2		0	0	0	5	2	7
Twentyfive Mile Wash	0	0	4	12	2		0	0	3	14	1	18
Escalante Total	0	9	30	86	44		0	6	21	100	42	169

KANAB CREEK SUBBASIN

The planning area includes about 22% of the 600,000 acre Kanab Creek Subbasin, in two watersheds. The principal stream in this portion of the planning area is Johnson Canyon Wash, which enters Kanab Creek south of the Arizona/Utah Border. BLM-administered lands in this subbasin contain very little riparian vegetation, primarily around and downstream of springs.

Kanab Creek Subbasin Water Quality

The State Division of Water Quality (the State) has determined that the beneficial uses for the Upper Johnson and White Sage watersheds are:

- ✓ Class 2B - Protected for secondary contact recreation such as boating, wading, or similar uses,
- ✓ Class 3B - Protected for warm water species of game fish and other warm water aquatic life, including the necessary aquatic organisms in their food chain,
- ✓ Class 4 - Protected for agricultural uses including irrigation of crops and stockwatering.

No waters in this subbasin are identified by the State as not supporting beneficial uses.

Kanab Creek Subbasin Watershed Health

A number of uplands rangeland health sites have been sampled within the Kanab Creek Subbasin and are displayed in the following table. A summary rating of '5' indicates that the site matches what is expected for that site whereas a '1' indicates extreme departure from what is expected for the site.

Table 3-20 Upland Rangeland Health Ratings for Sites within the Kanab Creek Subbasin

Subwatershed	Soil Stability Rating						Hydrologic Function Rating					Total Number of Assessments
	1	2	3	4	5		1	2	3	4	5	
Upper Johnson	0	0	1	15	0		0	0	4	11	1	16
White Sage	0	3	10	7	7		0	3	9	10	5	27
Total	0	3	11	22	7		0	3	13	21	6	43

CHAPTER 3
AFFECTED ENVIRONMENT

BIOLOGICAL SOIL CRUST

Biological soil crusts are an assortment of cyanobacteria, green algae, lichens, fungi, or mosses that occur together on the soil surface, forming layers that can range from 1-10 cm thick. They are common in arid and semi-arid areas worldwide. Crusts on fine-textured soils often appear dark, rough, and pinnacled. Those on sand usually do not develop pinnacles and instead appear as a dark, two-dimensional layer on the surface.

BIOLOGICAL SOIL CRUST FUNCTIONS

Nutrient Uptake

Biological crust show higher concentrations of nutrients, compared to source soils, as a result of cyanobacteria (blue-green algae) fixing nitrogen. Biological soil crust also traps fine soil particles to create nutrient-rich microsites. It is known that cyanobacteria (blue-green algae) have the ability to "fix" nitrogen into a form accessible by plants. However, cryptogamic soils are not the only source of nitrogen in arid environments. Other nitrogen fixing plants found in this region are: *Oxytropis* sp., *Trifolium* sp., *Astragalus* sp., *Cercocarpus ledifolius, Purshia tridentata* and *Sheperdia rotundifolia*

Seed Germination and Establishment

Anderson *et al*. (1982) concluded that biological crusts are not detrimental to vascular plants, and may even enhance seedling establishment. Li *et al*. (2006) reported that disturbed crusts inproved the environment for germination for annual plants. Johansen (1993) cites studies from both sides of the debate. One study found enhanced seedling establishment, the other found reduced emergence (therefore, establishment) in the presence of cryptogamic soils. The USDA (2001) stated that soil crusts may increase or decrease the rate of water infiltration. West (1990) cited Crisp who in 1975 wrote that cryptogamic soils aided in the selection of grasses. Crisp believed that species with awns and setae (i.e. *Stipa)* had an advantage over species which were round and smooth and could be washed away as suggested by Sylla (1987). Hawkes (2004) reported higher germination in crusted vs uncrusted soils for three out of four plant species studied in a greenhouse experiment. Hawkes also found that in field studies other factors than cryptogamic soils affected germination in two of the four species. Eldridge *et al.* (2001) suggested that disturbing the soil surface (e.g. grazing and cultivation) will stimulate the cover and abundance of cryptogamic soils by increasing the amount of unvegetated sites.
It has been pointed out (Harper and Marble 1988, Johansen 1993 and Hawkes 2004) that allelopathic and secondary compounds produced by crypotgamic soils may affect seedling establishment.

Soil Stabilization

Cyanobacterial filaments weave through the top few millimeters of soil, binding soil particles together. These filaments, along with mosses and lichens, stabilize and protect soil surfaces from wind and water erosion.
Sylla (1987) included a statement from Savory and Parsons that indicated that the physical impact of animals on desert ecosystems was not detrimental to arid rangelands but was in fact desirable to hasten the advance of plant succession. This physical action, Savory and Parsons indicated, is achieved through hoof action and the break-up of algae, lichen, and moss

communities and allows for greater grass seedling success. West (1990) refers to work done by Soviet and South African ecologist who see crypotgamic soils as an indication of desertification or degraded range conditions. In the Russian study desertification in the Kara Kum Desert is attributed to the lack of livestock grazing.

Water Retention

While some feel that crypotgamic soils are a benefit to the landscape others are of the opinion that cryptogamic soils inhibit or prevent different biological functions. It is agreed that cryptogamic soils are able to bind soil particles together which can reduce soil movement, however, Verrecchia *et al*. (1995) indicated that these semi-permeable crusts increased runoff while destruction of the crust increased water infiltration. In China Li *et al.* (2006) found that disturbance of cryptogamic soils decreased surface evaporation rate by 20.3% and increased storage of plant-available water in the herbaceous rooting zone. Johansen (1993) implied that infiltration rates can either be higher or lower in uncrusted soils when compared to crusted soils. Verrecchia *et al.* (1995) found that the swelling of cyanobacterial filaments can block up to 40% of the pores in the soil and therefore limits infiltration. Certain organisms, such as *Microcoleus vaginatus*, have been found to act like a sponge and absorb up to eight times their volume in water (Belnap and Gardner 1993). This function could be significant in arid areas that experience sporadic, but heavy rainfall. It has been suggested that the absorbed water is then slowly released and made available to plants. The current knowledge on water retention and infiltration is inconclusive. Comparisons with crust-free sandy soils show higher infiltration on the crust-free soils (but at the cost of higher wind erosion rates). The NRCS has reported that biological crust can either increase or decrease the infiltration rates of soils.

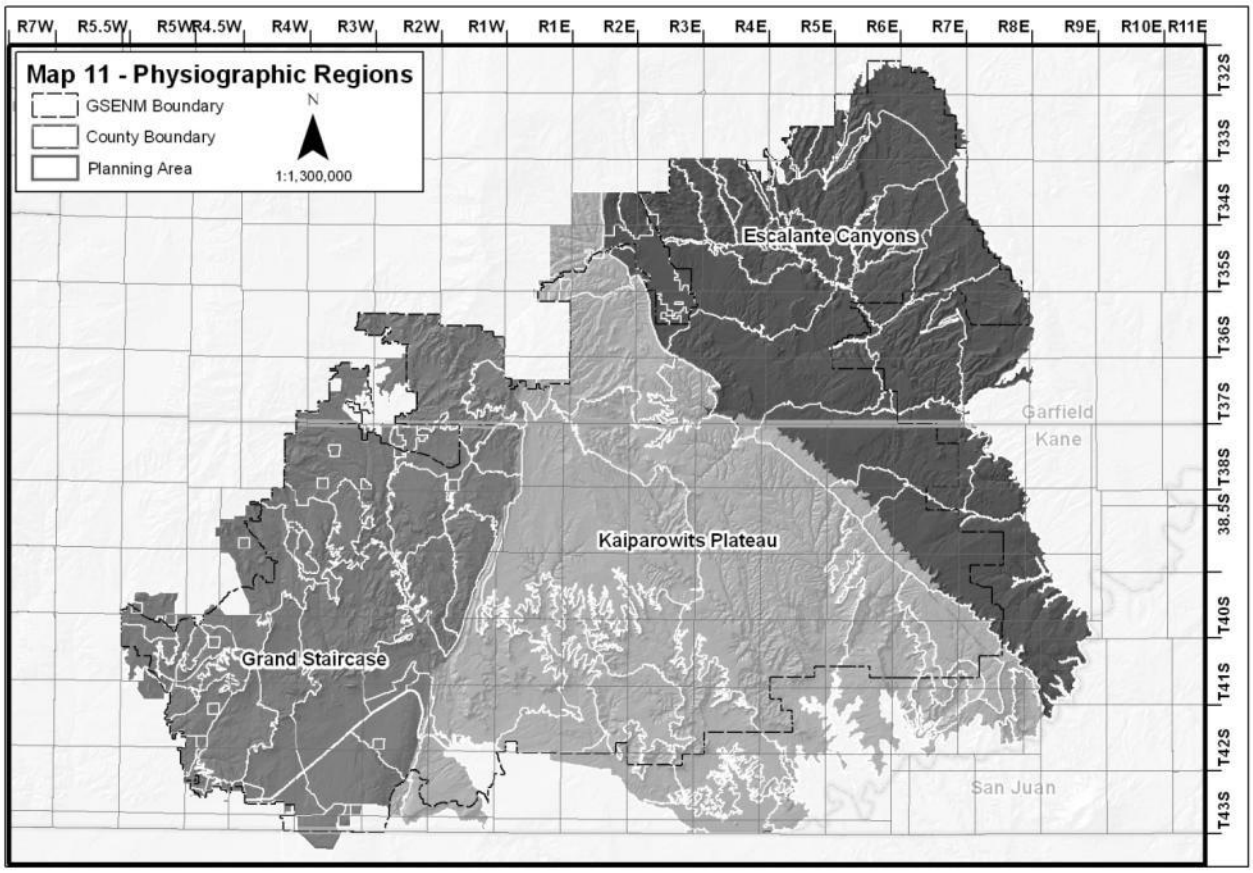
Rangeland Health Assessments

Biological soil crust was evaluated at 517 upland rangeland health sites during the 2000-2003 assessment period.

SOILS

Most of the soils in the planning area are semiarid, young, and poorly developed. Chemical and biological soil development processes, such as rock weathering, decomposition of plant materials, accumulation of organic matter, and nutrient cycling, proceed slowly in this environment. In many areas, natural or geologic erosion rates are too fast to develop distinct, deep soil horizons. Most soils are less than one-half meter deep to bedrock. The deeper soils are formed in recent alluvium. Almost all of the local soils are derived from sedimentary rock. The dominant topographic features are structural benches, mesas, valley floors, valley plains, alluvial fans, stream terraces, hills, cuestas, and mountainsides.

The planning area is divided into three distinct soil regions which match the three provinces within the region: Escalante Canyons, Kaiparowits Plateau, and the Grand Staircase (see Map 11).



The Escalante Canyons Region has three sub-regions: the Circle Cliffs, the Canyon-Slick Rock, and the Hole-in-the-Rock.

> *The Circle Cliffs sub-region* is predominantly Moenkopi Formation and Shinarump Member of the Chinle Formation, which form dominantly lithic soils with deeper soils around the Lampstand area and in alluvial bottoms.
>
> *The Canyon-Slick Rock sub-region* is dominantly the Navajo Sandstone and Carmel Formation. Navajo Sandstone weathers into sandstone slick rock and deep sand with lithic soils around the edges of the slickrock. Sand sheets of Navajo sand dominate this area. The Carmel Formation overlies the tops of the mesas. The Carmel Formation, and a smaller component of the Kayenta Formation, primarily has lithic soils with pockets of deep eolian sand derived from Navajo Sandstone.
>
> *The Hole-in-the-Rock sub-region* is a mix of fan surfaces and bedrock with overlying deep soils. The deeper soils are on alluvial fans and pediments derived from Fiftymile Mountain. Soil textures range from silt clay loam to sand. As you move towards the Escalante River, the soils become deeper sand derived from the Entrada and Navajo

formations. Of the three sub-regions, the Hole-in-the-Rock sub-region has the greatest concentration of deep soils.

In the Kaiparowits Plateau Region, the soils are formed from residual bedrock. The deeper soils are on the tops of benches or plateaus with lithic soils around the edges and on the side slopes. Unique features in this Region are the large landslide deposits.

The Grand Staircase Region has great diversity in geology creating tremendous soil variability. Generally, deeper soils are on the tread portion of the staircase and lithic soils are on the riser portion of the staircase. The unique feature in this region is a lava flow.

The Buckskin sub-region has the majority of the limestone bedrock in the area. The limestone bedrock is primarily Timpoweap Member of the Moenkopi Formation. The soils are mostly moderately deep to bedrock.

The Highway 89 Corridor sub-region is a mix of deep to shallow soils derived from alluvium and bedrock residuum from the Chinle and Moenkopi Formations.

The Vermillion Cliffs / White Cliffs (Navajo Sandstone) sub-region is dominated by relatively productive deep sands.

The North / Northwest White Cliffs sub-region has predominately deep soils with loamy soils residing in the middle of the benches, sandy soils towards the edges of the benches, and shallow soils at the edge of the escarpments.

The Northwest Gray Cliffs sub-region northwest of the Gray Cliffs the majority of the soils are lithic, formed in residium from bedrock. Large alluvial fan remnants and stream terrace remnants are also present in this sub-region. These are characterized by having deeper, older soils, some with thick petrocalcic horizons.

Complete soil data is contained in the Grand Staircase-Escalante National Monument Soil Survey. This information contains soil series descriptions, map unit descriptions, interpretations, and a detailed soils map.

SOIL MANAGEMENT AND SOIL PRODUCTIVITY

Soils in arid and semiarid regions are particularly critical to sustaining ecosystems because they can be more vulnerable to degradation from a number of natural and artificially induced disturbances. Management practices may affect the ability of the various soils to maintain productivity by influencing disturbances such as displacement, compaction, erosion, alteration of organic matter and soil organism levels. When soil degradation occurs in semiarid regions, natural processes are slow to return to site productivity. Soil bulk density (mass per unit volume), porosity, organic matter content, hydraulic conductivity, moisture content, nutrient content, and soil temperature are affected to various degrees by surface disturbance. In turn, these factors affect soil-water interactions, productivity, nutrient cycling, water holding capacity, and soil erosion rates.

Soil productivity varies widely due to characteristics such as soil depth, nutrient status, available water holding capacity, and site characteristics including elevation, aspect, and slope gradient. The most productive soils for forage production are found in valley bottoms, drainage bottoms, and terraces.

NOXIOUS WEEDS AND NON-NATIVE PLANTS

There are nineteen plant species on the Utah State Noxious Weed List, under Section 4-17-3 of the Utah Noxious Weed Act, seven have been found in the planning area (Table 3-22). There are other noxious weeds in the surrounding area that threaten to invade the planning area. One additional species (Whorled milkweed) is also listed as noxious by Kane County.

Table 3-22 Noxious Weed Species Identified In or Near the Planning Area

Species	Family	Legal Status	Comments
Whorled milkweed Asclepias subverticillata	Asclepiadaceae	Kane County Noxious	Native species found primarily along semi-disturbed roadsides and rangelands in the US Hwy 89 corridor. Poisonous to livestock but not especially palatable (Whitson et al. 2002).
Hoary cress Cardaria draba	Brassicaceae (Cruciferae)	UT State Noxious	Infestations have been documented along the Skutumpah Road and in the vicinity of Cannonville (Ecosphere Environmental Services 1998). Seeds are spread by wind, along waterways and irrigation systems, on vehicles and machinery, and in hay and crop seed. Small infestations spread by rhizomes, which are underground stems capable of producing shoots (Sheley& Petroff. 1999).
Russian knapweed, Hardheads Centaurea repens (*Acroptilon repens*)	Asteraceae (Compositae)	UT State Noxious	Widely established along US Hwy 89, UT SR 12, Cottonwood Road, Hole-in-the Rock Road, and along the Paria River. It is allelopathic, very competitive, and continuously fills in as others perennial plants are overgrazed or eliminated by disturbances.
Field bindweed (Wild morning glory) Convolvulus arvensis	Convolvulaceae	UT State Noxious	Established in disturbed roadsides along US Hwy 89, UT SR 12 and the Johnson Canyon, Skutumpah, Cottonwood, Hole-in-the-Rock, and Seaman Wash Roads.
Bermuda grass Cynodon dactylon	Poaceae (Gramineae)	UT State Noxious	Reported from riparian habitats in Alvey Wash and Rock Springs Creek. It is widely established in warmer regions of the West and Southwest, where it is frequently used as a pasture or lawn grass (Whitson et al. 2002).
Quackgrass Elymus repens (*Agropyron repens, Elytrigia repens*)	Poaceae (Gramineae)	UT State Noxious	Widely distributed, especially along roadsides, wet meadows, and riparian areas. Quackgrass is a desirable hay and forage species but is pernicious weed in moist environments, including cultivated fields and rangelands (Whitson et al. 2002).
Scotch thistle Onopordum acanthium	Asteraceae (Compositae)	UT State Noxious	Common along Johnson Canyon, Skutumpah, and Kitchen Corral Roads and becoming established in Lick Wash and Deer Springs Wash (Ecosphere Environmental Services 1998, Welsh and Atwood 2002). Sharp spines on this species deter livestock, and presumably wildlife, from grazing (Sheley & Petroff. 1999).
Johnson grass Sorghum halepense****	Poaceae (Gramineae)	UT State Noxious	Not yet widely established, but known from small colonies along US Hwy 89 east of Kanab and the switchbacks of UT SR 12 east of Escalante (Ecosphere Environmental Services 1998, Welsh and Atwood 2002). Plants form hydrocyanic acid when frosted or under moisture stress, making the plant toxic to livestock (Whitson et al. 2002).

As of summer 2005, 98 non-native plant taxa have been documented, accounting for 10% of the total local flora. The total number of local non-native species is relatively low compared to other floras of western North America. A list of additional Non-native plant species of management concern are found in Table 3-23.

Riparian habitats are especially vulnerable to invasion and replacement of native vegetation by non-natives. Of the 348 riparian sites assessed between 2000 and 2003, Tamarisk (*Tamarix* sp.) was the most common exotic (238 sites). Yellow clover (*Melilotus* officianalis) was also common (130 sites), as was Cheatgrass (*Bromus tectorum*)(112 sites). Russian olive (*Eleagnus* angustifolia) was present at 97 sites.

In upland sites, the dominant invasive non-native is cheatgrass. Of the 639 upland sites in the rangeland assessment survey, 344 had cheatgrass. In 74 of those sites, it was a dominant species. Russian thistle (*Salsola pestifer)* is also a common pest in many disturbed sagebrush types.

Table 3-23 Non-native Plant Species of Management Concern

Species	Family	Comments
Jointed goatgrass Aegilops cylindrica	Poaceae (Gramineae)	Troublesome agricultural pest, especially where wheat is cultivated. Found along Johnson Canyon Road and in vicinity of Kanab and Escalante.
Pale amaranth Amaranthus albus	Amaranthaceae	Less common than its weedy (but native) cousin Prostrate pigweed (*A. blitoides*), but becoming established along disturbed roadsides along US Hwy 89, the Johnson Canyon Road, and other smaller roads. This plant is a prolific seed producer and the seed can be spread great distances when mature wind-blown plants break off and tumble along the ground.
Burdock Arctium minus	Astraceae (Compositae)	Known presently from a single spring at the base of Fiftymile Ridge, but has high potential to become established in riparian areas throughout the Escalante River drainage. The burs can become entangled in the hair of livestock allowing seed to be distributed to new areas (Whitson et al. 2002).
Common oats Avena fatua var. sativa	Poaceae (Gramineae)	Recently documented near cabin on Fiftymile Mountain (Lake Allotment), probably originating from hay or horse manure. A palatable species, but could become established and crowd out other edible native species in moist meadow habitats (Whitson et al. 2002).
Bassia Bassia hyssopifolia	Chenopodiaceae	Currently of limited distribution, but could become widespread, especially in disturbed sites with saline clay soils.
Soft brome Bromus hordeaceus (*B. mollis*)	Poaceae (Gramineae)	An invasive winter annual, first discovered east of Kitchen Corral Canyon in 2001 (Welsh and Atwood 2002). It is only palatable in the early stages of growth before seeds dry in the spring.
Japanese brome Bromus japonicus	Poaceae (Gramineae)	Presently known just from the Deer Creek drainage east of Boulder, but potentially could spread to other riparian areas. It is only palatable in the early stages of growth before seeds dry in the spring (Whitson et al. 2002).
Red brome Bromus rubens	Poaceae (Gramineae)	Invasive winter annual that has become well established in desert shrub communities in the Kaiparowits Plateau area. May out compete other grasses and forbs for early season moisture and space and its fine fuels may increase fire frequency in sagebrush and Pinyon-juniper communities. Red Brome is spread short distances by wind. Animals (wild and domestic) carry it in their feces, hooves, hair, feathers, and tails. Humans may also transport brome seeds in vehicles and clothing (Sheley & Petroff. 1999).

Table 3-23 Non-native Plant Species of Management Concern (cont.)

Species	Family	Comments
Cheatgrass, Downy brome Bromus tectorum	Poaceae (Gramineae)	Invasive and well-established winter annual found throughout in nearly all vegetation types. May out compete other grasses and forbs for early season moisture and space and its fine fuels may increase fire frequency in sagebrush and Pinyon-juniper communities. Cheatgrass is spread short distances by wind. Animals (wild and domestic) carry cheatgrass in their feces, hooves, hair, feathers, and tails. Humans may also transport cheatgrass seeds in vehicles and clothing (Sheley & Petroff. 1999).
Ravennagrass Saccharum ravennae	Poaceae (Gramineae)	Known from scattered inlets along Lake Powell in Glen Canyon NRA. Forms dense stands that choke out other native wetland vegetation, as well as Tamarisk.
Bull thistle Cirsium vulgare	Asteraceae (Compositae)	Widespread, especially in wet meadows and riparian areas. Only exotic *Cirsium* known in area (all others are native and several are local endemics). Sharp spines on all three species deter livestock, and presumably wildlife, from grazing (Sheley& Petroff. 1999).
Poison hemlock Conium maculatum	Apiaceae (Umbelliferae)	Poisonous species currently known just from the Deer Creek drainage, but could spread to other perennial streams. Poison-hemlock usually behaves as a biennial that reproduces solely by seed. Despite its prolific seed production, it doesn't have a well developed mechanism for long distance seed dispersal, it simply drops its seed close to the parent plant (Sheley & Petroff. 1999).
Barnyard grass *Echinochloa crusgalli*	Poaceae (Gramineae)	An important crop pest, this species is mostly restricted to perennial streams, rivers, or springs.
Russian olive Elaeagnus angustifolia	Elaeagnaceae	Abundant along perennial streams and springs. Most fruits remain on trees until distributed by animals, especially birds (DiTomaso & Healy. 2003), but plant tends to crowd out native cottonwoods and willows, depriving cavity-nesting birds of habitat.
Halogeton Halogeton glomeratus	Chenopodiaceae	Becoming established on fine-textured clay soils along Henrieville Creek and Warm Creek. Halogeton is not an extremely competitive plant, but it readily invades disturbed or over-grazed areas where livestock congregate. It is readily grazed at times, and is responsible for thousands of livestock poisonings (Whitson et al. 2002). Livestock consume Halogeton, but the seeds are destroyed in the rumination process.
Rabbit barley Hordeum murinum	Poaceae (Gramineae)	Winter annual found commonly in towns surrounding the area, but becoming established at the old Paria townsite and possibly other sites along the US Hwy 89 corridor. Awns may cause irritation to livestock. Readily disseminated by long-awned florets.
Summer-cypress Kochia scoparia	Chenopodiaceae	Invasive forb found commonly in towns surrounding the area and now confirmed for Fiftymile Bench. While it is considered an objectionable weed, kochia is readily grazed by livestock (Whitson et al. 2002).
Dalmatian toadflax Linaria dalmatica (*L. genistifolia* ssp. *dalmatica*)	Scrophulariaceae	Infrequently documented along US Hwy 89. Cattle will sometimes casually browse flowering shoots. Occasional cases of mild poisoning have been reported for cattle, but the toadflaxes are usually avoided by cattle, and such cases are rare (Sheley & Petroff. 1999).
Horehound Marrubium vulgare	Lamiaceae (Labiatae)	Abundant along roadsides, especially in Grand Staircase region. The calyx of each flower surrounds the fruit and develops a whorl of small hooked spines, forming a characteristic cluster of bur like structures in each leaf axil (Whitson et al. 2002).
Yellow sweet-clover Melilotus officinalis	Fabaceae (Leguminosae)	Widely cultivated along roadsides to prevent soil loss. Can be toxic to livestock, during early growth stage plants are consumed by livestock.
Bur buttercup Ranunculus testiculatus	Ranunculaceae	Quickly becoming one of the most widely distributed annual forbs. Frequently associated with disturbed soils around roads, stock trails, corrals, and waterholes. The burs can become entangled in the hair of livestock allowing seed to be distributed to new areas.

Table 3-23 Non-native Plant Species of Management Concern (cont.)

Species	Family	Comments
Cultivated rye Secale cereale	Poaceae (Gramineae)	Has escaped along Johnson Canyon Road, US Hwy 89, and at old Paria townsite. It is only palatable in the early stages of growth before seeds dry in the spring.
Tumbling mustard Sisymbrium altissimum	Brassicaceae (Cruciferae)	Well established as a weed in towns and spreading along disturbed roadsides on Hwy 89 and Johnson Canyon. The plant often breaks off at soil level when mature and scatters seed as it tumbles in the wind (Whitson et al. 2002).
Black nightshade Solanum nigrum	Solanceae	Primarily a pest of cultivated crops, this species is occasionally found in moist sites. The green (immature) fruit and foliage contain toxic alkaloids (Whitson et al. 2002).
Spiny sow-thistle Sonchus asper	Asteraceae (Compositae)	Found primarily in wetland areas and disturbed roadsides. Fruits are reddish brown, flattened and with 3 to 5 ribs on each face, with a cluster of fine white hairs attached to the upper end promoting wind dispersal (Whitson et al. 2002).
Salt-cedar, Tamarisk Tamarix chinensis (*T. ramosissima, T. pentandra*)	Tamaricaceae	Originally introduced as an ornamental, tamarisk has spread along perennial or ephemeral wetlands, roadsides, and dry washes (especially in saline sites). Large quantities of seed are produced that are wind dispersed.
Small-flowered salt-cedar Tamarix parviflora	Tamaricaceae	Closely related to salt-cedar and may interbreed with it in North America, but apparently far less common. Large quantities of seed are produced that are wind dispersed.
Yellow salsify Tragopogon dubius	Asteraceae (Compositae)	Widespread on roadsides, riparian areas, and sagebrush grasslands. The flower head produces a "puffball" like seed head similar to a dandelion, but larger. The puffballs are composed of numerous umbrella like structures (pappus) attached to seeds (achenes), enabling them to travel great distances with the wind (Whitson et al.2002).
Puncture vine, Goathead Tribulus terrestris	Zygophyllaceae	Becoming more widely established along roadsides. The spiny burs attaches to the hair of animals, the bottom of shoes, and punctures bicycle tires.
Siberian elm Ulmus pumilus	Ulmaceae	Recently documented along switchbacks on UT SR 12 and in Sand Creek on the Boulder Mail Trail. Readily disseminated by wind-borne seeds and capable of colonizing large portions of the canyon country between Escalante and Boulder.
Woolly mullein Verbascum thapsus	Scrophulariaceae	Established along Johnson Canyon Road and infrequent on US Hwy 89. Prolific seed production makes long-term control difficult. Livestock will not eat the plant because of its woolliness.

The analysis of livestock and exotic species interactions in Chapter 4 will focus on introduction and spread mechanisms.

CHAPTER 3
AFFECTED ENVIRONMENT

WILDLIFE

The lands within the planning area provide a complex array of habitats for thousands of separate species ranging from the smallest of insects to large mammals. The BLM has funded numerous extensive multi-year survey projects to inventory and study wildlife species in order to provide a more complete understanding of this area of the Colorado Plateau. Results to date have produced an expansion to the list of previously known species for this area.

There are 82 verified mammalian species within the area, along with 21 species questionably present, 4 introduced species reported, and 6 currently extirpated species (Flinders and Rogers 2002), (Alston and Flinders 2000), (Flinders et al, 1998). There are also approximately 243 bird species, 20 different fish (McAda el al , 1977), (Mueller et al, 1999), (Fridell et al, 2004), more than 1,900 invertebrates (Bosworth and Oliver 1998), (Griswald and Messinger 2003), (Baumann and Nelson 2003), (Vinson 2002), and 29 species of reptiles and amphibians (Oliver 2003), (Graham 2003), including 1 salamander, 4 frogs and toads, 13 lizards, and 11 snakes. The list of invertebrate species will increase as collection and classification work continues.

Each species, or suite of species, within the planning area requires a specific set of habitat conditions in order to meet their particular needs for survival and reproduction. Different plant community seral stages are also important in providing habitat requirements. As seral stages move from one state to another, habitats are occupied by different wildlife species. For example, different seral stages of a sagebrush/grassland plant community provide habitat for the nesting and foraging requirements of a number of neotropical and upland birds. Some may require a more open sagebrush canopy with a greater percentage of grasses and forbs in the understory, while others would need a higher percentage of shrub canopy closure for nesting and protection from predators. For these and other reasons, it is usually important to provide for a mosaic pattern of various seral stages of healthy plant communities composed of native species across the landscape in order to accommodate the needs of all wildlife. This mosaic pattern is normally provided by natural disturbance regimes, such as fire, insect infestations, drought, and fluctuations in climatic patterns. Please refer to the Vegetation section of this chapter for a more detailed discussion of the vegetation types in the area.

Some animals use the planning area as migratory habitat, others are year round residents, while still others use the area seasonally. The Monument also contains small areas of specialized habitat that only a few species are adapted to use, for example some aquatic invertebrates and reptiles, such as the Glen Canyon chuckwalla. A complete list of wildlife species found within the planning area is located in Appendix 9.

BIRDS

The bird species of Utah have been identified for protection in several different ways. Bird species can be federally listed, as Endangered or Threatened (and birds on that list will be addressed in the separate section on “Threatened and Endangered Wildlife Species”). They can be state listed on the State of Utah Sensitive Species and Partners in Flight Priority Species list (Parrish et al, 2002). Birds which migrate outside of the continental United States are protected by the Migratory Bird Treaty Act. Utah BLM maintains its own list of species of concern, with

most classified as "BLM Sensitive Species. In addition to its nationwide list, the U.S. Fish and Wildlife Service has published regional lists of "Birds of Conservation Concern", with the planning area is falling within the Southern Rockies-Colorado Plateau conservation region.

Those lists (Appendix 9) contain sixty bird species which either are afforded special protections, or are of conservation concern. Not all of those species are present, or have suitable habitat within the planning area. The following twenty five species (listed by associated habitat type) have the potential to occur within the planning area, and may be impacted by changes in livestock management or vegetation management activities:

Aspen dependent species

Williamson's Sapsucker

State Species of Special Concern

This sapsucker is rare in the planning area with only three birds noted on surrounding federal lands in the past 25 years. It nests primarily in ponderosa pine and in aspen components of mixed-conifer forests, and often places nest cavities in aspen trees in stands adjacent to open ponderosa pine or mixed-conifer forest. Nest substrate preferences appear to be live aspen (with some decay) or aspen snags, followed by conifer snags. It requires large diameter trees for nesting. Fire can create snags for nesting.

Pinyon-Juniper dependent species

Black-throated Gray Warbler

This warbler is relatively common in the planning area. Its primary breeding habitat is Pinyon-juniper woodlands with secondary breeding habitat as lowland riparian. Lowland riparian is also used substantially during migration. Preferred breeding habitat includes dry oak slopes, pinyon, junipers, and Pinyon-juniper woods, open mixed woods, and dry coniferous and mixed woods with a brushy understory.

Gray Vireo

This vireo is relatively uncommon in the planning area, and is an obligate of semiarid mature, relatively weed-free Pinyon-juniper, juniper, or oak woodlands that are relatively "open" with a shrubby under story. Woodlands with moderate to steep slopes appear to be a critical factor, while elevation does not appear to be a critical factor as long as the preferred habitat type is present. Proximity to water is not essential.

Pinyon Jay

This jay is common in the area, with a range tied primarily to the distribution of Pinyon-juniper woodlands. They typically nest in Pinyon-juniper woodlands but will also nest in ponderosa pine forests. Large flocks (up to 250 individuals) nest communally in traditional breeding areas.

Virginia's Warbler

This warbler is relatively common in the planning area, and primary breeding habitat consists of oak with secondary breeding habitat of Pinyon-juniper woodlands. It typically requires scrubby hillsides with well developed herbaceous or woody understory. Lower mountain habitats with dense stands of Gambel's Oak and relatively high slope are preferred for

breeding, although mountain mahogany, riparian areas, ponderosa pine forests, and Pinyon-juniper woodlands, all with shrubby understories are also used for breeding.

Ponderosa Pine and Douglas Fir dependent species

Flammulated Owl

This owl is relatively rare, with approximately 20 records in the area over the past 15 years. It prefers old-growth or mature ponderosa pine, apparently due to the presence of large broken-top and lightning-damaged snags and trees for nesting cavities, large cavities excavated by Northern Flickers and other woodpeckers, open structure of trees and understory for foraging, and high prey availability. They will utilize other habitats with similar structure, such as open mixed-conifer and aspen forests. Key habitat features seem to be the presence of large trees and snags, scattered clusters of shrubs or saplings, clearings, and a high abundance of nocturnal arthropod prey. Territories are often on ridges or dry mid-slope areas.

Grace's Warbler

This warbler is extremely rare in the planning area with one record of a bird at low elevation, probably migrating. It frequents high mountain ranges from southern Nevada, southern Utah, and southwestern Colorado south to Nicaragua, with nests in mountain forest (tall ponderosa pine). Indications are that high mature stands of tall pines are preferred for nesting.

Lewis's Woodpecker

State Species of Special Concern

This woodpecker is uncommon in the planning area, with only one bird noted in 2003. Major habitat consists of open park-like Ponderosa Pine forests. Attracted to burned-over Douglas Fir, mixed conifer, Pinyon-juniper, riparian and oak woodlands, but is also found in the fringes of pine and juniper stands, and deciduous forests, especially riparian cottonwoods. Areas with a good understory of grasses and shrubs to support insect prey populations are preferred. Dead trees or stumps are required for nesting. Wintering grounds are over a wide range of habitats, but oak woodlands are preferred. Woodpeckers tend to be habitat specialists.

Northern Goshawk

BLM Sensitive Species

This raptor is a rare and localized resident in the planning area. In the southwest it primarily uses ponderosa pine and mixed conifer forests, although use of other forest types has also been documented, while in the west, it nests in both deciduous trees (e.g., cottonwood and aspen) and conifers.

Desert Shrub/Sagebrush Grassland dependent species

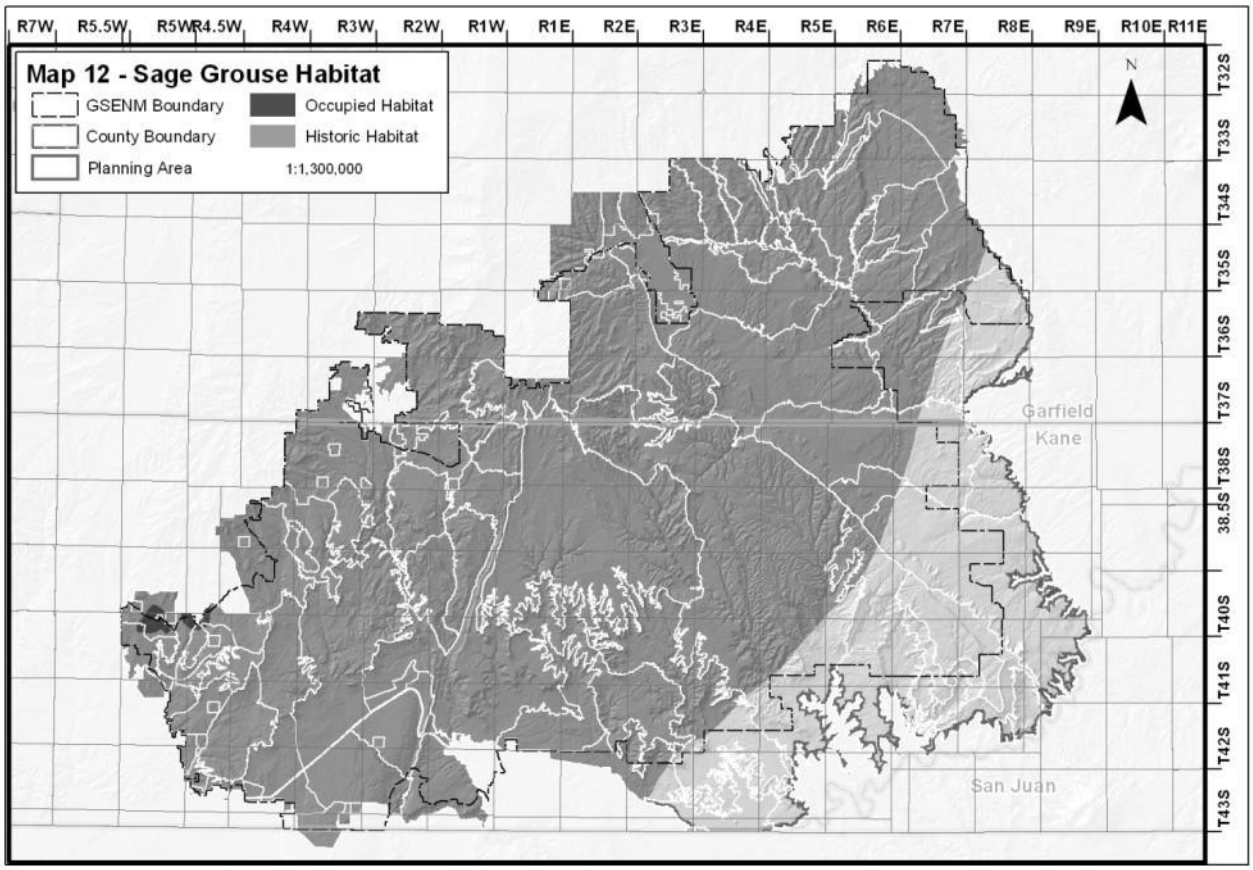
Brewer's Sparrow

This sparrow is a relatively common summer resident in the area, and may be a shrub steppe obligate species. However, it may also be found in high desert scrub (greasewood) habitats, particularly where these habitats are adjacent to shrub steppe, and can also breed in large sagebrush openings in Pinyon-juniper habitat or coniferous forests. Breeding habitats are

usually dominated by big sagebrush. Nesting and foraging areas are usually in patches, or individual shrubs that are taller than the surrounding vegetation. These areas also tend to have a greater percentage of live shrub growth, less bare or rock-covered ground, and greater canopy coverage than surrounding patches.

Sage Grouse
BLM Sensitive Species

Sage grouse occurs only in the sagebrush and sagebrush steppe ecosystems and sagebrush habitats are essential for its survival. Important habitat (Map 12) includes: strutting grounds, water sources (springs, seeps, creeks, and livestock water developments), wet meadows, forb-dominated meadows, and south and west-facing ridges and slopes where grouse are known to winter. Sage Grouse build their nest on the ground in the concealment of sagebrush or other plants. Diet consists of flowers and buds of various forbs, grasses, and almost exclusively on the evergreen leaves of sagebrush in the winter.



Sage grouse are year-round residents in the planning area. Particular areas are used only during certain seasons of the year. There remains one active breeding site near the boundary of the planning area. There are at least two historic inactive leks (breeding areas) within the

planning area on private lands. These breeding areas have been subjected to other agricultural uses (cultivation and intensive livestock grazing use) which have displaced sage grouse. Public lands within the planning area still support sage grouse during brood rearing and winter use.

Sage Sparrow

This sparrow is a relatively uncommon permanent resident in the planning area. It is considered a shrub steppe obligate species. Breeding Sage Sparrows prefer semi-open habitats with evenly spaced shrubs 1-2 m high. Vertical structure, habitat patchiness, and vegetation density may be more important in habitat selection than specific shrub species, however; Sage Sparrows are closely associated with big sagebrush throughout most of their distribution. They are often missing from what appears to be suitable habitat, so other unknown habitat characteristics may be important.

Grassland and Meadow/Sagebrush Grassland dependent species

Black Rosy-Finch (winter only)

Considered a rare winter migrant, with no known records of sightings, this species is a high elevation bird, breeding beyond timberline in barren, rocky, or grassy areas. The breeding habitat is secure.

Burrowing Owl

State Species of Special Concern

This owl is an uncommon summer resident with roughly 30 sightings in past 25 years. It is predominantly associated with prairie dog towns and ground squirrel populations which provide burrows and reduced adjacent vegetation, but it can also found along washes, near water tanks, or corrals on rangelands. Nesting burrows created by other species.

Ferruginous Hawk

State Threatened Species

This hawk is an uncommon permanent resident with about 15 sightings during the past 25 years, mostly on West Clark Bench. It breeds in flat and rolling terrain in grassland or shrub steppe, and avoids high elevations, forest and narrow canyons. Because of strong preference for elevated nest sites, cliffs, buttes, and creek banks are usually present. During winter, it uses farmlands, grasslands, and other arid lands where lagomorphs, prairie dogs, and other major prey items are present.

Northern Harrier

Relatively common in planning area, this species has a large home range. It breeds in a wide array of habitats, but typically prefers large tracts (250 acres) of wetlands with dense vegetation.

Short-eared Owl

State Species of Special Concern

This owl may be a rare permanent resident with no records of sighting. It breeds and forages in grasslands, prairies, wetlands, and croplands. Large blocks of suitable habitat (250 ac) seem necessary to support breeding pairs. Nest on the ground, usually on a dry site, often elevated on a small hummock.

Swainson's Hawk
This hawk is an uncommon summer resident in the planning area with 5 sightings in the past 15 years. It prefers open grassland or open fields which have a scattering of taller trees or trees along a riparian corridor for roosting, nesting, and perching. Require shorter grass species or crops for foraging.

Riparian dependent species

Blue Grosbeak
BLM Sensitive Species
This grosbeak is relatively uncommon within the area. It uses contiguous and linear riparian areas from about 0.8 hectares to hundreds of hectares in size with young to old-growth trees if vegetation is dense to moderately dense. Foraging habitat includes weedy fields and brushy areas after breeding, and before migration.

Broad-tailed Hummingbird
This hummingbird is probably most common as a migrant in the planning area at higher elevation Its primary Utah breeding habitat is lowland riparian with secondary breeding habitat as mountain riparian. It requires stream side areas adjacent to open patches of meadows or grasses with good quantities of wild flowers available throughout the breeding season.

Common Yellowthroat
State Species of Special Concern
This bird is an uncommon riparian breeder in area, with birds detected on point counts and captured in mist nests. Its preferred habitats include marshes, riparian areas, brushy pastures, and old fields.

Lucy's Warbler
This warbler is an uncommon riparian breeder, with birds detected on point counts and captured in mist nests. It needs mesquite, cottonwood, or willow trees for nesting cavities, and substrates for verdin nests, which are subsequently used by Lucy's warblers.

Peregrine Falcon
State Endangered Species
This falcon is rare and localized in the area, with several nesting pairs being monitored. It breeds on cliffs and rock outcrops from 1370m to more than 2740m (4,500-9,000 ft) in elevation. Most commonly choose cliffs that lie within Pinyon-juniper and ponderosa pine zones, but this choice probably depends on the nature and location of the cliffs rather than an attraction to these habitats. They select a ledge that has a wide view and plentiful prey in the area. Most eyries (nest sites) are within a mile of water. It hunts in adjacent open meadows, forested tree top areas, around lakes and rivers, and shrub steppe. Early records suggest that they once nested in somewhat more accessible spots, but now they tend to choose cliffs higher than 60 m (200 ft) in undisturbed areas.

Prairie Falcon

This falcon is a common permanent resident in the area with approximately 45 records in the past 45 years with several nest sites located. It breeds on cliffs and rock outcrops, and hunts in adjacent open areas such as grasslands and shrub steppe.

Bald Eagle
The bald eagle (*Haliaeetus leucocephalus*) is found locally as a winter resident, roosting in large trees and hunting in the adjacent areas. The bald eagle was removed from the list of threatened and endangered species on June 28, 2007.

Yellow-billed Cuckoo
State Threatened Species
There are no records of Yellow-billed Cuckoo for the area, and it is extremely rare in Utah. Nesting habitat is classified as dense lowland riparian characterized by a dense sub-canopy or shrub layer (regenerating canopy trees, willow or other riparian shrubs) with 100 meters (333 ft) of water. Overstory in these habitats may be either large, gallery-forming trees or developing trees. Nesting habitats are found at low to mid-elevations (2500-6000 ft) in Utah. Cuckoos may require large tracts of contiguous riparian nesting habitat. Riparian habitat loss is the primary reason for decline of this species. Riparian habitat corridors are important for dispersal and migration even where not suitable for nesting. Yellow-billed cuckoos are listed as threatened on the Utah State Sensitive Species List and the western population of the cuckoo is classified as a Candidate for Federal listing.

BATS

Despite recent advances in research in the last decade, bats are still one of the less understood wildlife species in the world lacking information on many aspects of natural history. Given the close proximity of different habitat types within the planning area, and the ability of flying bats to move great distances, many bat species probably migrate seasonally among habitat types. Unfortunately, because of the cryptic nature of bats and the lack of technology to track movements, even small scale seasonal movements are poorly understood. Capture records of many studies infer that such movements do occur, but details of habitat use by bat species are limited. Advances in technology in the last decade have increased knowledge on day-roost habitat characteristics, but limited knowledge is known about foraging habitat in any detail.

Bat studies conducted during the summers of 1997, and 2003-2005 showed that 16 of the 19 Utah species were present within the area. Additional bat surveys for known and suspected species are ongoing across the planning area. The following bat species are classified as being State of Utah and BLM Sensitive Species: Allen's lappet-brow (big-eared) bat, big free-tailed bat, fringed myotis, spotted bat, and Townsend's big-eared bat. Only these species will be carried forward for analysis (Table 3-24).

Table 3-24 Bat Species Brought Forward for Analysis

Common Name	*Species*
Multiple Habitat Bats	
California myotis	*Myotis californicus**
Western small-footed myotis	*Myotis ciliolabrum**
Long-eared myotis	*Myotis evotis**
Little brown bat	*Myotis lucifugis*±
Arizona myotis	*Myotis occultus*±
Fringed myotis	*Myotis thysanodes**†
Long-legged myotis	*Myotis volans**
Yuma myotis	*Myotis yumanensis**
Allen's Lappet-brow bat	*Idionycteris phyllotis**†
Pallid bat	*Antrozous pallidus**
Mexican free-tailed bat	*Tadarida brasiliensis**
Tree-roosting Bats	
Western red bat	*Lasiurus blossevillii*†
Hoary bat	*Lasiurus cinereus**
Silver-haired bat	*Lasionycteris noctivagans**
Cliff-roosting Bats	
Western pipistrelle	*Pipistrellus hesperus**
Spotted bat	*Euderma maculatum*†
Pocketed free-tailed	*Nyctinomops femorasaccus*
Big free-tailed bat	*Nyctinomops macrotis**†
Western mastiff bat	*Eumops perotis* ‡
Cave-roosting Bats	
Cave myotis	*Myotis velifer*
Townsend's big-eared bat	*Corynorhinus townsendii**†

* Confirmed on Monument through mist-netting capture.
‡ Confirmed on Monument through acoustic monitoring.
† State Sensitive Species
± One or both may be on the Monument. Determination still pending further research.

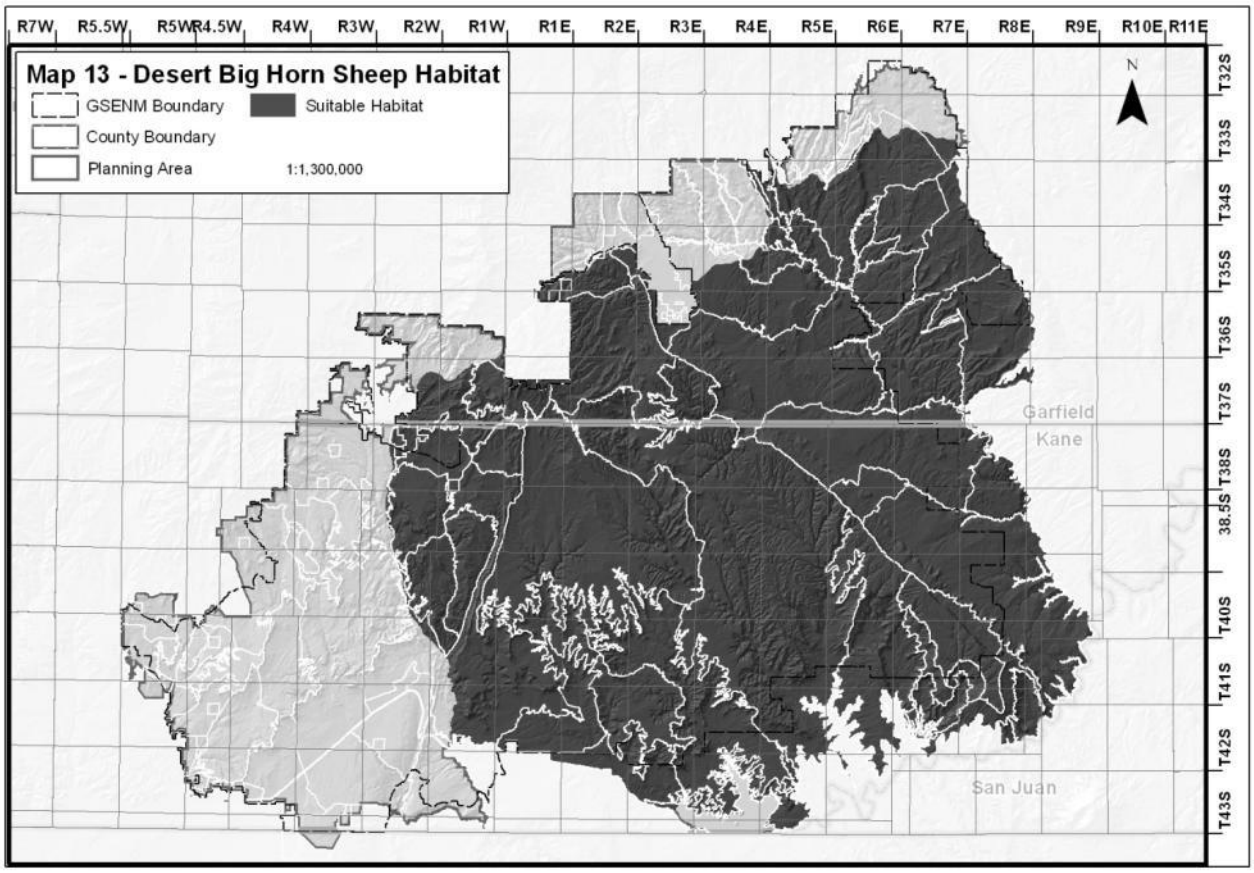
GAME SPECIES

Game animals provide an important recreation and economic benefit through hunting and wildlife viewing. Game populations in the area include the Paunsaugunt mule deer herd and desert bighorn sheep. Elk and pronghorn antelope currently have smaller, but increasing population numbers. None of these animals have achieved their population goals as described within the Utah Division of Wildlife Resources (DWR) Species Management Plans. Sagebrush, desert shrub, and grasslands provide habitat for these animals. The sagebrush habitat type was determined to have the highest percentage of non-functioning (10-13%) or functioning at risk (34-47%) sites for soil, hydrologic, and biotic integrity indicators within the planning area.

Desert Bighorn Sheep

Since 1980, bighorn sheep (*Ovis Canadensis nelsoni*) have been reintroduced by the UDWR and BLM. In 1999, 21 desert bighorn sheep were trapped and removed from Arizona and then transported and released into vacant but historically occupied habitat on the southern end of the Kaiparowits Plateau. In 2000, 20 more sheep were trapped and released. Twenty additional

sheep were trapped and released in 2006. Many of these sheep were fitted with radio transmitters in order to study their movements and reproductive success (Alston 2000). Typical habitats occupied are xeric desert grasslands in mountain and canyon associations. Rocks and cliffs are important habitat attributes (Map 13). Diet consists mainly of grasses with some shrubs and forbs mixed in.

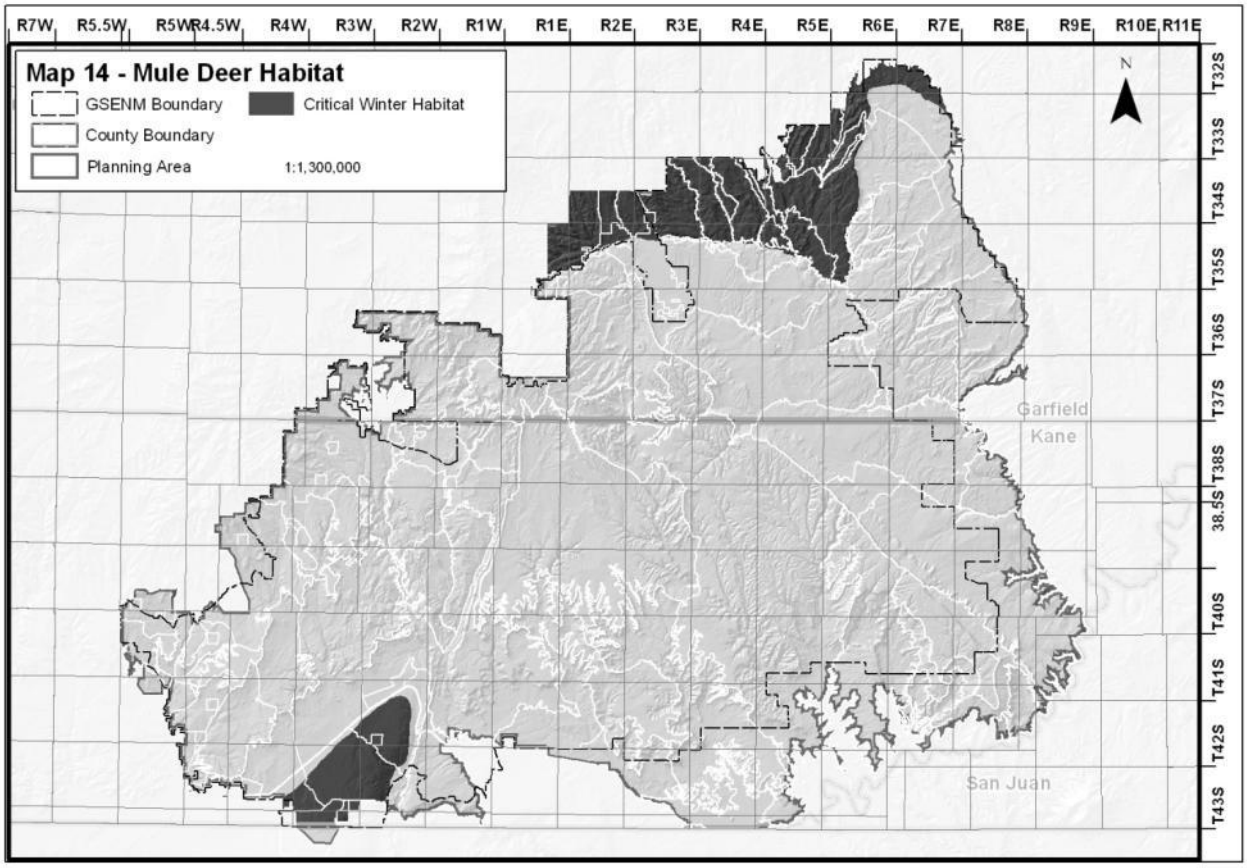


Mule Deer

The Buckskin Mountains provide critical wintering habitat (Map 14)for the Paunsaugunt mule deer herd. DWR includes these deer in Wildlife Game Management Unit 27. Other areas serve as important spring and fall migration corridors for this herd between their wintering on the Buckskin Mountains and summer grounds on the Paunsaugunt Plateau north of the Grand Staircase. This migration route is generally defined by the area between Kanab Creek and the Paria River. The grazing allotments affected by the migration corridor within the planning area include Coyote, Deer Spring Point, Flood Canyon, Ford Well, Johnson Lakes, Locke Ridge, Mill Creek, Second Point, Sink Holes, Timber Mountain, and White Sage. The allotments that the majority of these deer winter on include Five Mile, Mollies Nipple, and Vermilion. Additionally,

a portion of the Kaibab deer herd uses the extreme southern portion of the Buckskin Mountains as important wintering habitat. The majority of this herd are year-round residents of Arizona.

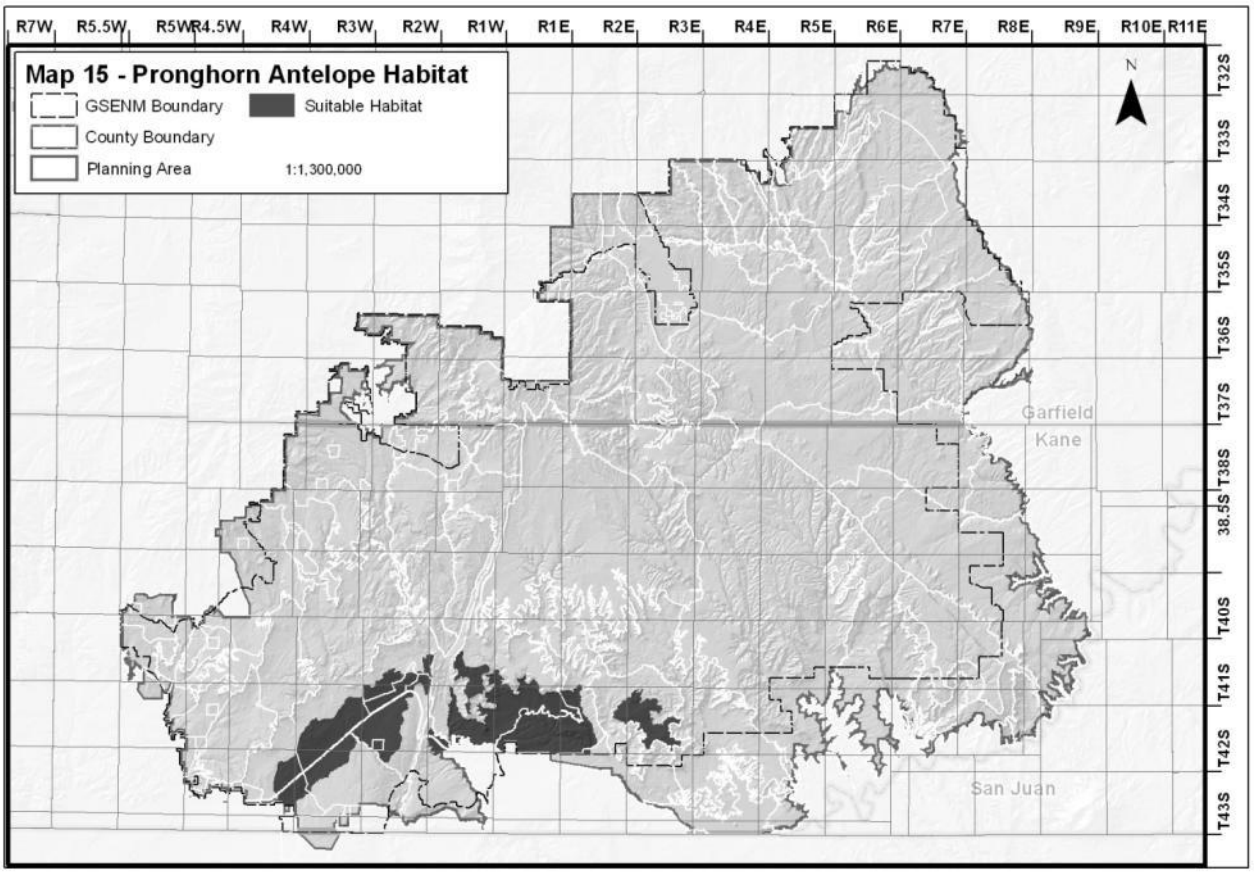
The area north of the Escalante River provides critical wintering habitat. This area encompasses the Upper Valley, Main Canyon, Wide Hollow, Pine Creek, Calf Creek, Boulder Creek, and Steep Creek drainages. This area also serves as a main corridor between the Dixie National Forest to the north, the Escalante River and its tributaries and the Escalante Desert and Canaan Peak.



Pronghorn Antelope

Twenty-two pronghorn antelope (*Antilocapra americana*) were reintroduced into the East Clark Bench area in 1970 (Smith and Beale, 1980). In 1999, approximately 100 pronghorn antelope were trapped on Parker Mountain near Loa, Utah, with 75 animals subsequently released on local public lands in the East Clark Bench area with the remainder released on adjacent State of Utah lands. This effort was repeated in 2000 with 60 more animals released into historic habitat on the south end of the planning area and 83 additional animals released in 2004. There are currently about 200 pronghorn antelope within the planning area. It is the goal of the UDWR and BLM to continue these reintroductions until target populations, per approved State of Utah

species management plans, are reached. Pronghorn antelope prefer open sagebrush grassland habitats. They primarily feed upon shrubs with a heavy reliance on forbs in the spring months.



Upland Game Birds

The two most common upland game birds inhabiting the planning area are chukar and wild turkey. Chukar are found on rocky, grassy, or brushy slopes as well as in canyons and drainages. Turkey are found in a variety of habitats which include woodlands, oak brush, pine groves, canyons, and riparian areas and are present within these cover types over the entire planning area. These birds feed on a variety of seeds, forbs, insects, fruits, nuts, and acorns. Access to water sources is critical. Additionally, turkey need roost trees, such as large ponderosa pine or cottonwood that are adjacent to foraging areas.

FISH AND AQUATIC SPECIES

Fish habitat in the planning area provides for both warm and cold water species. The two river systems are the Paria and Escalante Rivers. The Paria River is characterized as a warm water system, while the Escalante River drainage has both warm water and cold water habitats. Four native fish species have been identified during recent fish inventories: speckled dace (state

sensitive), flannelmouth sucker (state sensitive, covered by Conservation Agreement), bluehead sucker (state sensitive, covered by Conservation Agreement), and roundtail chub (state sensitive, covered by Conservation Agreement) (Fridell, et al. 2003, 2004). Speckled dace is the most abundant native species. Six non-native species have been identified including, brown trout, fathead minnow, channel catfish, common carp, red shiner, and green sunfish. Colorado River Cutthroat trout (state sensitive) is present within the Escalante River drainage, but prefers cooler waters, found above the planning area, and has not be identified within BLM managed lands. Stable riparian conditions in good or better ecological condition are necessary to maintain quality fish habitat. Non-insects, such as crustaceans and mollusks, in combination with the aquatic invertebrates, provide critical food sources for fish. Well vegetated banks and riparian zones with a multi-layered canopy of woody and non-woody riparian vegetation provide for the production of food such as aquatic invertebrates, proper maintenance of water temperatures, dissipation of energy from storm runoff events, and substrates for fish reproduction.

Surveys of the Escalante River's fishery have been completed. In 1974, Holden studied the distribution and abundance of the fishes in 48 miles of the Escalante River within Glen Canyon National Recreation Area (Holden and Irvine1975). Of the species collected, the most abundant and widely distributed was an introduced species, the red shiner (*Cyprinella lutrensis*). Four of the ten species collected were natives and were fairly common where they occurred: bluehead sucker (*Catostomus discobolus*), flannelmouth sucker (*Catostomus latipinnis*), roundtail chub (*Gila robusta robusta*), and speckled dace (*Rhinicthys osculus*). The two suckers and the chub are listed as Utah State Sensitive species.

In 1977, McAda et al primarily surveyed the tributaries (a majority located near the confluence of the main stem) of the upper Escalante River above Glen Canyon NRA (McAda et. al. 1977). The main river contained a high percentage of native species, mostly suckers and dace, with introduced species present in minor numbers, while the tributaries had speckled dace, bluehead sucker, and flannelmouth sucker.

In 1998, Mueller et al repeated Holden's 1974 study along 12 miles of the lower river. Mueller found, similar to Holden, that the upper six-mile section still contained a predominantly native species community while the lower six-mile section (near Lake Powell) was predominantly introduced species (Mueller et al 1999). Further fishery studies are ongoing.

THREATENED AND ENDANGERED WILDLIFE SPECIES

The consultation process with Fish and Wildlife Service (FWS) under section 7 of the Endangered Species Act was initiated by letter on July 26, 2000. A list of threatened and endangered species to be analyzed was provided by the FWS on November 26, 2000. The lists of federally listed threatened, endangered, and candidate species for Kane and Garfield counties were consulted. Only those species that have been detected in the project area as a result of survey work, or lie within historic ranges of these species were included. Some species were extensively surveyed for with no individuals detected, e.g., fish species. These species were not added to those in the consultation letter. A subsequent consultation letter was sent on April 22, 2003. A response was received on April 22, 2003**.** FWS has identified four endangered and

threatened animal species and one candidate species, with potential to occur within the planning area. Those species are:

1 The California Condor (*Gymnogyps californicus*), listed as endangered on March 11, 1967.
2 The Mexican Spotted Owl (*Strix occidentalis lucida,*), listed as threatened on March 16, 1993.
3 The Southwestern Willow Flycatcher (*Empidonax traillii extimus*), listed as endangered on February 27, 1995.
4 The Yellow-billed cuckoo (*Coccyzus americanus*), candidate for listing, July 25, 2001 (FWS finding in Federal Register).

In addition to the above listed species, the federally endangered Colorado pikeminnow (*Ptychocheilus lucius*) and razorback sucker (*Xyrauchen texanu*) are native to the adjacent Colorado River system, but not identified in the planning area. The Escalante River and its tributaries are not considered by the Fish and Wildlife Service as habitat for these fish (Yvette Converse, FWS per. Comm., September 2002.). Surveys have been conducted on the Escalante River, a tributary to the Colorado River, and no federally listed fish were recorded.

Peregrine Falcons nest and breed in the area, but as a result of their nationwide recovery, are no longer listed as Threatened or Endangered. Utah Prairie Dogs are of concern on Bryce Canyon National Park, and the Dixie National Forest, but suitable prairie dog habitat has not been identified in the planning area and no individuals have been documented in the planning area.

California Condor

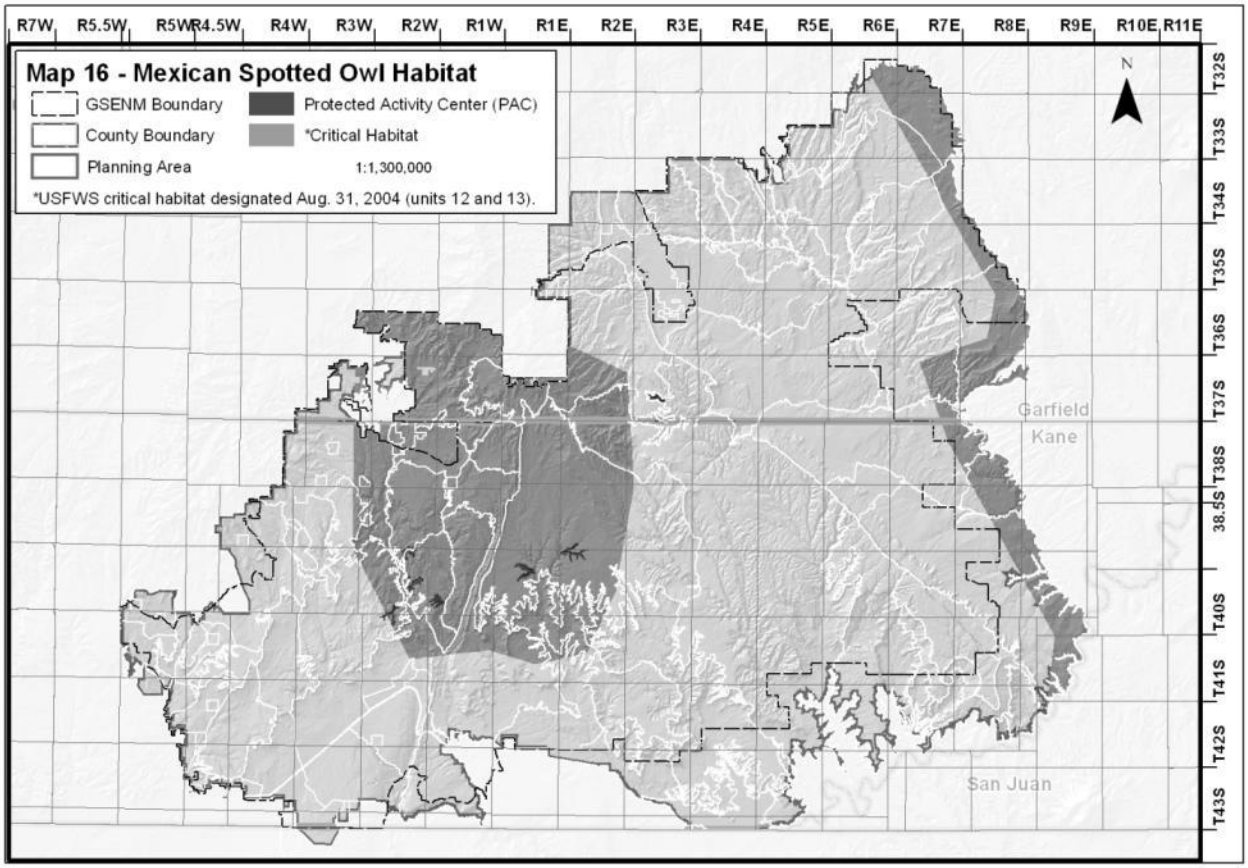
The California condor (*Gymnogyps californicus*) was listed as endangered on March 11, 1967. On October 16, 1996, a population destined for release in northern Arizona was listed as an experimental, non-essential population under Section 10(j) of the Endangered Species Act (61 FR, 54043-54060). Six birds were released on December 12, 1996, from the Vermilion Cliffs in Arizona, just north of the Grand Canyon and south of the planning area. Condor releases continue from that location. The total northern Arizona releases exceed 60 birds. These Condors have been sighted locally, but none have nested within the planning area.

California condors are opportunistic scavengers, with the recovery plan citing an "estimated that 95 percent of their diet consisted of cattle, domestic sheep, ground squirrels, mule deer, and horses." The same report noted that half of all feeding observations were on livestock carcasses, but that California condors showed a strong preference for mule deer.

Mexican Spotted Owl

The Mexican spotted owl (*Strix occidentalis lucida*) was listed as a threatened species on March 16, 1993 (58 FR, 14248-14271). The primary reasons cited were historic alteration of habitat by silvicultural management for even-aged timber stands, and the threat of this practice continuing. Additional habitat was vulnerable to loss by catastrophic wildfire (U.S. Fish and Wildlife Service 1995).

Critical Habitat was designated on August 31, 2004 (69 FR, 53181-53298). Unit CP-12, Kaiparowits Plateau, overlaps the planning area, and covers 434,480 acres within the planning area (Map 16). Three levels of habitat are designated; protected areas, restricted areas and "other forest and woodland types." Protected areas include Protected Activity Centers (PACs), and all areas in mixed-conifer and pine-oak types with slopes greater than 40 percent, and no recent silvicultural activity. Along with the currently designated PACs, portions of the Oak woodland and Ponderosa pine/Douglas fir communities (see Vegetation discussion) within the planning area may qualify as protected, "Protected areas can also include steep-walled canyon habitat." The latter two types of protected habitat (woodlands and steep canyons) require the presence of nesting and roosting sites. Within the planning area the known nesting/roosting sites are already protected by PACs.



A recovery plan was adopted in December 1995, but it focused on habitat of non-canyon dwelling birds. On the Colorado Plateau, Mexican spotted owls tend to select narrow, steep walled canyons as preferred nesting and roosting sites. They often nest within the canyon walls in small clefts, cracks, and depressions and make use of the canyons and adjacent uplands as foraging habitat. The Recovery Plan is in the process of being revised to address the particular

habitat needs of owls that inhabit canyons. The local BLM has several years of survey data. Survey work for Mexican spotted owl within suitable or potentially suitable habitat is on-going (Willey, D.W., 2001). Several pairs of Mexican spotted owls have been identified as permanent residents. The existing recovery plan establishes PACs around known spotted owl nest territories. There currently are seven PACs in the planning area, all within the northern and western portions of the Kaiparowits Plateau.

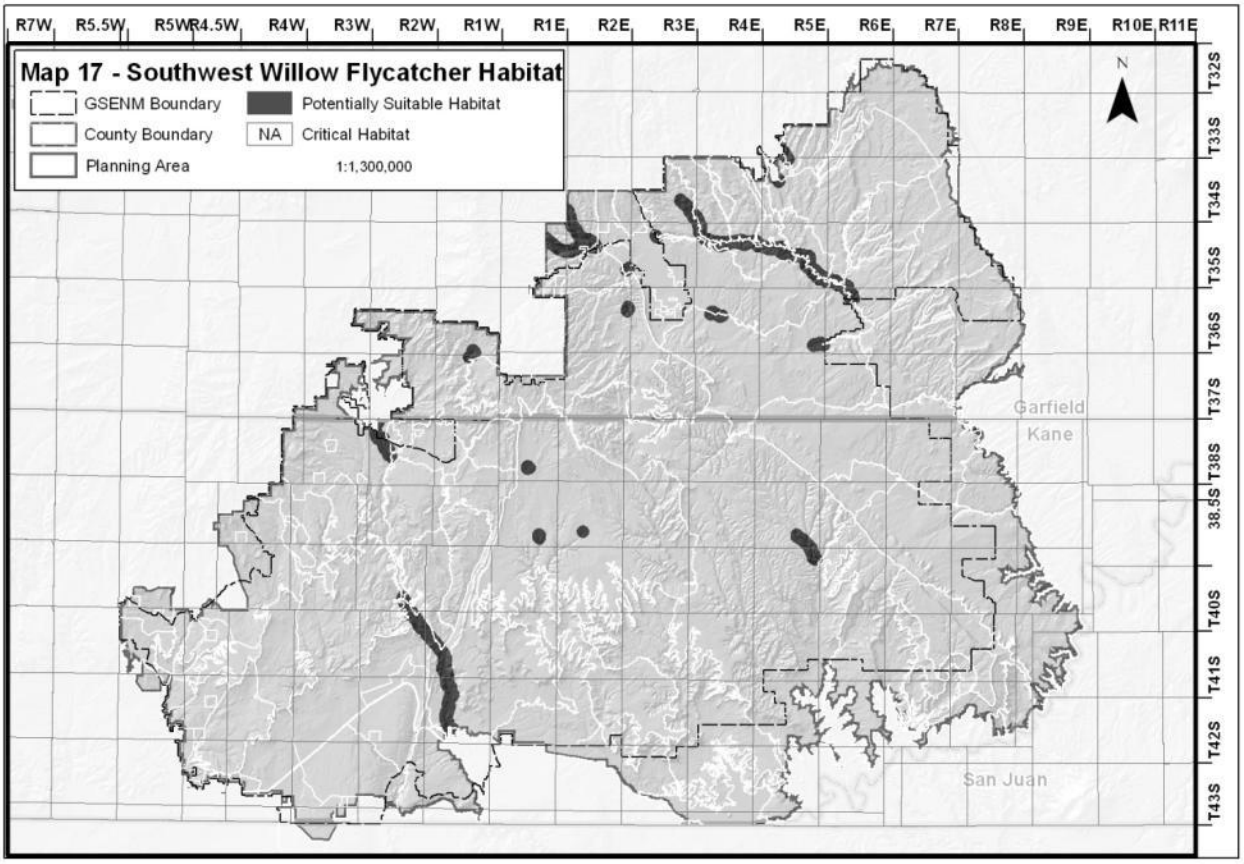
Southwestern Willow Flycatcher

The Southwestern willow flycatcher (*Empidonax traillii extimus*) was listed as endangered on February 27, 1995 (60 FR, 10695-10715). Approximately 900 to 1100 pairs exist across its range. A Final Recovery Plan for this species was approved on August 30, 2002 (USFWS 2002). Critical habitat was designated on July 22, 1997, but that designation was overturned by the 10th Circuit Court. A revised designation was proposed on October 12, 2004, but has not been issued in final form. The new proposed designation does not include any lands within the planning area. The proposed critical habitat in Utah is within the Virgin River and Muddy River drainages, to the west of, and lower in elevation than, the planning area.

Suitable and potentially suitable habitat has been designated within the planning area (Map 17), and is addressed by the Recovery Plan. The planning area includes portions of the Powell Management Unit of the Upper Colorado Recovery Unit, and Virgin Management Unit of the Lower Colorado Recover Unit. Ironically, the four populations of southwestern willow flycatcher identified (by the Recovery Plan) within the planning area are found outside of the recovery units.

The southwestern willow flycatcher breeds in dense riparian habitats in southwestern North America, and winters in southern Mexico, Central America, and northern South America. Its breeding range includes extreme southern portions of Utah. Migrants may occur in non-riparian habitats or in riparian habitats not suitable for breeding. This bird breeds in relatively dense riparian tree and shrub communities associated with rivers, swamps, and other wetlands. The Recovery Plan is to increase and improve occupied, suitable, and potential breeding habitat; increase metapopulation stability; minimize threats to wintering and migration habitat; and track recovery progress. Multiple year surveys recently have been completed within suitable or potentially suitable habitat (Utah Division of Wildlife Resources 2001). In 1997, Peterson and O'Neill (1997) found Southwestern willow flycatchers in both the Paria and Escalante riparian river corridors. In addition, a habitat suitability model has been created and ground tested for potentially occupied habitat (Callahan and White 2002). No nesting pairs have been detected through either the surveys or modeling effort.

The Recovery Plan identified specific river reaches for recovery efforts. Locally this consists of the Paria River below the confluence with Cottonwood Wash, which is recognized as having "substantial recovery value" with "currently or potentially suitable habitat" (USFWS 2002).



Yellow-billed Cuckoo

Federal Register of July 25, 2001 (Vol. 66, No. 143) stated the findings of FWS that a petition to list the western continental populations of the Yellow-billed cuckoo was warranted, but precluded by higher priority listing actions. The species was added to the candidate for listing list. Western Yellow-billed cuckoos breed in large blocks of riparian habitats dominated by woodlands comprised of cottonwoods and willows. Dense understory vegetation is an important component in these areas for nest site selection. This bird over-winters in Central and South America. Based upon historical accounts, the Yellow-billed cuckoo was generally uncommon to rare along river bottoms of the arid and semi-arid portions of Utah.

Yellow-billed cuckoo have not been found in surveys within the planning area. Suitable habitat may exist within the planning area. The proper mix of riparian woodland plant species is present, however, the area is at the margins of potential habitat, being both higher in elevation, and cooler in winter than currently occupied habitat in neighboring states. Impacts on yellow-billed cuckoo will be assessed along with other riparian dependent species under "*Migratory/Special Status Bird Species*" in the Environmental Impacts chapter.

Kanab Ambersnail

Populations of the federally endangered Kanab amber snail (*Oxyloma haydeni kanabensis*) are found outside this planning area. Potential habitat within all three physiographic provinces was surveyed throughout the planning area in 1999 with no snails detected (Meretsky 2000) and (Meretsky and North 2002). There are no known records for this snail within the planning area.

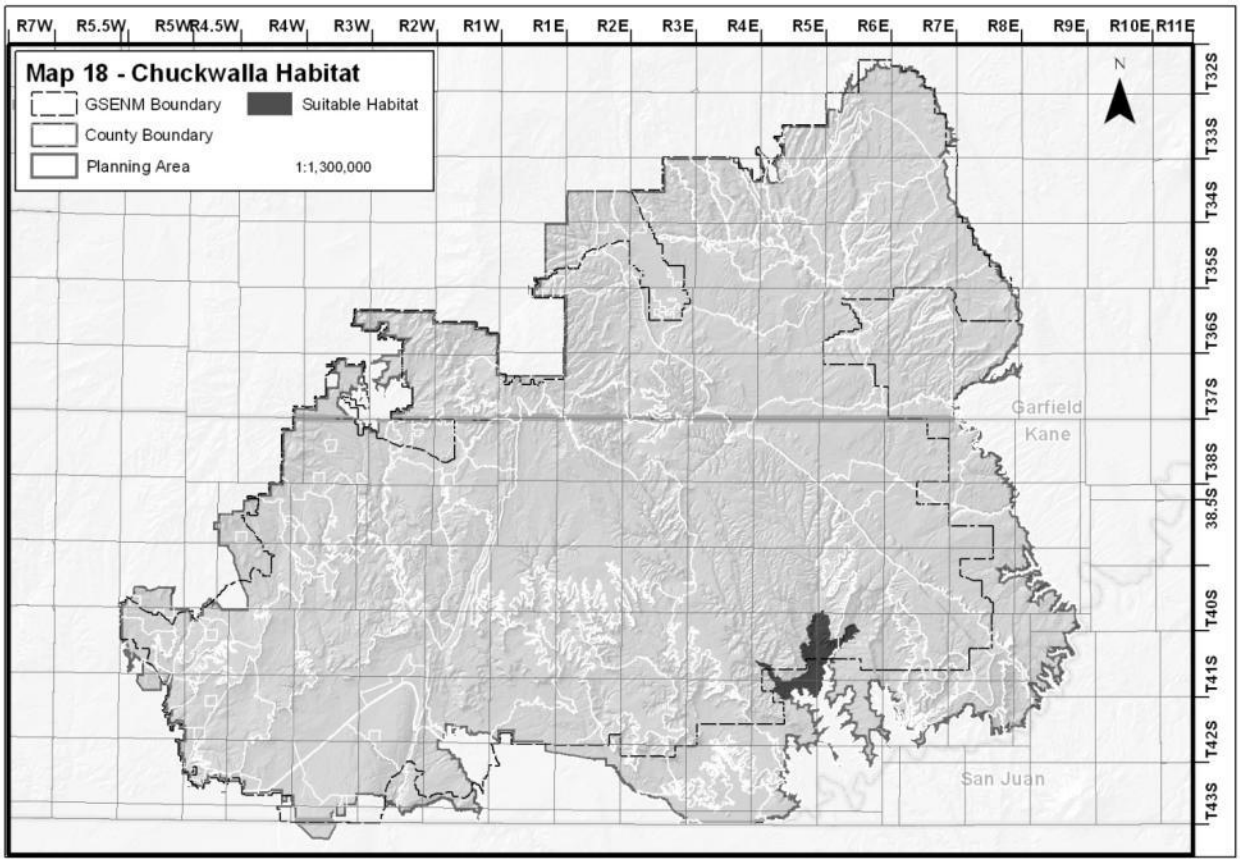
Since surveys have not located Kanab ambersnail within the planning area, and since the U.S. Fish and Wildlife Service has not identified potential habitat within planning area, Kanab ambersnails will not be addressed in the Environmental Impacts chapter.

OTHER SPECIES

Four separate general population, terrestrial and aquatic, invertebrate surveys have recently been completed covering all habitat types to determine species presence, population distribution and livestock grazing impacts on populations. Through this process approximately 2,000 separate invertebrate species were collected and classified to date. Identification and classification of additional invertebrates collected during these surveys are yet to be accomplished. This process is expected to add additional species to the current database.

Surveys for reptiles and amphibians were conducted during 1999-2002, and found 29 species consisting of 1 salamander, 4 frogs and toads, 13 lizards, and 11 snakes. Of these species, the Arizona toad, common chuckwalla (Map 18), and desert night lizard were detected and are included on the state sensitive list for occurrence within the project area. All of the amphibians and most of the reptiles are found in greater abundance in close proximity to water sources. Although the reptiles can be found in all vegetation types, a higher concentration of reptiles were detected in those areas that were water was available. Water quality, especially for breeding, is an important habitat feature for reptiles and amphibians. With the exception of the chuckwalla, the effects to riparian resources between the alternatives would describe the habitat qualities for the state sensitive species. These species benefit the most from high quality riparian conditions. The chuckwalla is the only herbivorous lizard found within the project area. This lizard is dependent upon vegetative conditions that are in good ecologic condition.

Small mammalian trapping surveys of all classes of mammals were completed between 1999 and 2001with 17 small mammal species trapped and identified and another 17 species present based upon sightings, spotlighting, or biologist reports. Pygmy rabbits are classified as a state sensitive species. Surveys have not detected this species in the project area and suitable habitat for them lies outside of this area. Consequently, they will not be discussed further.


Map 18 - Chuckwalla Habitat
GSENM Boundary
Suitable Habitat
County Boundary
Planning Area
1:1,300,000
N
R7W
R5.5W
R5W
R4.5W
R4W
R3W
R2W
R1W
R1E
R2E
R3E
R4E
R5E
R6E
R7E
R8E
R9E
R10E
R11E
T32S
T33S
T34S
T35S
T36S
T37S
T38S
38.5S
T40S
T41S
T42S
T43S
Garfield
Kane
San Juan

CHAPTER 3
AFFECTED ENVIRONMENT

CULTURAL RESOURCES

Cultural resources are the physical indications left behind by prehistoric peoples as well as those left by historic explorers, pioneers, settlers, and inhabitants of the planning area into the first half of the 20th century. Also included are Traditional Cultural Properties, or sites that hold importance to the history and current practices of one or more cultural groups. Cultural resources are protected under several Federal laws and regulations, including the National Historic Preservation Act, the Archaeological Resources Protection Act, the Native American Graves Protection and Repatriation Act, and the Code of Federal Regulations at 36 CFR 800.

CULTURE HISTORY

Local culture history is most conveniently divided into six major periods: the Paleo-Indian, Archaic, Early Agricultural, Formative, Post-Formative, and Euro-American. The following is a brief description of the life ways and cultures that define these periods.

Paleo-Indian

The Paleo-Indian Period is generally considered to represent the first human inhabitants of the project area. Temporally, this period runs from about 11,500 years before present (B.P.) to approximately 9,000 B.P. As a life way, available information suggests that people concentrated on big-game hunting (such as mammoth, bison, camel, and horse) and probably lived in small, family oriented, highly mobile groups. Artifacts most commonly associated with the Paleoindians are the Clovis, Folsom, and Plano diagnostic projectile points. Paleo-Indian sites are rare and none are known from the project area. Fluted Clovis and Folsom-like points are occasionally found on the southern Colorado Plateau and Arizona Strip, but these are most often found as isolated artifacts and in surface contexts.

Archaic

The Archaic Period on the southern Colorado Plateau extended from the close of the Paleoindian Period, about 9,000 B.P., to about 2,000 B.P. and is generally associated with climatic warming and drying. The Archaic Period is usually viewed as a widespread, generalized hunting and gathering life style practiced by small, mobile groups. Most researchers have divided the Archaic into three distinct intervals; the early, middle, and late Archaic, with each defined by diagnostic projectile points.

Archaic sites are well represented within the area. Diagnostic projectile points from the early and middle intervals are relatively scarce, but they are occasionally found. Late Archaic types, such as Gypsum points, are relatively common, indicating that all microenvironments within this area were in use by that time. A buried late Archaic residential site has been tentatively identified in an alluviated canyon bottom in the Grand Staircase physiographic province. Rock art diagnostic of at least the late Archaic, such as the Barrier Canyon and the Glen Canyon Linear styles, is not unusual in the area.

Early Agricultural

This period has also been referred to as the Basketmaker II period, and marks the era characterized by the introduction of agriculture but pre-dating the use of ceramics. In the

planning area this, starts at the close of the Archaic Period and lasts until about 400 A.D. Sites within this time period are difficult to identify because the botanical evidence from this period rarely survives in open sites. Sheltered sites, such as alcoves, have a better chance of preserving perishable materials such as pollen and organic artifacts, but controlled excavation is necessary to recover these materials in a context that will allow reliable analysis. Without such analysis and perishable artifacts, sites from this period are often difficult to discern from earlier Archaic sites. At least one rock art site near Kanab has been attributed to the Basketmaker II period.

It was during the Early Agricultural Period that cultivation of maize and squash was introduced, but even the methods of introduction are in question. In a recent review of the Basketmaker II period north of the Anasazi area, it was concluded that the Fremont adopted agriculture through diffusion, but that it is quite possible that it was introduced to the southern Colorado Plateau through immigration of agriculturalists. Recent studies indicate that in Basketmaker II times, much of the daily diet of area inhabitants consisted of maize. The rise of agriculture and the evolution of a Puebloan life style are key concerns to archaeologists in the southwest, making the Early Agricultural Period perhaps one of the most important and least understood cultural periods.

Formative Period

The Formative Period is characterized by permanent or semi-permanent dwellings, a heavy reliance on agriculture and domesticated crops, and the production of ceramics. Within the planning area two distinct Formative Period cultures are recognized: the Virgin Anasazi and the San Rafael Fremont. The Virgin Anasazi were centered around the Virgin River basin in southwestern Utah, northeastern Arizona, and the adjacent portions of Nevada. Their sites are found primarily across the lower portions of the Grand Staircase physiographic area, with a few sites found as far as the western margins of the Kaiparowits Plateau. The local branch of the San Rafael - Fremont were found surrounding the upper Escalante River drainage in the northeastern portion of the planning area, in the Escalante Canyons physiographic province, and the eastern margin of the Kaiparowits Plateau.

The two groups shared several important traits, including architecture, agriculture, and ceramics. There were also marked differences in their adaptations that clearly distinguish the two cultures. The Virgin Anasazi were agriculturalists who practiced residential mobility. Full-time farmers, they apparently moved farmsteads frequently in response to changing conditions possibly including resource (e.g. firewood) availability, condition of arable lands, insect infestations, and short and long term climatic fluctuations. Such a life style resulted in the characteristic accretional pattern to the Virgin architecture, as farmsteads and structures were repeatedly occupied, abandoned, re-occupied, and modified. It has been proposed that the Fremont, by contrast, practiced seasonal mobility, moving into the watered valley bottoms in the summer to farm, and then returning to the uplands in the winter to take advantage of resources such as big game and firewood. On-site storage for excess food supplies is a hallmark of Anasazi sites. Fremont residential sites lack on-site storage, but isolated granaries are common in remote canyon locations. Both the Fremont and Anasazi cultures had disappeared from the area by the early 1200s.

There is indication in the Fiftymile Mountain area of the Kaiparowits Plateau of possibly a third agricultural group, the Kayenta Anasazi. The differences between the sites on Fiftymile Mountain and the Virgin sites to the west and the previous Fremont sites are great enough that some consider these sites as representing a distinct adaptation.

Post-Formative

This period covers the time from the collapse of the agricultural system and the depopulation of the area by the Anasazi and Fremont cultures, to the arrival of the first Euro-Americans in the early 1500s. This period reflects the return to an Archaic-like hunting and gathering lifeway. In the planning area, this runs from the arrival of the Numic speaking (a.k.a. Paiute) hunter-gatherers shortly after the disappearance of the Anasazi and Fremont until about 1500 A.D., when indirect influences from Spanish settlement to the south were probably felt. The inhabitants at this time period are referred to as the Southern Paiute. Archaeological evidence from the Grand Canyon and the Glen Canyon area shows Paiute presence by the late 1200s and early 1300s, but firm evidence of contact between the earlier horticulturalists and the Paiute is so far lacking.

The hallmark of the Paiute lifeway was mobility. Seasonal movements were dictated by the availability of resources and were marked by extreme flexibility. Family groups would aggregate into larger bands in response to late summer pinyon nut harvests, communal rabbit drives and big game hunts, and then split again into smaller extended family units and disperse in the winter to their base camps. Surplus foods were cached and recovered as necessary later. Horticulture was practiced on a very limited basis. Gardens might be planted in the spring and left unattended until harvest time, or tended by older persons while the balance of the band was gone on hunting and foraging expeditions. Architecture was limited to brush shelters, lightly constructed in the summer and heavier and more durable in the winter. Basketry was highly developed, and although some ceramic vessels were constructed, their use remained secondary. Heavy items such as metates might be cached at various locations. Diagnostic Paiute artifacts include Paiute Brownware ceramics, specific styles of basketry, and Desert Side-notched projectile points. Recent studies have shown that most of the obsidian found in and around the area originated in the Great Basin, and may be attributed to Paiute and Archaic use of the landscape.

Euro-American

The first well-documented direct contact between the local Numics and Europeans occurred with the explorations of the Spanish Franciscan friars Francisco Atanasio Dominguez and Silvestre Velez de Escalante in 1776. Other Euro-American explorers, trappers, and settlers followed shortly thereafter, and influences and pressures on the Paiutes and their traditional lifeways increased. The Historic period begins about 1850 A.D. with the arrival of Mormon settlers.

Native American Tribes including the Paiute, Navajo, and Hopi currently make use of the project area lands for traditional spiritual activities, hunting and gathering, and access to Traditional Cultural Properties.

CHAPTER 3
AFFECTED ENVIRONMENT

THE ARCHAEOLOGICAL RECORD

There are more than 4,000 archaeological and historical sites recorded within this planning area, the majority of which are considered eligible to the National Register of Historic Places. This represents only a small fraction of the archaeological and historical sites within this same area. Although extensive, cultural resource surveys have covered only about 3% of the more than two million acres involved in the planning area. Within Glen Canyon National Recreation Area (GCNRA), site densities of up to 108 sites per square mile have been recorded. In some areas within GSENM site densities of up to 70 sites/square mile have been recorded. An estimation of the total number of cultural resource sites found within the planning area would be speculation at this point, but it is safe to assume that there are thousands of sites that have not yet been identified.

SITE TYPES

Impact agents can vary greatly depending on a variety of factors, but are also largely influenced by site type. Following is a list of major site categories and potential impacts to these sites.

Alcoves and Rock Shelters

These locations are generally found in the walls of vertical or near-vertical rock faces in bedrock exposures, but can also be found under large talus boulders. Sites found in such locations can be almost any type of prehistoric site, and also a variety of historic sites. Alcoves and shelters offer the best natural protection from the elements and can, therefore, preserve otherwise perishable artifacts and organic materials for thousands of years. Prehistoric peoples often made use of these locations. The resulting sites can be complex and cover large time spans.

Architectural Sites

Sites of this type can be found both in open settings as well as rock shelters and alcoves. Sites in this category include any site with constructed architectural features such as pit houses, granaries, storage cists, surface dwellings, pueblos, room blocks, and storage structures. These sites can be either masonry, jacal (stick or timber framing with mud plaster walls), or a combination of both.

Historic Sites

Historic sites are those that are at least 50 years old and can include a wide variety of types. Within this project area, the majority of historic sites are related to livestock and ranching activities, but include mining, transportation, exploration, and homesteading themes as well.

Open sites

This category includes sites that are found in open settings, unprotected by alcoves or overhangs, and generally exposed to the elements. This may include sites such as, but not limited to, lithic and ceramic scatters; hearths; roasts; architectural, structural and habitation sites; middens; prehistoric and historic camps; historic trails; roads; can scatters; cabins; and dumps.

Rock Art

This is a not uncommon site type within the project area, with examples spanning from archaic to historic times. Petroglyphs (design elements pecked or incised into the rock surface) and pictographs (design elements painted onto the rock surface) are the two basic forms of rock art. Both are usually found on vertical rock faces (either on cliffs, ledges, or boulders) but are occasionally found on horizontal surfaces as well. Inscriptions left by settlers and pioneers as well as Native American drawings dating from the historic period are considered sites as well.

Traditional Cultural Properties

These are locations associated with beliefs and practices of a surviving culture and people and are important to both the history and current practices of those peoples. Such sites may not be readily apparent to members of other cultures, and may not have associated artifacts or features that can aid identification. Sites of this type can be subject to various forms of impact, but may be especially susceptible to unintentional impacts by those who do not or cannot recognize these locations as Traditional Cultural Properties.

CHAPTER 3
AFFECTED ENVIRONMENT

RECREATION

OVERALL RECREATION SETTING

The planning area offers a range of recreational opportunities and exploration. Located in rural southern Utah, it was one of the last places in the continental United States to be mapped. Even today, the region remains one of the least developed and populated areas within the State. Most of the area lies within the boundaries of Garfield and Kane counties, whose combined populations total < 0.5% of the population of Utah.

The overall topography is a mixture of high desert plateaus, mesas, buttes, terraces, towering cliff faces, and rugged, rocky, desert canyons. Water can be scarce, especially during the hot summer months.

With the exception of U.S. Highway 89, Utah State Route 12, paved portions of the Burr Trail, and a short section of Johnson Canyon, vehicle access is via dirt roads. Many locations within the planning area are reached by lengthy journeys on rough 4-wheel-drive roads.

RECREATION USE ACTIVITIES

Encompassing a combined total of approximately 2.3 million acres of scenic, high-plateau canyon country, the planning area provides a wide range of opportunities for diverse recreational activities. Examples include: front country vehicle touring, backpacking, backcountry vehicle touring, off-highway vehicle (OHV) driving, mountain biking, horseback riding, hunting, fishing, photography, rock-hounding, hiking, orienteering, exploring, snowshoeing, cross-country skiing, motorized boating, vehicle camping, water skiing (Lake Powell), swimming, non-motorized boating, scientific pursuit (archeology, geology, paleontology, astronomy, botany and wildlife study), visiting historic/cultural sites, technical rock climbing, and canyoneering (both non-technical and technical).

RECREATION USE AREAS AND USE LEVELS

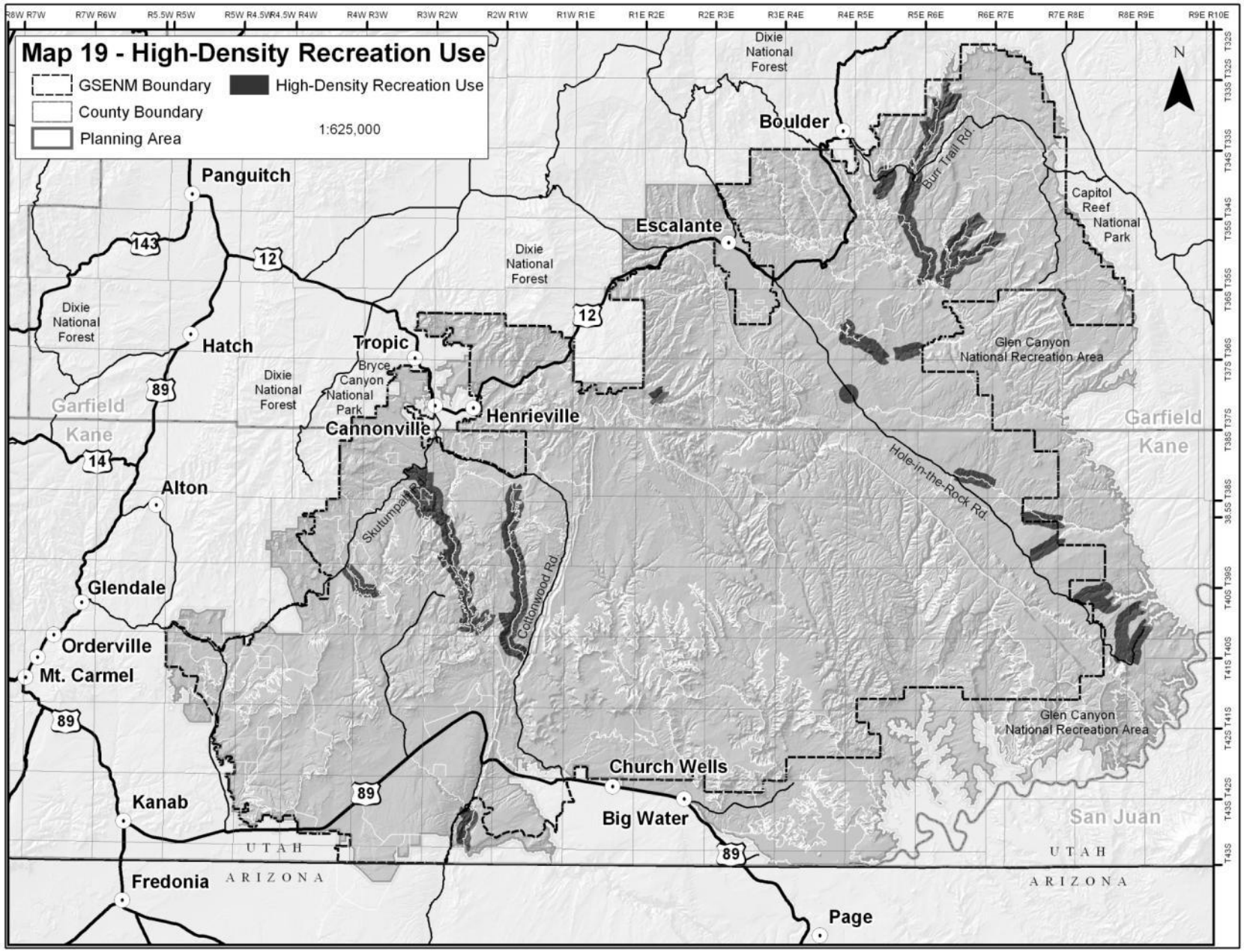
The recreation use activity areas, as well as use levels, generally correspond to three distinct physiographic provinces, known as the Grand Staircase, the Kaiparowits Plateau, and the Canyons of the Escalante. The Canyons of the Escalante receives the highest level of recreational use activity, the Grand Staircase area the second highest, and the Kaiparowits Plateau the least (Map 19).

A key factor that appears to influence all recreational use and use levels is the availability of water in this arid environment. Not surprisingly, the majority of the area's recreational users (particularly backcountry users) tend to seek out and concentrate their activities in areas where water resources can be found. Desert canyons with riparian environments and flowing water are the most popular destinations. Portions of Lake Powell's Warm Creek Bay and Wahweap Bay receive thousands of boaters who recreate in these bays, many of whom camp at large along the shoreline. Isolated upland springs attract recreation activity as well, especially in remote backcountry areas, such as the Fiftymile Mountain portion of the Kaiparowits Plateaus.

Another consideration that influences recreation use (and level of use) is ease of access. Recreation access is primarily by motor vehicle, on horseback, and by foot, although some limited travel also occurs by bicycle and watercraft (Escalante River, Lake Powell). With the exception of US Highway 89 and Utah State Route 12, most of the area's transportation routes consist of rough, rugged, and (oftentimes) un-maintained desert dirt roads. Some of the backcountry routes require many hours of driving across rugged and demanding 4 x 4 roads. Visitors must be well prepared with good maps, vehicles in good condition, and properly equipped for emergencies, including being stranded on muddy or damaged roads (heavy rains, flash floods).

With the exception of one developed front country trail (Calf Creek Recreation Area, Lower Falls trail) there are no developed trails. The majority of backcountry foot and horseback travel is via cross-country routes, both overland, and desert canyons (wet canyon hikes as well as dry washes). Most backcountry users tend to use desert canyons or washes as their main routes of travel. In addition to the increased potential for water, desert canyons provide relatively convenient, delineated routes of travel, especially for less experienced hikers lacking good orientation skills.

A number of upland, cross-country routes are located throughout the area, including historic stock trails and abandoned historic transportation routes. The majority of these routes travel from one canyon (water source) to another. Unlike the desert canyons, these overland routes require a much higher degree of cross-country orientation/navigation knowledge and experience. Typically, as these routes climb up out of the canyon bottoms, they are oftentimes delineated by small sections of constructed trail (piled rocks, chipped "steps", remnants of wood or rock fence along the edge of the route), that are reasonably easy to follow. However, once the trails reach the canyon rim, they often times disappear into a maze of braided trails, with no discernable central path.


Map 19 - High-Density Recreation Use
GSENM Boundary
High-Density Recreation Use
County Boundary
Planning Area
1:625,000
N
Panguitch
Boulder
Escalante
Hatch
Tropic
Bryce Canyon National Park
Henrieville
Cannonville
Alton
Glendale
Orderville
Mt. Carmel
Kanab
Fredonia
Church Wells
Big Water
Page
Dixie National Forest
Capitol Reef National Park
Glen Canyon National Recreation Area
Burr Trail Rd.
Hole-in-the-Rock Rd.
Cottonwood Rd.
Skutumpah
Garfield
Kane
San Juan
UTAH
ARIZONA
143
12
89
14

Canyons of the Escalante

Historically and currently, the majority of recreation use takes place in the well publicized region known as the Canyons of the Escalante. The Canyons of the Escalante can be described as the area that extends east from Fiftymile Bench (from the base of the Straight Cliffs), across a large expanse of Navajo and Wingate sandstone carved deeply by the Escalante River system, ending at the Circle Cliffs and Waterpocket Fold. The Canyons of the Escalante is bounded on the North by the Aquarius Plateau, dominated by 11,000' Boulder Mountain, and on the south by Lake Powell.

The main feature of the area is the canyon system carved by the Escalante River and its tributaries. The Escalante River was the last major river system to be mapped in the continental United States. The headwaters of the river begin high in the mountains, cascading off the southern flank of the Aquarius Plateau; and then winding their way through a maze of interconnected canyons, before emptying into Lake Powell. Although remote in character, the moderately easy access, coupled with an abundance of water, makes the Escalante River system and surrounding slick rock country an ideal hiking, backpacking, and occasional horseback riding destination. Not surprisingly, this region has the greatest concentration of authorized commercial recreational use within the area of concern.

Utah State Route 12, which traverses the Escalante Canyons, is an All American Road—the highest designation within the National Scenic Byway system. The scenic driving opportunities on SR 12 and the Burr Trail (both paved routes) are world-class. Unpaved routes of the physiographic region, including the historic Hole-in-the-Rock Road and the Wolverine Loop Road, are highly scenic as well, and along with associated spur roads, provide access to most of the region's trailheads.

During spring run-off following winters of above-average snowfall, the Escalante River is navigable by small, non-motorized watercraft (primarily kayaks). Other than Lake Powell, it is the only navigable waterway within the area of concern.

The majority of the Escalante River trailheads are located within the boundaries of the Monument. The majority of the river destination points are located in the Glen Canyon NRA.

The Dixie National Forest (and the Box-Death Hollow Wilderness Area) bounds the area to the north. This high mountain environment attracts visitation and offers a full range of recreation activities and a cool respite from the hot sun for tired desert hikers. The Box-Death Hollow Wilderness Area has been publicized in numerous commercial hiking guide publications and attracts a number of recreational users. Recreationists who start trips outside the planning area in upper Death Hollow usually continue into lower Death Hollow, which is within the planning area.

Kaiparowits Plateau

The Kaiparowits Plateau is bounded on the east by the 42-mile long Straight Cliffs (Fiftymile Mountain), and on the west by the jagged double edge of the East Kaibab Monocline—more commonly known as the Cockscomb. With notable exception of its contact with Lake Powell, the Kaiparowits Plateau is the wildest, most arid, and remote part of the area, with a few isolated

springs, and only a handful of creeks. As such, it receives the least overall amount of visitor use. Although the Plateau has sometimes described as a "stony, desiccated maze of canyons," it is also a land of forested level benches and thousand- year old juniper trees.

Recreational and educational interest is high in this region due to the ongoing research and discovery of new and interesting fossils. Educational and recreational opportunities relating to fossil resources in the Kaiparowits region include university and natural history museum surveys and excavations, public tours to excavation sites, and unstructured individual exploration.

The Kaiparowits is largely undeveloped the exception of some of the most remote and demanding 4 x 4 roads, rugged and un-maintained (historic) stock trails, and isolated livestock improvements (troughs, fences, permittee cabins, etc.).

The majority of visitor activity is from sightseers navigating the demanding 78-mile long Smoky Mountain road (#300) between the small towns of Escalante and Big Water (Highway 89). Scenic and remote, this 6-8 hour drive provides an adventure in itself, as the road travels north-south through the isolated middle of the Kaiparowits Plateau. The primary backcountry use activities for the Kaiparowits Plateau are day hiking, backpacking, horseback riding, and hunting (deer, bighorn sheep).

The Kaiparowits Plateau offers outstanding opportunities for primitive recreation. This is particularly true of the plateau portion of Fiftymile Mountain; in general the area extending south from Window Wind Arch to Navajo Point (a popular destination point providing spectacular views of Lake Powell). Access is by foot/horseback from secondary trailheads located along the Fifty Mile Bench. The topography is a mixture of high desert plateaus, open meadows, steep ridges, as well as rugged and steep desert canyons. Water is available at several isolated springs, helping provide for an island of green in the midst of red and yellow canyon lands. Vegetation ranges from moderately dense juniper forests trees to open grassy meadows. Occasional stands of aspen can be found near water sources (Pleasant Grove, Steer Canyon, and Pinto Mare Canyons). Some of the more notable canyons located in the area include: Second Blackburn Canyon, Steer Canyon, Pinto Mare, Lake Draw and Lake Canyon, Georgie Hollow, Harry Cowles Draw, Pool Hollow, Tank Hollow and Tank Hollow Canyon, Elbow Hollow, Spencer Canyon, and Trail Hollow.

Portions of Glen Canyon National Recreation Area lie within the southern portion of the Kaiparowits Plateau, including Lake Powell, which receives several thousand visitors each year (mostly boating enthusiasts, but recreational hikers as well). Several bays (Wahweap, Warm Creek, Padre, Last Chance, Rock Creek), as well as several hundred miles of Lake Powell shoreline provide for easy boat access. Overnight boat campers often take the opportunity to hike some of the numerous canyons and plateaus located along the shoreline.

The Grand Staircase

The Grand Staircase receives the second highest level of recreational use. Bounded in the east by the Cockscomb, and in the west by Utah State Highway 89, the Grand Staircase is comprised of a succession of Chocolate, Vermilion, White, Gray, and Pink cliffs and terraces that rise 3,500 feet (south to north) in elevation. (The north rim of the Grand Canyon serves as the bottom step

of the geological staircase, while the pink cliffs of Bryce Canyon National Park serve as the top riser.) Into this staircase of cliffs and terraces, the Paria River and its tributaries have carved a landscape of isolated mesas, valleys, and buttes. The southern portion of the Grand Staircase region includes portions of the Vermilion Cliffs National Monument, as well as portions of the renowned Paria Canyon-Vermilion Cliffs Wilderness Area. The Paria Canyon-Vermilion Cliffs Wilderness Area is one of the most popular destination points in southern Utah and attracts hikers from around the world. It is known for the unique rock formation called "The Wave", the spectacular 37-mile long Paria River Canyon, and 16-mile long Buckskin Gulch hikes.

In the frontcountry, two popular scenic transportation routes (Skutumpah and Cottonwood Road) as well as portions of US Highway 89 and Utah State Route 12, provide easy access to the interior of the Grand Staircase. These scenic drives feature several short, roadside hikes, as well as points of interest, and attract the majority of visitors. For the more adventurous, a number of backcountry 4 x 4 routes provide challenge and access to the more remote areas of the region along with opportunities for seclusion and overnight camping.

The majority of backcountry users within the Grand Staircase region concentrate their activities in the Paria and Hackberry Canyons where water can be found. Other backcountry use includes a series of little known upland overland routes (historic stock trails). As with the Canyons of the Escalante, most of these historic stock trails travel from one canyon (water source) canyon to another and are still used today by livestock.

General Recreation Use/Livestock Conflicts

Conflicts between recreation use and livestock (including livestock management) primarily occur in primitive backcountry settings, involving visitors seeking a primitive, natural, backcountry experience. Frontcountry recreational visitors have few conflicts with livestock. Most frontcountry visitors do not spend any appreciable time in the presence of livestock or their immediate effects (feces, urine, flies), particularly those engaged in auto touring.

Some visitors appreciate being able to see livestock and/or their management, such as calves playing in a meadow, cattle drives, or wranglers on horseback. There are numerous commercial "Dude Ranches" located throughout the west, including the Kanab and Escalante areas, where for a fee, visitors can spend time on a working ranch, learning to ride horses, and generally assisting with livestock management.

CHAPTER 3
AFFECTED ENVIRONMENT

SOCIO-ECONOMIC

INTRODUCTION

Socioeconomics can typically be discussed in terms of social setting, economic setting, and the relationship between them. Each of the components of socioeconomics is relevant to both the general activity of grazing as well as the specific settings of the Grand Staircase-Escalante National Monument (GSENM), and Kane and Garfield Counties.

GENERAL METHODOLOGY

Social and economic analysis traditionally involves gathering relevant and available data to prepare a report describing the socioeconomic characteristics of a given area. While this is always an important step in understanding a community and its setting, we took an additional step to help us understand and document the conditions in Kane and Garfield Counties by collaborating with the counties' citizens and other interested parties.

With the assistance of the Sonoran Institute[1], economic strategy workshops were held in both Kane and Garfield Counties. Their purpose of the meetings were two-fold: 1) to provide easily accessible, impartial information to aid successful planning, and 2) provide an effective means of bringing community members and land use planners together to achieve better results. Participants in the workshops consisted of local residents, business owners, elected officials, public land managers, government employees, and scientists. These participants were asked to comment on the data presented here, as well as provide supplemental data and observations based on their own perceptions and values. The results of these two workshops have been incorporated into this baseline socioeconomic description, and are used to further describe and interpret the data and trends in the region.

This social and economic assessment relies upon quantitative, qualitative and participatory data. The Sonoran Institute's Economic Profile System (EPS) has played a central role in gathering and analyzing these data. EPS is an automated system for developing customized socioeconomic profiles for any region in the western U.S. based on data from the 2000 Census, the Bureau of Economic Analysis, and the Bureau of Labor Statistics. EPS automatically and efficiently accesses these data sets to produce socioeconomic profiles containing tables and figures that illustrate long-term trends in population, employment, and personal income by industry, average earnings, business development, commuting patterns, and agriculture, as well as retirement and other non-labor income. Appendix A shows the results of the EPS analysis for both Kane and Garfield Counties. Appendix B provides summaries of the Kane and Garfield County community meetings.

[1] The Sonoran Institute's mission is to "work with communities to conserve and restore important natural landscapes in Western North America, including the wildlife and cultural values of these lands. The Institute's efforts create lasting benefits, including healthy landscapes and vibrant livable communities that embrace conservation as an integral element of their economies and quality of life" (Sonoran Institute 2005).

CHAPTER 3
AFFECTED ENVIRONMENT

HISTORY, CULTURE, AND CHANGE

The history and culture of the communities, surrounding the Grand Staircase-Escalante National Monument are as unique as the regions landforms. Here, the cultural identity of both communities and citizens are tightly linked to the past. This historical background is provided to better understand the events and people that settled this remote region, carving an identity shaped by a strong religious foundation and a utilitarian view of the land.

THE 1840S THROUGH THE PRESENT DAY

When the first Euro-Americans arrived in the region of today's GSENM, the Southern Paiute, Utes, and Navajos used portions of the Monument, practicing lifestyles that had evolved over centuries. Although Spanish expeditions in the late 1700s had begun to introduce European culture and beliefs, Native Americans maintained a semi-traditional way of life until Mormon settlers arrived in the mid-1800s. Indeed, the arrival of settlers and widespread livestock grazing removed many of the plants and grasses essential to Native American foraging habits. Resources were depleted and streams were dammed or rerouted, forever altering the landscape and a way of life.

To Mormon settlers, the isolation of Deseret – the vast arid region claimed by Brigham Young, president of the Church of Jesus Christ of Latter Days Saints (LDS or Mormons) – was seen not only as a place to escape persecution, but also as an alternative to mainstream American culture. The region allowed seclusion and protection for the Saints, a refuge from unwanted social change and a sanctuary from non-LDS "Gentiles" in a world with values not in line with Mormon doctrine. Mormon ideology did not separate church from state, and in dozens of newly established communities, Mormon settlers oftentimes placed community welfare above that of the individual.

As settlements prospered, communities in southern Utah exported minerals, cotton, livestock, and dairy products. As Cedar City and St. George grew, settlers began to move eastward in search of more rangelands for grazing and well-watered areas for farming. Within the Monument region specifically, the most important economic activity was sheep and cattle grazing, with some dairy operations.

In 1864, frustrations between Mormon settlers and Native American tribes mounted and led to the Black Hawk War – resulting in the abandonment of Mormon settlements from Kanab through Long Valley. By 1867, however, settlers were able to initiate peace, and many towns were subsequently resettled while new ones established.

In 1869, John Wesley Powell embarked on his legendary exploration of the Colorado River. Based on his work, Powell successfully lobbied Congress to fund a second expedition in 1871. The second expedition expanded its focus to the Colorado Plateau watershed, and began charting this last unmapped and most remote region of the continental United States. Powell's work in mapping and describing the geology, flora and fauna of the region set the scientific standard for the time. Expedition members were the first whites to visit the confluence of the Dirty Devil and Escalante Rivers, and experience the topographic mystery of the Henry Mountains. In 1875, Powell's survey crew was in Potato Valley, where they encountered four Mormons from Panguitch searching for a site to establish a settlement with more favorable climate. Almon

Thompson, Powell's brother-in-law, "[a]dvised the Saints to call the place Escalante," thus the name given to the present day community of Escalante (Anderson and Anderson 1996).

While Mormon culture and traditions remained strong, the growing influx of "Gentiles" became difficult to ignore. Tens of thousands of people headed for California during the Gold Rush, with more arriving once the transcontinental railroad was completed through Utah in 1869. Pressures from new migrants with different and oftentimes competing cultural values grew, but there was little that Mormons could do to stave off the movement of new migrants seeking their fortunes in the West. Throughout these changes, communities in southern Utah remained connected to this concept of the frontier and their significance as a spiritual people. It has been this spirituality that has allowed them to retain the cultural core that many of their ancestors worked so hard to establish.

Still, the communities surrounding today's Monument remained isolated in terms of their worldview, sense of community, and spiritual life. The growth of the region provided economic opportunities that proved irresistible to Mormon and non-Mormon alike, and ranches sprang up in remote locations beyond established towns. New people with new ideas arrived, and the isolation that had for so long protected the Saints was no longer a deterrent to the outside world. The area was now well mapped so that obstacles to progress could be avoided. Improved access and economic integration led more and more ranchers to raise livestock for growing regional markets. Over time, small operators could not compete and succumbed to larger outfits.

By the late 1800s, the effects of unregulated grazing were becoming difficult to ignore on public lands. In response, a number of laws and regulations emerged in the early decades of the 20th Century that regulated uses on public lands. In 1906, grazing fees were imposed on USDA Forest Service lands – a policy that reduced grazing pressures because some ranchers could not afford the fees. As allotments were identified, new fences emerged, limiting what was once communal access to rangelands. At the same time, the newly passed Antiquities Act of 1906 led to the designation of a host of national monuments – many of which would later become national parks.

World War I greatly expanded the market for livestock, and operators from outside the area moved in. At the end of the war, however, the market crashed, only to be followed a decade later by the Great Depression. In 1934, continued degradation of public rangelands lead to the passage of the Taylor Grazing Act, which regulated grazing in an unprecedented way – greatly impacting the main livelihood of people in the region and changing the life of the cowboy forever (Cassidy and Truman 1998). Under the law, a newly created Division of Grazing, operated by local grazing advisory boards, was charged with dividing lands into districts. Smaller operators suffered the most, and with the implementation of the "commensurate property" rule, were all but forced off the range (Muhn and Stuart 1988). Soon afterwards, public lands would be removed from homesteading as well.

By the end of the war, growing cultural and economic integration was having profound effects on rural southwest Utah. In 1946, the Grazing Service was combined with the General Land Office to form the Bureau of Land Management (BLM) – a new organization with a philosophy of decentralization and "multiple use." Although grazing and farming had sustained many

southern Utah communities for decades, other economic activities began to emerge. Mining, logging, tourism, and movie-making each played a role in the decades before and after World War II. Some of these would later surpass grazing as drivers of economic growth.

By the 1950s – a century after the first Mormons had arrived in Utah – the region's physical and cultural fabric had been altered, first by settlement and the railroads, then by overuse and regulation, two world wars, and the rise of television, phones, the automobile, and interstate highway transportation systems. These events unalterably reduced the isolation of once-remote communities.

In the 1960s, Lake Powell was created by the construction of Glen Canyon Dam on the Colorado River – a project that was to have a profound influence on communities near the Monument. The idea for a dam originated in 1916, but came to fruition 50 years later under the Eisenhower Administration. Glen Canyon City (now Big Water) emerged on the Utah side of the dam – a boomtown fueled by new markets for electricity, water, and water-based recreation. Such rapid development strained the infrastructure of Kane County, and sparked an influx of new residents and tourists that continues to this day.

In 1964, the BLM reorganized to better integrate multiple use concerns for wildlife, recreation, and soil and water resources into the Agency's traditional programs of range, forestry, and minerals management (Muhn and Stuart 1988). Large scale land use planning was institutionalized – a development that could threaten existing uses like grazing since other uses would now be given much greater consideration in the planning process.

This review of past settlement and land use helps explain the unique social and cultural landscape of the region that exists today. Indeed, the region's uniqueness has largely stemmed from the importance of land for sanctuary and subsistence. Grazing, as a way of life, was practiced by almost every Mormon pioneer to some degree. Indeed, on most lands it was the only economic use available. And although things have changed over the last 150 years, it is still this vision that has become the "tradition" of the region. This concept of ranching – perhaps especially today – is closely tied to the desire for an enduring connection to the land, and the craving for isolation in a society where solitude is increasingly difficult to find. Also important is the genuine concern for raising a family in a simpler environment, along with a strong sense of ownership of the public lands.

Today, Mormon society remains close knit and dedicated to a vision of religious conviction, family values, and hard work. Within this context, ranching is more than a livelihood – it is a vehicle through which families can pass down a multi-generational lifestyle (and may explain why many ranching families hold multiple jobs in order to remain solvent). The remoteness and isolation of the region fosters this unchanging sense of the past. In fact, it is this very thing that is priceless, and is oftentimes what visitors to the Monument are seeking as well.

When the Monument was designated in 1996, underlying fears about persecutions of the past emerged in surrounding Mormon communities. And as the first Monument to be placed under the jurisdiction of the BLM, no existing template for reference existed. Questions about how the Monument would implement a multiple use mandate were widespread. Even with a planning

team composed of federal, state, and local government employees, fears remained. Battles over RS2477 road issues continue without resolution. Rangeland health, the current issue of concern, is being analyzed through an extensive process in cooperation with Kane and Garfield Counties. Many bridges remain to be built between the past and the present to forge a sustainable future for the region and its residents. This grazing plan amendment is one important step in that process.

TRADITION AND CHANGE IN SOUTHERN UTAH

While the region in and around the Monument once represented an expanse of opportunity to gain wealth from the land through farming, logging, mining, grazing, and other extractive industries, rural communities today are struggling with economic transition and, in many cases, decline.

Across the West, these once vibrant economic sectors are declining in absolute and/or relative terms as many commodity prices fall in the face of increased global production and competition. In some areas, diminished job prospects has had a profound demographic impact on communities, where younger workers have left rural counties for improved employment opportunities and higher wages in rapidly growing urban areas. Oftentimes, residents that remain in these rural counties must engage in multiple employment pursuits in order to enhance or even maintain household income.

Several forces are rapidly altering this socioeconomic fabric of communities and the natural resource based economy of southern Utah: (1) a relative or absolute decline in the economic contribution of many traditional resource uses like agriculture, grazing, forestry, and mining; and (2) a rapidly growing tourism-based service economy spurred by national and international recognition of southern Utah's scenic beauty and cultural and scientific resources.

Many of southern Utah's extractive industries are declining relative to other economic sectors due to a number of factors:

- The region's remoteness and aridity make grazing, agriculture and timber harvesting economically marginal due to high costs and low productivity.
- Limited access to markets threatens to further erode the profitability of these traditional, resource-based economic sectors.
- Globalization, reduced trade barriers, and inexpensive energy exacerbate these challenges by allowing market penetration by suppliers from areas with more productive lands, lower wages, and fewer environmental constraints.
- Large percentages of southern Utah counties are under public ownership and administered by various agencies of the federal government, which have tended to restrict traditional uses on public lands in order to protect environmental quality and foster the development of recreation and tourism.

In contrast to the decline of traditional economic sectors, southern Utah's recreation and tourism industries are fast-growing and hold the potential to expand and diversify the economic base of many rural communities in the region. Tourism's growth stems from a number of factors. These include:

- internationally recognized natural, scientific, and scenic resources;

- cultural resources (e.g., archeological sites from the Fremont and Anasazi cultures, to more recent ghost towns and pioneer settlements);
- a large number of state- and nationally-designated parks and protected areas;
- historically inexpensive and abundant energy;
- accessibility to international tourists via Salt Lake and Las Vegas international airports; and
- accessibility to domestic tourists from Las Vegas, Colorado, the West Coast, Arizona, and Utah's own rapidly growing Wasatch Front.

Travel and tourism, broadly defined, has become one of Utah's largest economic sectors. Indeed, in 2004, over 17.5 million domestic and international travelers visited the state, spending an estimated $5 billion (GOPB 2005). Businesses supporting these visitors accounted for over 100,000 jobs, or roughly 10% of all non-agricultural jobs in the state. Large portions of these visitors are attracted to Utah's national parks and other areas of scenic beauty. National park visits more than doubled between 1984 and1996, although visitation has actually fallen somewhat since then; and despite Utah's international reputation as a premier ski destination, visits to the state's national parks in 2003 exceeded that of skiing by nearly 60% (e.g., 5.4 million national park visitors vs. 3.4 million skier visits).

The shifting balance between resource extraction and tourism-based development is clearly present in Garfield and Kane Counties, the home of Bryce Canyon, Zion, Capital Reef and Canyonlands National Parks; two wilderness areas, four state parks; much of Lake Powell and the Glen Canyon National Recreation Area; and the BLM's 1.9-million-acre Monument. In addition, Utah's Highway 12, a major east-west travel corridor north of the Monument, is nationally recognized as a Scenic Byway and one of 20 All-American Highways.

Southern Utah and surrounding areas have long been popular for their scenic attractions, and conservation efforts date back nearly a century. For example, portions of the Grand Canyon were first protected in 1908, followed by Zion in 1909, and Bryce in 1924. In fact, national park proposals were first considered for the Monument's Escalante River canyons as early as the 1930s, during the Roosevelt Administration. Today, visitors from around the world flock to the region. For example, over 900,000 people visited Bryce Canyon National Park in 2003, making it the second most-visited Utah national park behind Zion. Furthermore, visitation at Canyonlands National Park, while lowest among Utah parks, is growing twice as fast as the state's other four national park destinations (i.e., Bryce, Zion, Arches, and Capitol Reef). While the economic recession and terrorist attacks of 2000 and 2001 have dampened both international and domestic tourism in the area, recent rebounds suggest a return to more robust growth in this increasingly important sector of the Utah economy.

Table 3-25 Visitation to Utah Parks and Scenic Areas, 2004

Protected Area	Size (acres)	Annual Visitation
Arches National Park	73,233	746,414
Bryce National Park	35,840	1,025,763
Canyonlands National Park	337,570	372,963
Capitol Reef National Park	254,251	569,707
Glen Canyon National Recreation Area	1,254,306	2,127,265
Grand Staircase-Escalante National Monument	1,900,000	572,000
Kodachrome Basin State Park	4,000 (est.)	58,616
Zion National Park	146,590	2,729,258
Total	**4,005,790**	**8,205,951**

Source: Governor's Office of Planning and Budget 2005.

In some rural areas, the niche once filled by declining traditional economic sectors has been replaced or even exceeded by a growing service sector, especially in "gateway" communities near scenic protected areas where natural amenities are conducive to recreation and tourism. Indeed, one study found that from 1970 through 1996, the population growth of non-metropolitan counties in the U.S. that rated high on six natural amenity factors grew by an average of 125%, compared to an average growth rate of just 1% among counties that rated low on those same measures. Also important has been the in-migration of retirees to rural areas– including many of these gateway communities–where investment income and transfer payments often combine to create a major new source of economic stimulus.

Facing these dynamics, many rural areas are attempting to seek a middle ground that recognizes the contributions that both traditional and newly emerging economic sectors might offer a region. Indeed, if one views the extractive and amenity-based economies as the extremes of a continuum, then each end of the spectrum clearly has its own advantages and disadvantages.

For example, while tourism-based job growth in gateway communities may provide a host of economic opportunities, these new jobs may be part-time or seasonal, and wages are often low when compared to those of traditional extractive industries. On the other hand, the well-paying jobs traditionally associated with many extractive industries are oftentimes subject to "boom and bust" cycles of their own, which may run counter to community needs for stability. In reality, each end of the spectrum presents challenges and opportunities to the long-run economic growth and stability of rural communities.

REGIONAL IDENTITY WORKSHOPS FACILITATED BY THE SONORAN INSTITUTE

A series of workshops with the Sonoran Institute engaged a cross-section of Kane and Garfield County stakeholders to express their values and identity. Through these meetings, it was apparent that like many areas of the West, the communities surrounding the Monument do not share a single regional identity, but instead exhibit a broad diversity of views. For example, when it comes to public land management resident opinions ranged from favoring policies of strict environmental preservation to those leading to large-scale resource extraction.

One common theme that emerged through the meetings is that locals feel that they should have more say in what happens on public lands, particularly given their predominance in the study area, and the traditional economic and cultural ties that have long existed between these lands and local residents. There is also a general perception that communication between public land managers and local residents could be improved.

Another common theme that arose in the Garfield and Kane County workshops is that tourism needs to be better promoted, and that the Monument should have an active role in the process. Residents of both counties identify visual resources as a primary tourism generator and express their desire to maintain this attraction. However, with this said, commentary also included from both counties the concern that most of the tourism based jobs are low paying and seasonal in nature, and that more needs to be done to promote higher wage positions and year-round employment opportunities.

GARFIELD COUNTY

Demographic Characteristics

Table 3-26 shows the trends in Garfield County's population from 1990 and 2000. The county's overall population grew by 16% between 1990 and 2000, for a total 2000 population of 4,735 persons. Since 1970, the county's population grew slower than the Utah average, but slightly above the national rate.

Table 3-26 Population of Garfield County, By Sex and Age, 1990 and 2000

	1990		2000		% Chg (1990–2000)	% Chg per Year (1990–2000)
	Number	% Total	Number	% Total		
Population	3,980		4,735		19%	1.9%
Male	2,031	51%	2,421	51%	19%	1.9%
Female	1,949	49%	2,314	49%	19%	1.9%
Under 20 years	1,530	38%	1,674	35%	9%	0.9%
65 years and over	556	14%	667	14%	20%	2.0%
Median Age			***33.8***			

Source: Bureau of Census, US Department of Commerce, 2000.

Although the overall population has increased across all age categories, the youth population has declined in percentage terms when compared to the 1990 census. The median age is up 8% to 33.8 years from 1990 to 2000, slightly younger than that national median age of 35.3 years, but older than the Utah median of 27.1. Members of the Baby Boom generation (age 40 to 54 in 2000) had increased 5% during the same period. The retirement age population has held stable during this period, remaining at 14% of the total population -- substantially higher than the state average of 9%. While recreational opportunities, a favorable climate, and ready access to extensive protected areas may be attracting Baby Boomers to the region, at the same time younger residents are leaving to earn college degrees or pursue improved job opportunities.

County residents are 95% white. Approximately 2.9% are Hispanic or Latino (of any race), followed by 1.8% American Indian. Home ownership is relatively high: roughly 80% of non-vacant homes are owner-occupied, while 20% are renter occupied. For comparison, the Utah average is 71.5% owner-occupied. Finally, in testament to the region's tourist economy, nearly 35% of the county's 2,767 housing units are held for seasonal, recreational or other uses.

Economic Characteristics

County-level employment and income data are described below for Garfield County, as well as a more specific discussion of the characteristics of the county's agricultural sector.

Employment

Table 3-27 shows employment change by industry between 1980 and 2000, including full-and part-time jobs. Total employment for the period grew 25%, with a total of 766 new jobs added to the county's job market. Expressed on a jobs-per-worker basis, the employment situation slightly improved: from 1.23 jobs per person in 1980 to 1.29 jobs per person in 2000.

Table 3-27 Employment by Industry in Garfield County, Changes from 1980 to 2000

	1980	% Total	2000	% Total	New Employment	% of New Employment
Total Employment	***2,330***		***3,096***		***766***	
Wage and Salary Employment	1,850	79.0%	2,302	74.0%	452	59.0%
Proprietors' Employment	480	21.0%	794	26.0%	314	41.0%
Farm and Agricultural Services	284	12.0%	374	12.0%	90	12.0%
Farm	279	12.0%	366	12.0%	87	11.0%
Agricultural Services	5	0.2%	8	0.3%	3	0.4%
Mining	339	15.0%	59	2.0%	-281	NA
Manufacturing (incl. forest products)	258	11.0%	162	5.0%	-96	NA
Services and Professional	599	26.0%	1,785	58.0%	1,187	155.0%
Transportation & Public Utilities	95	4.0%	161	5.0%	66	9.0%
Wholesale Trade	5	0.2%	7	0.2%	2	0.0%
Retail Trade	222	10.0%	364	12.0%	142	19.0%
Finance, Insurance, and Real Estate	58	2.0%	113	4.0%	55	7.0%
Services (Health, Legal, Business, Others)	219	9.0%	1,140	37.0%	921	120.0%
Construction	415	18.0%	132	4.0%	-283	NA
Government	435	19.0%	584	19.0%	149	19.0%

Agricultural Services include soil preparation services, crop services, etc. It also includes forestry services, such as reforestation services, and fishing, hunting, and trapping. Manufacturing includes paper, lumber and wood products manufacturing.

Source: Bureau of Census, US Department of Commerce, 2000.

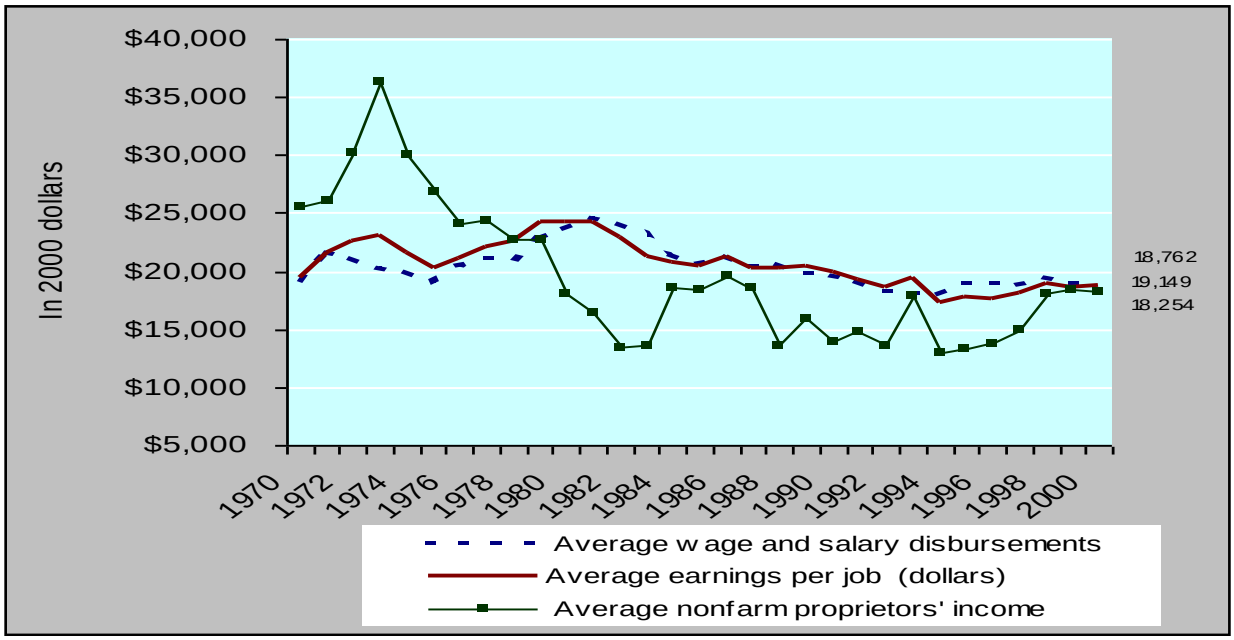
Employment data reveal a shift from Mining, Manufacturing, and Construction jobs, to an increase in the Service and Professional sectors. For example, in 1980, the largest employment sector was the Services and Professional category, comprising 26% of the total jobs. Government jobs were the second largest sector, comprising 19% of the total market, followed closely by Construction (18%). By 2000, 1,187 new jobs in the Services and Professional sector were created, increasing the total percentage for this sector to 58%—an increase of 123%. In 2004, 40% of the county's non-farm jobs were in the leisure and hospitality industry, the highest share of any Utah county (Utah Department of Workforce Services 2005). By contrast, Mining jobs decreased by 281 between 1986 and 2000.

Farming and Agricultural Services positions increased by 32% between 1980 and 2000, with a total of 90 new positions created. Within this area of the economy, the Farming sector created 87 positions, while Agricultural Services created 3 new positions. Farm and Agricultural Services has been consistent in comprising approximately 12% of total county employment during this period.

Income

Average wages per job, in "real" or inflation-adjusted dollars, have fallen from $19,452 per year in 1970, to $18,762 per year in 2000–a drop of 3.5%. This wage rate for the county is far below the state and national averages of $29,203 per year and $36,316 per year, respectively. In 2000, wage and salary comprised 53% of labor income, an increase of 40% from 1990. Other labor income, consisting primarily of payments by privately administered benefit plans, comprised 9% of personal income, an increase of 37% from 1990. Proprietors' income accounted for 8% of total personal income, compared to 12% in 1990. From 1990 to 2000, proprietors' income decreased by 9%.

Table 3-28 Wages and Income in Garfield County, 1970–2000



Source: Bureau of Census, US Department of Commerce, 2000.

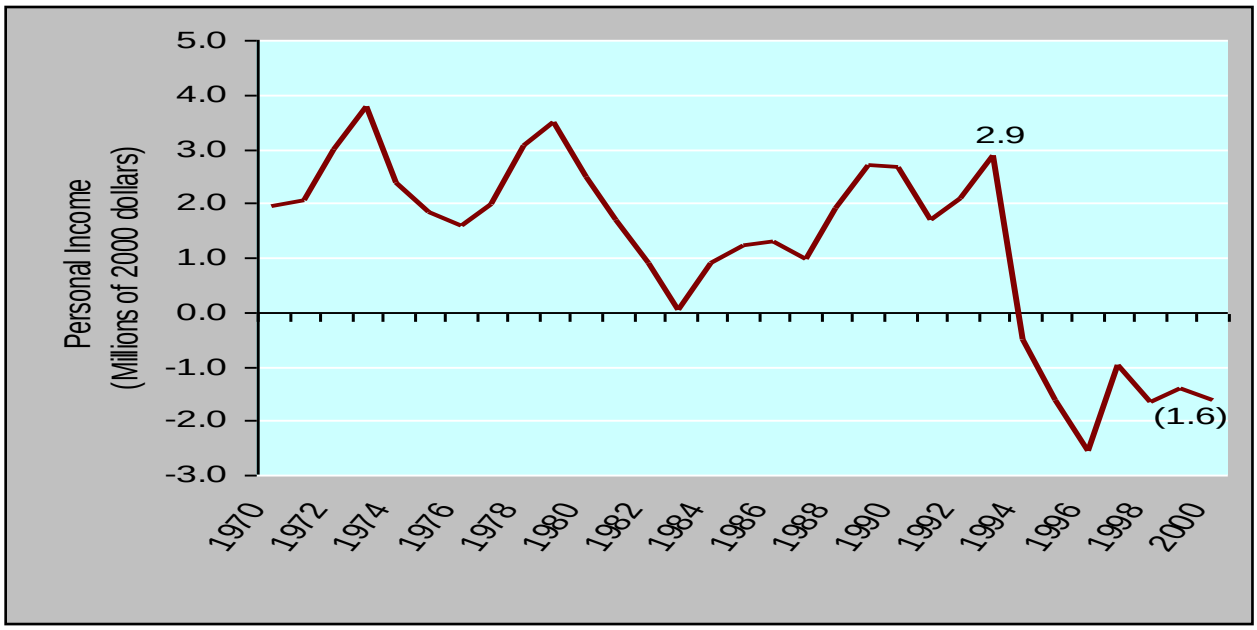
In many parts of the West, non-labor income (i.e., income from dividends, interest, rent, and transfer payments) has become an increasingly important component of rural economies. For example, in Garfield County, non-labor income comprised 37% of total personal income in 2000, second only to the Services and Professional sector at 40%. Moreover, this category of income has increased nearly 60% since 1980. The growth in non-labor income reflects increased in-migration of retirees (along with their lifelong accumulated assets), as well as increased affluence among the already well off through preferential federal and state tax policies enacted over the last two decades. Indeed, the degree of income and wealth concentration in the U.S. today rivals levels not seen since the late 1920s. For rural economies, it is ironic that these non-labor sources of income appear to be independent or even counter-cyclical with labor income, and may provide a degree of economic stability—especially in rural areas heavily dependent on seasonal tourism.

Finally, it is important to note the high degree of seasonality in the Garfield County job market. For example, in 2001 the unemployment rate varied from a low of 4.1% during the summer months, to a high of over 21% during winter months, when many tourist facilities are closed for the season. The overall unemployment in Garfield County is 9.2%, higher than the state and national averages of 4.4% and 4.8%, respectively. Such a high degree of seasonal employment undoubtedly creates hardship for county residents, who must struggle to earn as much as possible during the tourist season in order to survive prolonged periods of unemployment during winter months.

Agriculture

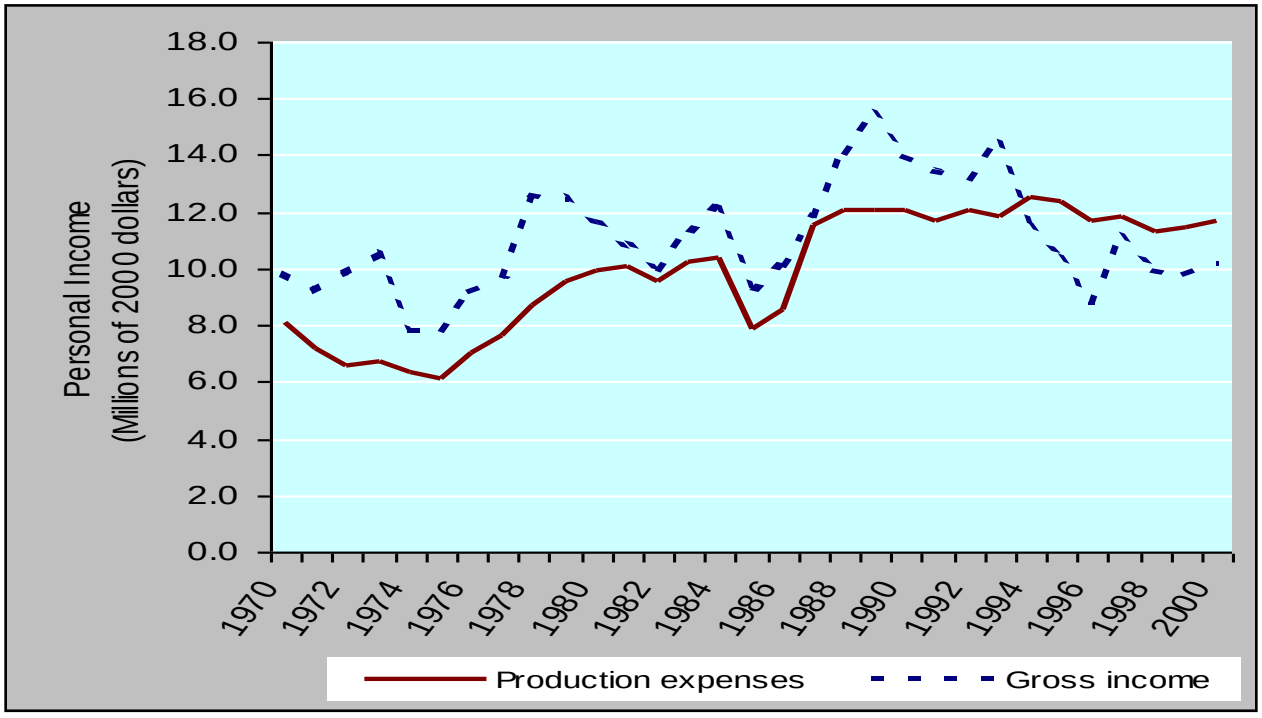
Although the number of agricultural jobs has increased over the last 20 years, the economic contribution of the sector in Garfield County has declined dramatically since 1970. For example, the total net income of farms in Garfield County peaked at approximately $4.0 million in 1974. Net income has fluctuated since, with total net income dropping in 2000 to -$1.6 million (Table 3-29). In 1970, gross farm income exceeded production expenses by $2.0 million (Table 3-30). However, by 2000, gross farm income minus production expenses (net income) equaled $1.5 million. In 1970, 78% of gross farm income was from livestock, while 6% was derived from crops. By 2000, the reliance on livestock had weakened somewhat, with 74% of gross income from livestock, and 12% from crops. Income from government payments has dropped as well, from 4% of gross in 1970 to 1% in 2000.

Table 3-29 Personal Income from Agriculture in Garfield County, 1970–2000



Source: Bureau of Census, US Department of Commerce, 2000.

Table 3-30 Gross Income and Expenditures for Agriculture in Garfield County, 1970–2000



Source: Bureau of Census, US Department of Commerce, 2000.

Table 3-31 Gross Income, Expenses, and Net Income from Farming and Ranching in Garfield County (in Thousands of Year 2000 Dollars)

	1970	% of Gross Income	1985	% of Gross Income	2000	% of Gross Income
Gross Income (Cash + Other)	9,844		9,287		10,120	
Cash Receipts from Marketing	8,246	84%	6,926	75%	8,732	86%
Livestock and Products	7,634	78%	6,080	65%	7,539	74%
Crops	612	6%	847	9%	1,193	12%
Other Income	1,598	16%	2,361	25%	1,388	14%
Government Payments	377	4%	208	2%	57	1%
Imputed Rent and Rent Received	1,220	12%	2,153	23%	1,331	13%
Production Expenses	8,069		7,856		11,652	
Realized Net Income (Income - Expenses)	1,775		1,431		(1,532)	
Value of Inventory Change	111	1%	(206)	-2%	(102)	-1%
Total Net Income (incl. corporate farms)	***1,953***		***1,224***		***(1,634)***	

Source: Bureau of Census, US Department of Commerce, 2000.

Earlier discussion noted the rise of tourism and the service economy in Garfield County. This growth has both positive and negative impacts on the county's agricultural sector. Positive impacts include:

- Opportunities for off-farm employment, including secondary income form outfitting, guiding, hunting, etc.
- Improved access to transportation networks and food processing, distribution, and retailing enterprises.
- Land value appreciation. This last factor in turn provides collateral to borrow against when financing agricultural improvements, and provides long-term capital gains that allow farm families to better finance retirement.

Some negative impacts may include:

- Increased costs of production (e.g., land costs from appreciation and higher rental fees).
- Fragmentation of fields (which makes it harder to manage operations efficiently).
- Higher labor costs (if one competes for labor in the local market).
- Increased nuisances (e.g., complaints from neighbors and greater environmental scrutiny from community members and local officials).

Moreover, some agricultural lands may be taken out of production or used for marginally economic "ranchettes" and "weekend ranchers." In sum, the overall effects of these pressures are likely to be mixed and indeterminate.

CHAPTER 3
AFFECTED ENVIRONMENT

A Profile of the Community of Escalante

Escalante is the second largest community in Garfield County (Panguitch, the county seat, is the largest with 1,623 residents), and its large size and central location near the scenically important Escalante Canyon region of the Monument makes it a good socioeconomic case study for the study area. The community of Escalante was settled by Mormon pioneers in 1875. The town occupies a fertile valley with a relatively long growing season, and is named after Silvestre Velez de Escalante, a Franciscan priest who traveled through the region in 1776 in an unsuccessful search for a route from Santa Fe, New Mexico, to Monterey, California.

Like many Mormon towns, the original part of town was comprised of four home-site blocks surrounded by 10-acre farms. Wide streets and large yards with corrals and outbuildings still remain in many parts of town. Also characteristic are Victorian homes constructed of native brick.

During the Great Depression, several Civilian Conservation Corps (CCC) camps were established in the area and completed various public works, including much-needed roads. Also during this time, noted photographer Dorothea Lange worked in the area under the Farm Security Administration, documenting both social and natural features of the area. During World War II, residents migrated out of the region either to join the armed forces, or to support the war effort in various urban centers. Throughout these changes, the community's traditional natural resource economy based on farming, timber harvesting, grazing, and mining continued.

Even by today's standards, Escalante is an isolated community. In fact, the Monument lands south of town were some of the last areas mapped in the lower 48 states. To travelers along Utah's Highway 12, Escalante is a welcome site, with its gas stations, restaurants, and lodging facilities. This isolation instilled a strong sense of independence and self-reliance that is evident to this day.

The population of Escalante peaked in 1940 with 1,161 residents then declined to a low of 638 inhabitants in 1970. Since then, the population has gradually increased, and today stands at 818 residents.

In 2000, Escalante's average household size was 2.7 persons (US Bureau of Census 2000). Seventy-one percent of Escalante residents were born in Utah, and 56% lived in the same house in 1995. Eighty-five percent of Escalante's adult population over age 24 has completed high school. In addition to this 21% have had some college experience but no degree, 5% have an associate degree, 15% have a bachelor's, and 8% have a master's, doctoral, or professional degree.

Nearly half of Escalante households earned less than $30,000 in 1999 (US Bureau of Census 2000). In fact, the income bracket with the largest number of households was $20,000 to $24,999. Just 2% of households earned more than $100,000 a year in 1999. Over 70% of household income was derived from wages, salary, or self-employed income. This was followed by Social Security income (10.7%) and retirement income (10.3%). Interest, dividend, or net

rental income comprised just 5.2%. Ninety-five percent of Escalante residents worked within the county, 69% of them in town.

Like many communities with active tourism sectors, seasonal jobs compose a large part of the local job market. While 61.5% of residents worked 50–52 weeks per year, 26.7% worked less than 40 weeks. These part-time workers experienced lower median incomes than full-time workers. In fact, in 1999, 11% of Escalante residents had income levels below the official poverty line. The highest poverty rates were experienced by Native American residents (100%) and single parent households.

The town has seen a steady increase in home construction over the last 30 years. For example, from 1940 to 1969, the town added an average of 18.3 new homes per decade. Between 1970 and 2000, the 10-year average has been 54.3 new homes per decade, a nearly three-fold increase. Despite this growth, nearly 15% of Escalante's housing units are vacant and are either for sale or rent. Roughly 10% are vacant and held for seasonal, recreational or other use. Escalante's median home value in 2000 was $100,600. In comparison, median household income was $32,143 in 1999, resulting in a Housing Affordability Index of 125, which suggests that the median family could afford the median home. The average Affordability Index for the county was 157, meaning that housing in Escalante is more expensive than the average home in the county.

Since the Monument was designated 1996, real estate values have appreciated, and there has been a noticeable increase in new residents acquiring and restoring the town's historic brick homes. The community also is home to one of Utah's fastest-growing native plant societies, and newer residents have been instrumental in implementing an ambitious native plants project along the town's one-mile Main Street.

KANE COUNTY

Demographic Characteristics

Kane County's population in 2000 was 6,065. The county experienced a 17% population increase between 1990 and 2000, and has grown by 149% since 1970. In fact, since 1970, the county's population has grown faster than both the state and national averages. While Kane County's under-20 youth population declined in both absolute and percentage composition during the 1990s, it is still relatively high, at 32%. The population of those 65 years and older experienced a 41% increase and, as of 2000, comprised 17% of the County's total population. Like Garfield County, Kane County's population is growing older. The median age of Kane County residents increased from 30.8 to 39.1 between 1990 and 2000. The Baby Boomer age group (age 40 to 57) in 2000 was up 6% (492 residents), while the under-20 age group experienced a 4% decline during the same period. The 65 and older age group grew by 41% (295 individuals). Like Garfield County to the north, Kane County is overwhelmingly white (96%). The Hispanic or Latino (of any race) composition is 2.6%, with American Indians comprising 1.6% of the county's population.

Table 3-32 Population of Kane County, by Sex and Age, 1990 and 2000

	1990		2000		% Chg (1990–2000)	% Chg per Year (1990–2000)
	Number	% Total	Number	% Total		
Population	5,169		6,046		17%	1.7%
Male	2,605	50%	2,997	50%	15%	1.5%
Female	2,564	50%	3,049	50%	19%	1.9%
Under 20 years	2,019	39%	1,936	32%	-4%	-0.4%
65 years and over	715	14%	1,010	17%	41%	4.1%
Median Age			***39.1***			

Source: Bureau of Census, US Department of Commerce, 2000.

Economic Characteristics

Employment

From 1982 to 2000, 2,393 new jobs were created in Kane County (Table 3-33). Wage and Salary employment grew by 175% during this period, increasing from 1,075 positions to 2,966 positions. In 2000, the Services and Professional sector represented the largest sector of employment in Kane County at 55% of the total job market, dropping from 62% in 1982. However, this sector saw an increase of 1,196 jobs, and accounted for 50% of the new jobs created since 1982. The fastest growing categories in this sector are Services (which include health, business, legal, engineering, and management services), representing 24% of total employment, and Retail Trade, representing 20% of total employment. The second largest employment sector in Kane County is Government jobs, with 708 employees. The majority of growth in government employment has been with state and local governments.

Table 3-33 Employment by Industry in Kane County, Changes from 1982 to 2000

	1982	% Total	2000	% Total	New Employment	% of New Employment
Total Employment	***1,599***		***3,992***		***2,393***	
Wage and Salary Employment	1,075	67.0%	2,966	74.0%	1,891	79.0%
Proprietors' Employment	524	33.0%	1,026	26.0%	502	21.0%
Farm and Agricultural Services	164	10.0%	322	8.0%	158	7.0%
Farm	156	10.0%	185	5.0%	29	1.0%
Agricultural Services	8	0.5%	137	3.0%	129	5.0%
Mining	44	3.0%	5	0.1%	-39	NA
Manufacturing (incl. forest products)	75	5.0%	376	9.0%	301	13.0%
Services and Professional	989	62.0%	2,185	55.0%	1,196	50.0%
Transportation & Public Utilities	107	7.0%	99	2.0%	-8	NA
Wholesale Trade	26	1.6%	41	1.0%	15	1.0%
Retail Trade	393	25.0%	804	20.0%	411	17.0%
Finance, Insurance, and Real Estate	55	3.0%	267	7.0%	212	9.0%
Services (Health, Legal, Business, Others)	408	26.0%	974	24.0%	566	24.0%
Construction	66	4.0%	396	10.0%	330	14.0%
Government	261	16.0%	708	18.0%	447	19.0%

Agricultural Services include soil preparation services, crop services, etc. It also includes forestry services, such as reforestation services, and fishing, hunting, and trapping. Manufacturing includes paper, lumber and wood products manufacturing.

Source: Bureau of Census, US Department of Commerce, 2000.

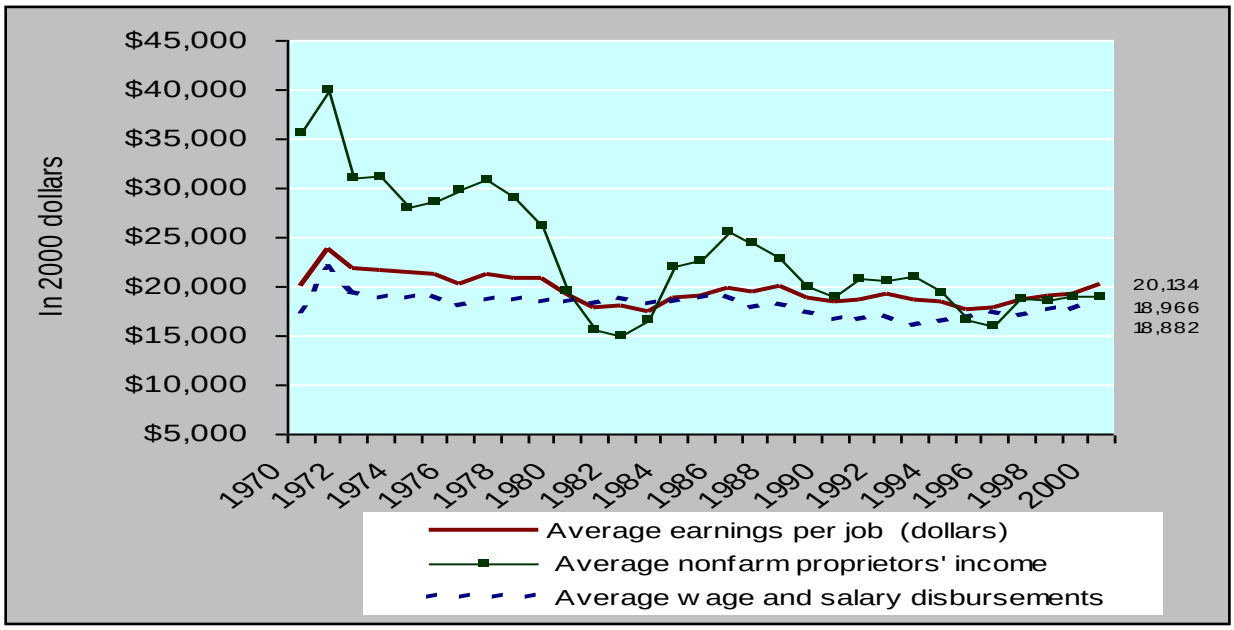
Farm and Agricultural services experienced a 96% increase in new employment from 1982 to 2000, with 158 new positions. Despite this growth, the sector's percentage of overall employment dropped from 10% to 8%, and the 158 new positions represent 7% of the total number of jobs created since 1982. Within this economic grouping, the farm sector increased by 29 positions, while dropping from 10% to 5% of total employment in the county. Agricultural Services grew from 8 positions (or 0.5% of the total job market) in 1982, to 137 positions (or 3% of the job market) in 2000. These positions represented 5% of the new employment opportunities in Kane County for this time period. Of the county's new jobs created since 1982, 1,891 positions (79%) are considered wage and salary employment. Proprietors' employment grew by 96% during the same period, totaling 1,026 new opportunities. Proprietors' employment represented 26% of the total employment in 2000, down 7% from 1982.

Income

Adjusted for inflation, average earnings per job in Kane County increased just $100 between 1970 and 2000, (from $20,034 to $20,134 in constant 2000 dollars) an increase of just 0.5% for the 30-year period (Table 3-34). Non-labor income decreased from 1982 to 2000 by 5%, having

a detrimental impact on the average earnings in Kane County. From 1990 to 2000, consumer services accounted for 16% of new income in the county, while producer services just 5%.

Table 3-34 Wages and Income in Kane County, 1970–2000



Source: Bureau of Census, US Department of Commerce, 2000.

Agriculture

Since 1970, income from farming and ranching has fluctuated, and has struggled since 1980 to regain or surpass its 1970 levels. In 1970, 79% of gross farm income was from livestock, while 2% was from crops. By 2000, 69% of gross income was from livestock, and 6% from crops. Income from government payments has dropped from 2% of gross in 1970 to 1% in 2000. The total net income has decreased, declining 81%, from $1.2 million in the 1970s, to $0.2 million in 2000 (Table 3-35).

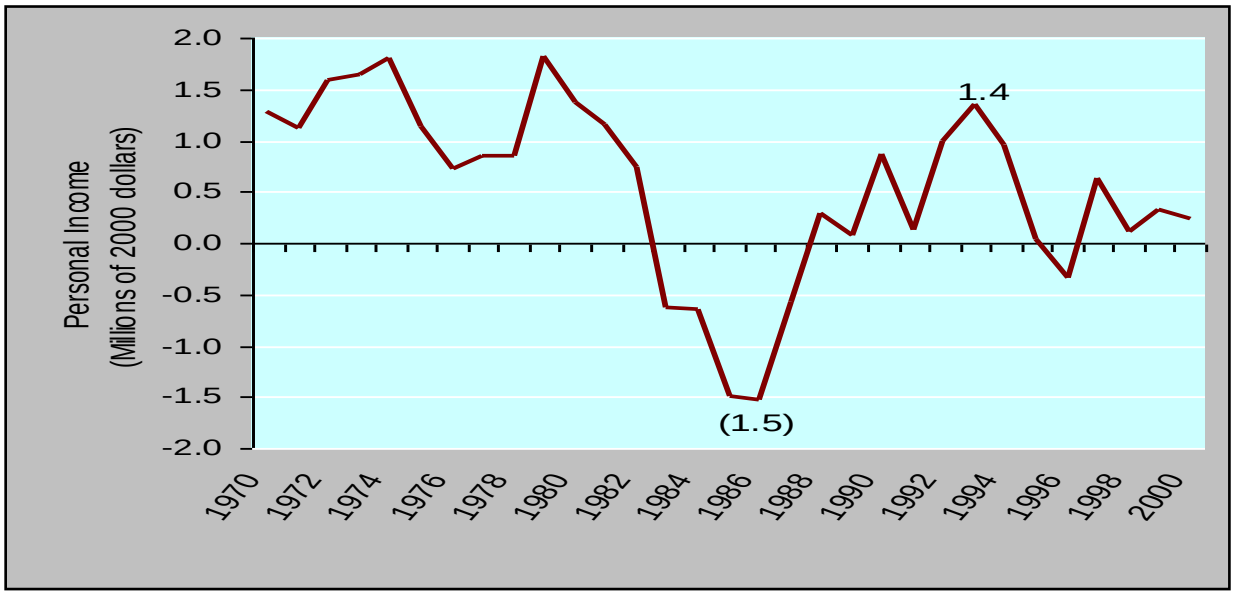
The total net income from farming and ranching in Kane County dropped from $1.7 million in 1974 to -$1.5 million in 1985 (Figure 1), and then rose to $0.2 million in 2000. In 1970, gross farm income exceeded production expenses by $1 million. However, during the mid to late 1980s, production expenses were equal to or greater than gross income. By 2000, gross farm income minus production expenses (net income) equaled $0.3 million (see Figure 2). Gross income exceeded expenses for agriculture by a small margin in 2000 (Figure 2).

Table 3-35 Gross Income, Expenses, and Net Income from Farming and Ranching in Kane County (in Thousands of Year 2000 Dollars)

	1970	% of Gross Income	1985	% of Gross Income	2000	% of Gross Income
Gross Income (Cash + Other)	6,160		3,745		4,853	
Cash Receipts from Marketing	4,953	80%	2,415	64%	3,618	75%
Livestock and Products	4,842	79%	2,072	55%	3,341	69%
Crops	111	2%	342	9%	277	6%
Other Income	1,047	17%	1,333	36%	1,236	25%
Government Payments	111	2%	40	1%	25	1%
Imputed Rent and Rent Received	936	15%	1,293	35%	1,211	25%
Production Expenses	4,922		5,168		4,593	
Realized Net Income (Income - Expenses)	1,238		(1,423)		260	
Value of Inventory Change	111	2%	(82)	-2%	25	1%
Total Net Income (incl. corporate farms)	***1,283***		***(1,504)***		***238***	

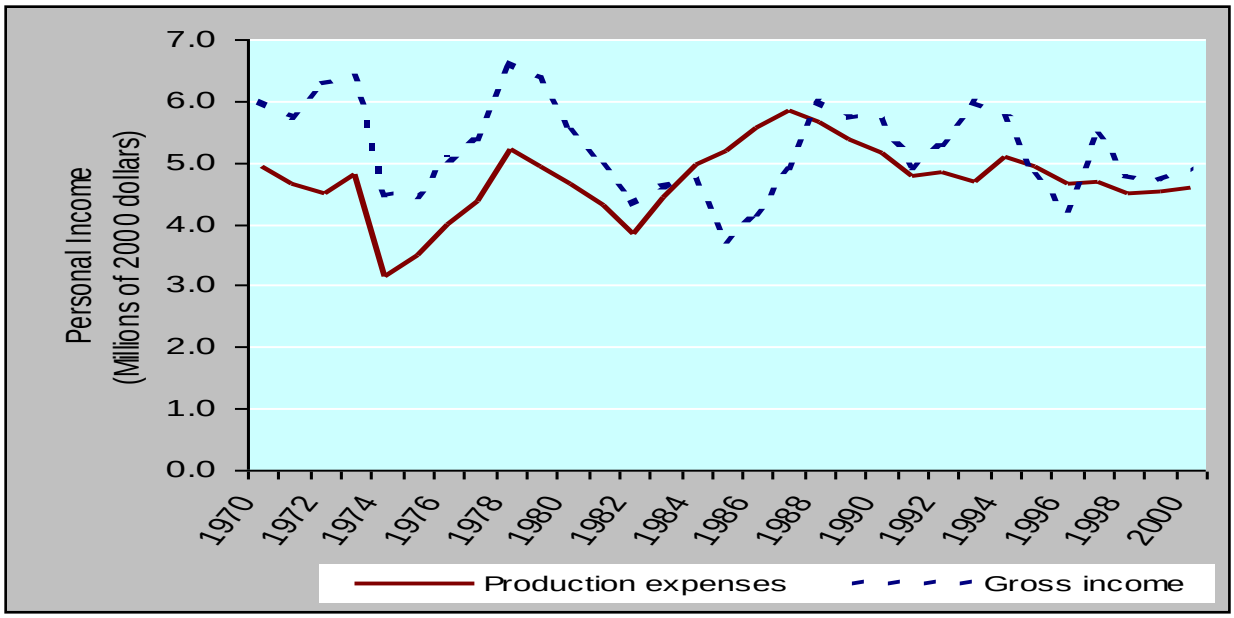
Source: Bureau of Census, US Department of Commerce, 2000.

Table 3-36 Personal Income from Agriculture in Kane County, 1970–2000



Source: Bureau of Census, US Department of Commerce, 2000.

Table 3-37 Gross Income and Expenditures for Agriculture in Kane County, 1970–2000



Source: Bureau of Census, US Department of Commerce, 2000.

A Profile of the Community of Kanab

Kanab, Utah, is located on the southwest border of the Monument, and is home to the Monument headquarters. Kanab is the oldest and most populous city in Kane County. Its proximity to the Monument and the services that it offers makes Kanab an important "Gateway" to the Monument.

The name "Kanab" comes from the Native American word for a willow basket used to carry an infant on a mother's back. The city is known as a sort of oasis in the desert, with its tree-lined streets surrounded by stunning redrock landscapes. Settlement of the region was slow due to its isolated location and troublesome terrain. The first settlers arrived in 1858, beginning a decade of unsuccessful colonization primarily due to conflicts with Native Americans. It wasn't until 1870 that serious colonizing efforts began. The area was considered prime for cattle grazing, but the extension of Mormon dominion into northern Arizona was equally important.

Since its beginning, Kanab has always been a cattle town. However, beginning in the 1920s, hundreds of films were filmed in and around Kanab because of its attractive scenery and favorable climate. The first, Dead Coach in 1922, starred Tom Mix with the Vermilion Cliffs as a backdrop. Since then (and to varying degrees), the movie industry has provided welcome economic relief to the city. The construction of Glen Canyon Dam in 1956 also proved to be a boost to the economy, as well as local population.

Tourists from all over the world come to enjoy the wonders of the surrounding landscape. The town is in very close proximity to the Kaibab National Forest and Grand Canyon, Bryce, and Zion National Parks, as well as the Monument, BLM lands, Lake Powell and other scenic

landscapes. Because of its location, Kanab is also known as "Park Central," and tourism has become a welcome and viable industry in and around the city.

The City of Kanab has been growing slowly since 1870. In 2000, the thriving city had a population of 3,564 people, up from 1,381 in 1970. It is the county seat of Kane County and is home to many businesses, particularly in the tourist service sector (US Bureau of Census 2000).

In 2000, Kanab's average household size was 2.64 persons, slightly higher than the national average of 2.59. Fifty-seven percent of Kanab residents were born in Utah, and 59% have lived in the same house since 1995. Eighty-seven percent of Kanab's adult population over age 24 has completed high school. In addition to this, 32% have had some college experience but no degree, 6% have an associate degree, 15% have a bachelor's, and 8% have a master's, doctoral or professional degree (US Bureau of Census 2000).

The city has seen a steady decrease in home construction since its peak in 1970. During the 1970s, the town experienced a 400% increase in homes built from the previous decade. While the 1970s brought 424 new homes to the city, the 10-year average since has been 154.3 per decade—the 1990s being the lowest, with 115 new homes constructed. Of the 1,492 housing units in Kanab, nearly 90% are occupied, with 20% being used as rental units. Four percent of housing units are vacant for seasonal, recreational, or occasional use. In the surrounding areas of Kane County, many homes have been built in higher-elevation forests as vacation homes. Indeed, the County reports that nearly 75% of property tax notices are sent to addresses located outside of the County (US Bureau of Census 2000).

Seventy-four percent of households in 1999 earned less than $30,000. In fact, the income bracket with the largest number of households was $25,000 to $30,000. Just 3% of households earned more than $100,000 in 1999. Approximately 69% of household income was derived from wages, salaries, or self-employment income. This was followed by Social Security income (11.1%), retirement income (9.8%), and interest, dividends, or net rental income (6.3%). The median household income in 1999 was $35,125. This combined with Kanab's median home value of $106,100, results in a Housing Affordability Index of 136, which suggests that the median family can afford the median house (US Bureau of Census 2000).

Like Escalante, seasonal jobs comprise a large part of the local job market. While 59.1% of residents worked 50–52 weeks per year, 31.2% worked less than 40 weeks. These part-time workers experienced lower median incomes than full-time workers. In 1999, 6% of Kanab residents had incomes below the poverty line. The highest poverty rates were experienced by Native American residents, at 45% (US Bureau of Census 2000).

GRAND STAIRCASE-ESCALANTE NATIONAL MONUMENT

The Monument was established in 1996 by Executive Order, and is part of the BLM's National Landscape Conservation System (NLCS). The NLCS includes 15 national monuments, along with wilderness areas, national conservation areas, wild and scenic rivers, national scenic and historic trails, and wilderness study areas. A resource management plan for the Monument was completed in 1999 (BLM 2004). The plan outlined a management strategy designed to protect the Monument's many historic and scientific resources by: (1) retaining the region's remote and

undeveloped character, and (2) providing opportunities for research. Other emphases within the Plan include fostering economic development in communities around the Monument, and recognizing the importance of the area for recreation and tourism, as well as the role that these activities can play in generating direct and indirect income and employment in the region.

The designation of the Monument has attracted much new development to the area, both publicly and privately funded. For example, a series of new visitors' centers have been constructed in gateway communities surrounding the Monument (e.g., Cannonville, Big Water, Escalante, and Kanab). New restaurants, campgrounds, bed and breakfasts, and motels have also arrived in anticipation of increased tourism, and home and land prices have appreciated noticeably since designation.

As expected, visitation to the area has increased since 1996, although the effect has been somewhat dampened by the economic recession of 2000-2001, and the terrorist attacks of 9/11. For example, between October 2002 and September 2004, 1,241,161 people visited the Monument. This number includes everything from driving through the Monument, to people requesting backcountry recreation permits. The most popular recreational activities were (in this order) driving for pleasure, hiking/walking, viewing, picnicking and camping. The number of backcountry and car camping permits issued have been on the rise since 2001 as well. During FY 2002 (October 1, 2001 through September 30, 2002), 2,128 backcountry permits and 918 car camping permits were issued. Over the next fiscal year, those numbers rose to 2,444 backcountry permits and 1,465 car camping permits.

But tourism is not without its costs. For example, the financial burden borne by local communities for services like solid waste disposal, water development, police and fire protection, and search and rescue efforts may outpace the growth of local revenues. Indeed, local business owners have voiced frustration that expensive motor homes and SUVs pass through town without stopping to make a purchase. This phenomenon may be due to the high number of international visitors that are reluctant to make large purchases that would need to be shipped home. (In fact, one local proprietor noted how U.S. license plates are popular souvenirs because they take up little room in a suitcase.) Another explanation may simply be that visitors typically come to the area to experience the scenery and outdoors, not to shop, but to make a few purchases locally.

A reliance on tourism may pose other risks as well. For example, while tourism can clearly play an important role in economic diversification, areas may become so heavily "tourism-dependent" that they can be as vulnerable to downturns as places dependent on more traditional, resource-based, extractive economies. Indeed, the effects of economic recession and 9/11 on visitation have added another element to the cyclical seasonality often seen in tourist economies. And as noted above, employment opportunities associated with amenity-based growth tend to be in lower wage-service sector industries, often on a part-time or seasonal basis, with lack of opportunity for advancement and few, if any, benefits. Indeed, as described above, Garfield County's wage rate is roughly half the national average.

In some parts of southern Utah, studies of resident perceptions of tourism-based economic activity show a tendency for residents to express skepticism if not outright dissatisfaction with

the social and economic impacts of tourism in their communities. It is suggested that some rural residents balk at working in amenity-based occupations not only due to low wages and limited benefits, but also because they consider these jobs to be inconsistent with the cultural traditions and values associated with more traditional rural occupations such as logging, mining, and agriculture. In many areas, these traditional land uses are increasingly seen as incompatible with a growing tourism economy. This has happened in communities around the Monument, where tension between grazing use and recreation has emerged, especially in riparian areas that are valuable to both user groups.

Local communities faced with the dynamics of a changing economic base can respond in a number of ways. For example, many residents desire a return to the traditional, resource-based economies that have sustained their communities in the past and have an aversion to transitioning to an amenity-based economy. The conservative, rural composition of many small Utah communities often leads to conflict over land use between locals, "newcomers," and public land managers.

A second response is to embrace the emerging amenity economy by engaging in supporting service industries like food and lodging, outfitting and guide services, etc. A third approach seeks to exploit emerging niche markets while still relying on traditional extractive uses by, for example, tailoring activities to be compatible with the region's emerging focus on visual amenities. Indeed, the desire to maintain traditional resource-based economic activities may spur efforts to identify niche markets like environmentally certified agricultural produce, beef, and forest products.

How communities respond to these changes, and the collective successes and failures that follow, will largely determine the long-run economic viability of a region. In the case of southern Utah, the region has strong opportunities for amenity-based economic growth and diversification due to the area's internationally renowned scenic, recreational, scientific, ecological and cultural resources, many of which have been protected as national parks, monuments, and recreation areas. Moreover, the ability of southern Utah's communities to capture the economic gains from recreation and tourism are aided by a spirit of self-reliance, the state's highly urbanized and educated population, and ready access to a host of other population centers due to the region's proximity to two international airports (i.e., Salt Lake City and Las Vegas).