

FINAL REPORT

**LAKE POWELL PRELIMINARY
SOCIOECONOMIC IMPACT ANALYSIS**

Submitted to:

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SUMMARY

This report discusses the existing economic and social conditions within the region surrounding Glen Canyon National Recreation Area (GCNRA). For purposes of this report, the region, or "zone of impact," is determined by proximity to GCNRA. The region includes four counties (Coconino County, Arizona and Kane, Garfield and San Juan Counties, Utah), communities within those counties that are within approximately 50 miles of GCNRA, and the Navajo Nation. In the first part of the analysis, the four counties and the pertinent communities are described in terms of population, demographics, income, unemployment, major industries, primary employers, and tourism. The data show that this region is sparsely populated and highly dependent upon tourist dollars. The region is also enriched by a variety of national and state parks, monuments, and recreation areas that are important in attracting people to move into the area. The next section of this report examines the social and economic impacts that the reservoir has on the Navajo Nation. The main impacts of Lake Powell include increased availability of water, although this water is not currently utilized to a major extent, and the inundation of land and places of religious significance. Following this, studies examining the economic impacts to the region from reservoir and downstream recreation are described. Finally, recommendations are made for future information gathering and analysis to fill gaps in data identified in previous sections of this report. A separate appendix contains unpublished reports and data used in this report.

I. INTRODUCTION

Glen Canyon, one of a string of deep canyons carved by the Colorado River through southern Utah and northern Arizona, is the site of a 186-mile-long reservoir (commonly referred to as “Lake Powell”) created by Glen Canyon Dam. The dam is located near the town of Page in Coconino County, Arizona, approximately 110 miles north of Flagstaff, the county seat. From the dam, the reservoir stretches northeast through San Juan, Kane, and Garfield Counties, Utah. All of the reservoir is encompassed in Glen Canyon National Recreation Area (GCNRA), a unit of the National Park Service (NPS) system. GCNRA, which also includes a 15 mile section of river directly below the dam to Lee’s Ferry, lies directly upstream of Grand Canyon National Park and downstream of Canyonlands National Park (Figure 1).

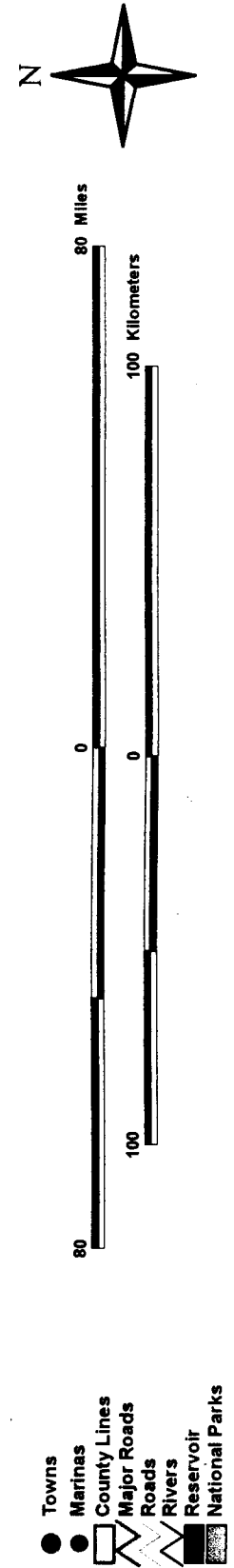
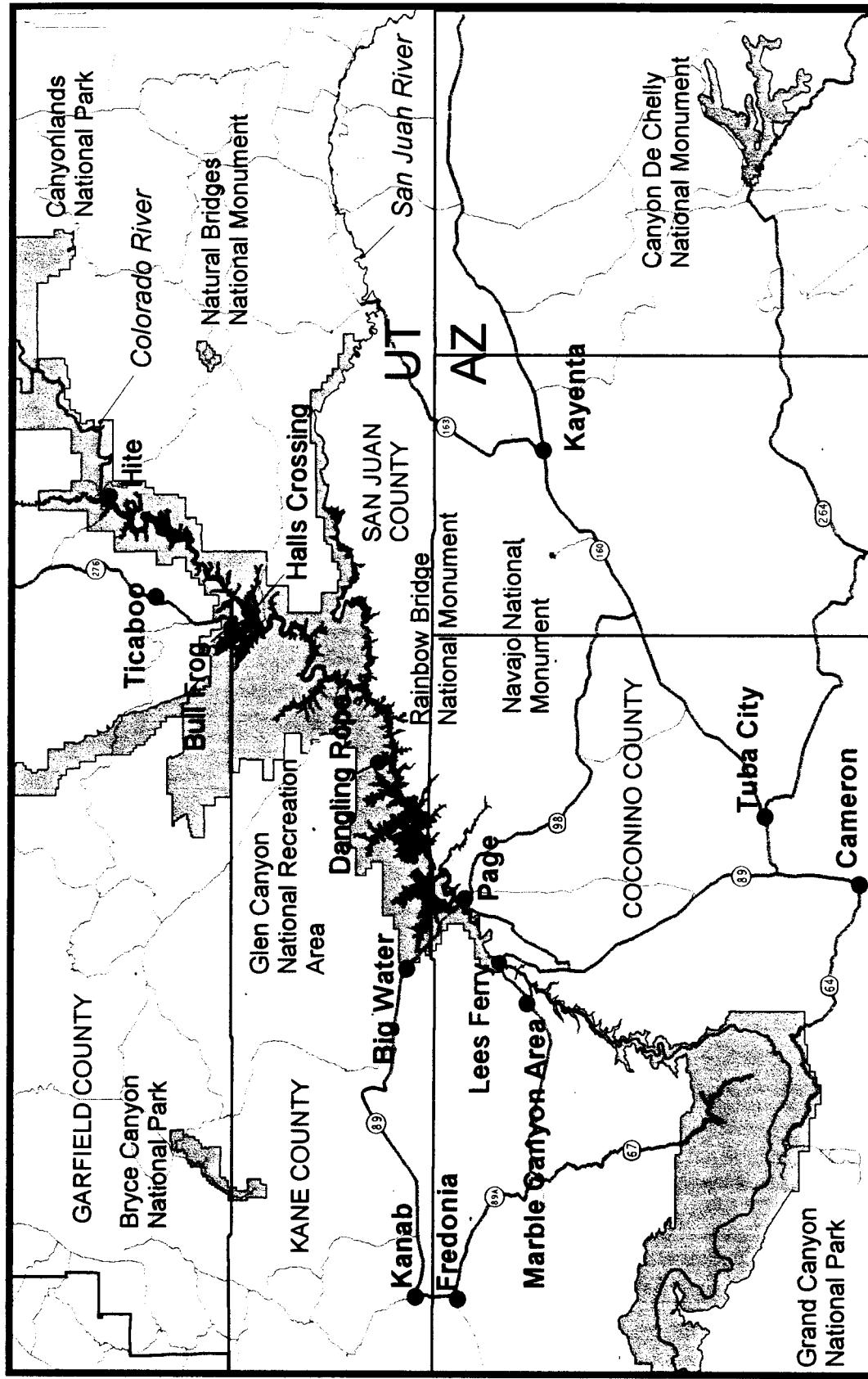
The reservoir, which inundates all but about 15 miles of Glen Canyon, ranks as the second largest reservoir in the United States. It began filling in 1963 when the dam was completed and reached full pool for the first time in 1980. When full, the reservoir has about 1,960 miles of shoreline. Recent interest in decommissioning Glen Canyon Dam, draining the reservoir, and restoring Glen Canyon has prompted public debate and focused attention on the potential effects of such an action on a multitude of resources. This report establishes the base for an analysis of socioeconomic impacts by analyzing current and historical impacts the reservoir has on the region. The four main objectives of this report are to:

- describe the existing socioeconomic conditions of the reservoir region, specifically Kane, Garfield and San Juan Counties, Utah, and Coconino County, Arizona, along with communities within those counties whose economies are most directly affected by public use of the reservoir;
- describe the economic, social, and cultural impact of Glen Canyon Dam and the reservoir on local Native American groups;
- describe the impacts of the reservoir-related recreation on regional economies; and
- provide recommendations and guidelines for future data collection and analyses necessary to determine the effects of the reservoir on the identified region.

II. METHODS

The zone of impact identified for this report was determined by identifying the counties and communities most likely impacted by the construction of Glen Canyon Dam and the filling of the reservoir. The reservoir stretches across four counties which are included in this analysis: Coconino County, Arizona, and Kane, San Juan, and Garfield Counties, Utah. Also included in this study are incorporated and unincorporated communities within the above mentioned counties that are located

Figure 1. The zone of impact



within a 50 mile radius of the reservoir. The counties and communities within the zone of impact are Listed in Table 1.

Table 1. Counties and communities included in the socioeconomic zone of impact

County, State	Community
Coconino County, Arizona	Page Fredonia Marble Canyon Area
Kane County, Utah	Kanab Bigwater
San Juan County, Utah	none
Garfield County, Utah	Ticaboo

In addition to the above listed counties and communities, the zone of impact also includes the Navajo Nation as well as the six marinas on the reservoir (Wahweep, Dangling Rope, Bullfrog, Hite, Halls Crossing, and Antelope Point).

Three main methods were used to collect data for this report: 1) literature review 2) Internet searches, and 3) phone contacts/interviews. The U.S. Census Bureau website and various state and county government websites were used extensively to gather relevant population, demographic, income, and industry data, which were then analyzed, organized, and described. Industry data were analyzed to determine the leading industries within each county and/or community. Representatives of various state, municipal, and county government agencies were contacted by telephone to gather reports and other materials containing relevant data on each of the four counties and pertinent communities. In some cases, private businesspeople, such as owners of lodges and fishing guides, were interviewed by telephone. Key people within the Navajo Nation, the Bureau of Reclamation (BOR), Aramark marinas, and the Navajo Generating Station were also identified and contacted by telephone to obtain relevant information. Finally, literature searches were done to gather reports and articles on past studies conducted within the zone of impact that are relevant to this report.

III. EXISTING SOCIOECONOMIC CONDITIONS OF THE RESERVOIR REGION

This section of the report discusses the socioeconomic conditions of the four counties that are adjacent to the reservoir; Coconino County, Arizona, and Kane, Garfield and San Juan counties, Utah. For each of these four counties, population, demographics, unemployment and income are discussed. This data was obtained primarily from the U.S. Census Bureau, the Arizona Department of Economic Security, and the Utah Department of Community and Economic Development. Also, the most important industry sectors and industries, in terms of employment and annual payroll, for each of the counties are discussed in detail.

The principle communities, scenic areas, and popular destinations within the zone of impact are discussed in terms of socioeconomic trends. Information pertaining to population, important employers, tourism, labor force, unemployment, and tax base is included. This information was compiled from various government and non-government sources including, but not limited to, the U.S. Census Bureau, the Arizona Department of Economic Security, the Arizona Department of Commerce, the Navajo Nation, the Utah Department of Workforce Services, and the municipalities for each community examined.

COCONINO COUNTY, ARIZONA

Coconino is the largest of the four counties considered in this report, both in terms of size and population. Coconino is the second largest county in the United States in terms of area, with 18,608 acres. It is also one of the most sparsely populated counties in the nation, with a population of 121,625 (Arizona Department of Economic Security, 1998). Indian reservation lands, including the Navajo, Hopi, Paiute, Havasupai, and Hualapai nations, comprise 38.1 percent of the land. The U.S. Forest Service (USFS) and Bureau of Land Management (BLM) control 32.3 percent of the land; the state of Arizona owns 9.5 percent; other public lands comprise 6.8 percent; and private individuals/corporations own the remaining 13.3 percent (Coconino County, 1999).

According to the 1990 U.S. Census, the demographics for Coconino County are as follows: 64.5 percent Caucasian, 1.3 percent African American, 29.3 percent Native American, 0.8 percent Asian or Pacific Islander, and 4.2 percent for all other races (U.S. Census Bureau 1990b). The median household income for the county in 1990 was \$26,112, which is relatively low compared to the state median household income of \$35,082 and the U.S. median household income of \$35,945 (U.S. Census Bureau 1990a).

In 1996, Coconino County had 50,745 people in its workforce (Table 2), including the public sector (U.S. Census Bureau, 1996). The largest industry sector was government, with 16,100 employees or 31.7 percent of the total workforce. The second largest industry sector was retail trade, which employed 13,133 people, or 25.9 percent of the total workforce. This sector had a \$174.24 million annual payroll. Within the retail trade sector, the industries that employed the greatest number of workers were eating establishments and miscellaneous retail. The third largest industry sector was the services sector, with 11,956 employees, or 23.6 percent of the total workforce. This sector contributed \$236.9 million in annual payroll. Within the services sector, the industries that employed the greatest number of workers were health services, hotels and other lodging places, and amusement and other recreational services. The fourth largest industry sector in 1996 was manufacturing, which employed 2,304 people, or 4.5 percent of the total work force. This sector had a \$77.2 million payroll. The largest industry within this sector was medical/surgical instruments and related products, with over 1,000 employees. The fifth largest industry sector in 1996 was construction, which employed 2,221 people, or 4.4 percent of the total work force. Important industries within this sector include special trade contractors, general building contractors and operative builders. Agriculture, fishing, mining, transportation, public utilities and wholesale trade

were less significant industries in terms of employment, but may contribute significantly in terms of annual payroll. For example, mining was not an important industry in terms of employment (only 127 employees), but the annual payroll for this sector was \$4.38 million. Mining in Coconino County produces mostly crushed and broken stone, and construction sand and gravel (U.S. Census Bureau 1996).

Table 2: Coconino County, Arizona - Industry Sectors By Percentage of Total Workforce

Sectors and Industries (Sectors shown in bold)	Number of Employees	Percentage of the Total Workforce
Government	16,100	31.7%
Retail Trade	13,133	25.9%
• Eating Establishments	5,903	
• Miscellaneous Retail	1,480	
Services	11,956	23.6%
• Health Services	3,344	
• Hotels and other Lodging Places	2,396	
• Amusement and Recreation Services	1,406	
Manufacturing	2,304	4.5%
• Medical/Surgical Instruments and Related Products	1,000+	
Construction	2,221	4.4%
• Special Trade Contractors	1399	
• General Building Contractors	647	
• Operative Builders	571	
Other Industries (Agriculture, Fishing, Mining, Transportation, Public Utilities, Wholesale Trade and Unclassified Establishments).	5,031	9.9%
Total:	50,745	100%

Source: U.S. Census Bureau. 1996. County Business Patterns. Arizona Dept. of Economic Security. 1998

The current labor force for Coconino County is 50,311 (excluding government and reservation labor force), with an average unemployment rate of 6.0 percent (excluding Indian reservation unemployment) (Arizona Dept. of Economic Security, 1999). This rate of unemployment is much higher than state and national unemployment rates and would be even higher if the county unemployment rate included the reservation labor force. The unemployment rate for the State of Arizona is currently 4.33 percent, and the national unemployment rate is 4.29 percent (U.S. Bureau of Labor Statistics 1999).

Tourism is a major industries in the area. In addition to the reservoir, other popular tourist attractions within Coconino county include Grand Canyon National Park, Oak Creek Canyon, Sunset

Crater National Monument, Wupatki National Monument, Walnut Canyon National Monument, Navajo National Monument, and the San Francisco Peaks.

Table 3 summarizes tax revenues collected in Coconino County in 1997, 1998, and 1999.

Table 3. Transaction, privilege, use, and severance taxes collected in Coconino County (for fiscal year)

1997	1998	1999
\$3,419,598	\$3,248,052	\$3,271,362

Source: Coconino County, 1999.

Flagstaff is the county seat of Coconino County, with a population of 59,945, nearly half of the population of the entire county. Three other incorporated cities are located in Coconino County: Page (population = 9,250), Williams (population = 2,735), and Fredonia (population = 1,375). Also within Coconino County and within the Navajo Nation are the unincorporated cities of Tuba City (population = 8,986), Leupp (population = 1,702), and Kayenta (population = 6,311) (Arizona Department of Commerce 1999). Based on their proximity to the reservoir, and thus the potential for economic impact, only the cities of Page and Fredonia are examined further in this report.

Page, Arizona

Page is a planned community that was administratively created in 1957 as a temporary housing community for workers building Glen Canyon Dam. The land on which Page was built was obtained by the BOR from the Navajo Nation in exchange for land in Utah. The BOR constructed 100 block houses, a hospital, and a few roads. During the construction phase, the population of Page was approximately 3,000. After completion of Glen Canyon Dam in 1963, the population dropped to approximately 1,500, but then steadily increased, reaching 4,907 in 1980, 6,598 in 1990, and 9,250 in 1998. No information was available on the seasonal changes in Page's population; however, the population estimates provided seem to represent Page's baseline or winter population. Estimates are based on numbers generated from Page's local water company, and thus do not include part-time, seasonal employees and visitors who rent apartments or other places to stay and do not pay the water department directly for their water bills (pers. comm., J. Stavely, Page Chamber of Commerce, 1999). It is projected that Page will reach a population of 11,128 in 2010, 13,057 in 2020, and 14,841 by 2030 (Arizona Department of Economic Security 1999).

The major contributors to Page's economy are the reservoir, the Navajo Generating Station, and tourism (Arizona Department of Economic Security 1999). Following this, recreation-oriented firms and public utilities are the predominant employers in Page. The single largest employer is Aramark, which owns a number of the reservoir marinas and employs approximately 900 marina workers during the peak summer months (pers. comm., J. Stavely, Page Chamber of Commerce, 1999). Recreational employment in the area is impacted by the seasonal nature of tourism. The Navajo Generating Station provides more stable employment. However, as Table 4 illustrates, the overall

employment figures and unemployment rates reflect the seasonal nature of the recreation/tourism industry, with the highest unemployment rates occurring in January and February (7.5 percent and 6.9 percent, respectively). The average unemployment rate in Page is 5.8 percent.

Table 4. Special unemployment report from January thru December 1998

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	AVG
Labor Force	3,930	3,987	4,013	4,100	4,011	4,119	4,172	4,062	4,134	4,152	4,127	4,048	4,071
Employment	3,637	3,711	3,761	3,887	3,813	3,848	3,889	3,843	3,937	3,963	3,924	3,829	3,837
Unemployment	293	276	252	213	198	271	283	219	197	189	203	219	234
Unemp. Rate	7.5%	6.9%	6.3%	5.2%	4.9%	6.6%	6.8%	5.4%	4.8%	4.6%	4.9%	5.4%	5.8%

Source: Arizona department of Economic Security 1998

Table 5 provides a summary of growth indicators for Page, Arizona, including tax revenues collected, new building permits, school enrollment, and net assessed valuation for 1990 and 1997 through 1999.

Table 5. Tax and growth indicator information for Page, Arizona

	1990	1997	1998	1999
Transaction, Privilege, Use, and Severance Taxes Collected*	unavailable	\$3,419,598	\$3,248,052	\$3,271,362
Taxable Sales	\$85,715,500	\$170,979,900	162,402,600	unavailable
New Building Permits**	101	187	178	unavailable
School Enrollment	3,284	3,516	3,431	unavailable
Net Assessed Valuation	\$22,966,042	\$37,645,933	\$40,983,067	unavailable

*Source: Arizona Department of Revenue(for fiscal year)

**Source: Arizona Business, Arizona State University

All other information from Arizona Department of Commerce

Navajo Generating Station. The Navajo Generating Station, located in Page, employs approximately 580 full-time workers, of which over 50 percent are Native Americans. In addition, approximately 386 workers are employed seasonally, of which approximately 93 percent are Native Americans (Salt River Project 1998). The Navajo Generating Station is a coal-burning power plant that produces 1.38 million megawatts per hour per month at 85 percent capacity. It is owned by a number of entities (Table 6) and provides power to Los Angeles, Las Vegas, Phoenix and Tucson, where the average two and one-half person household uses approximately 1,150 kilowatt hours per

month. Coal burned in the Navajo Generating Station is shipped 70 miles from mines operated by Peabody Western Coal Company (Peabody) at Black Mesa on the Navajo Nation, near the town of Kayenta. Peabody employs approximately 490 full-time employees at the mines, of which 93 percent are Native Americans. The Generating Station began energy production in 1974 and is generally expected to continue production until the year 2024, based on common equipment life span and amortization standards (pers. comm., M. Woods, Navajo Generating Station, 1999).

Table 6. Navajo Generating Station - percent ownership by entity

U.S. Bureau of Reclamation	24.3%
Salt River Project	21.7%
Los Angeles Dept. of Water and Power	21.2%
Arizona Public Service Company	14.0%
Nevada Power	11.3%
Tucson Electric Power	7.5%

Source: Glen Canyon Institute. 1999.

Fredonia, Arizona

Fredonia lies four miles south of the Utah-Arizona border on the Arizona Strip, a relatively isolated part of Arizona separated from the rest of the state by the Grand Canyon. Fredonia's population is estimated at 1,375 (1998), and is expected to grow to 1,507 in 2010, 1,671 in 2020, and 1,811 in 2030 (U.S. Census Bureau 1999).

The major contributors to Fredonia's economy are tourism and agriculture. Fredonia is located within a two hour drive of Grand Canyon National Park (North Rim), Zion National Park, Bryce Canyon National Park, Cedar Breaks National Monument, and Coral Pink Sand Dunes State Park. Because of these other tourist attractions, Fredonia is not dependent on the reservoir tourist dollars. Employers that provide more stable employment than tourism include Reidhead Logging; Peterson Logging; International Uranium, Inc.; Petro Source Asphalt Co.; Canyon Country Cabinet Shop; and Red Hills Manufacturing. Combined, these companies employ 143 workers (Arizona Department of Commerce 1999).

Overall employment figures and unemployment rates reflect the seasonal nature of the recreation/tourism industry (Table 7), with the highest unemployment rates occurring in January and February (8.7 percent and 8.1 percent). The average unemployment rate in Fredonia was 6.8 percent in 1998 (Arizona Dept. of Economic Security 1998). Table 8 provides a summary of growth indicators for Fredonia for 1990, 1997, and 1998.

Table 7. Fredonia, Arizona - Special unemployment report from January thru December 1998 (Prefinal)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Avg
Labor Force	633	642	646	658	643	663	672	652	663	666	662	650	654
Employment	578	590	598	618	606	612	618	611	626	630	624	609	610
Unemployment	55	52	48	40	37	51	54	41	37	36	38	41	44
Unemp. Rate	8.7%	8.1%	7.4%	6.1%	5.8%	7.7%	8.0%	5.3%	5.6%	5.4%	5.7%	6.3%	6.8%

Source: Arizona department of Economic Security, 1998.

Table 8. Fredonia, Arizona - Growth Indicators

	1990	1997	1998
Taxable Sales	\$3,708,6550	\$4,433,050	\$3,531,050
New Building Permits**	5	N/A	9
School Enrollment	450	437	446
Net Assessed Valuation	\$22,966,042	\$37,645,933	\$40,983,067

**Source: Arizona Business, Arizona State University

All other information from Arizona Department of Commerce

Marble Canyon Area

Marble Canyon is formed by the Colorado River just downstream from Glen Canyon Dam. Businesses consist of a series of lodges along Highway 89A: Vermillion Cliffs Lodge, Marble Canyon Lodge, and Cliff Dweller's Lodge. These lodges are popular stopping places for river runners preparing for a trip through the Grand Canyon (originating at nearby Lee's Ferry); anglers visiting the Lee's Ferry trout fishery; and tourists who are traveling to the North Rim of the Grand Canyon, the reservoir, or other tourist destinations in northern Arizona, southern Utah, and southern Nevada (i.e., Las Vegas). Vermillion Cliffs Lodge provides 11 rooms and a restaurant (pers. comm., J. English, Lee's Ferry Anglers, 1999). Cliff Dweller's Lodge offers 20 rooms, 1 restaurant, a general store and a gas station. Cliff Dweller's Lodge employs 13-14 employees during the summer months and 3-4 employees during the winter months (pers. comm., Cliff Dweller's Lodge, 1999). Marble Canyon Lodge has 51 rooms, 1 convenience store, 1 gas station, 1 laundromat, and an airplane landing strip. Marble Canyon Lodge employs 45-65 people during peak summer season; however, business is year-round (pers. comm., Don Foster, Marble Canyon Lodge, 1999). There are approximately 20 licensed fishing guides, 17 of whom currently have permits to work at Lee's Ferry in 1999 (pers. comm., Glen Canyon Concessionaires, 1999). The population of the Marble Canyon area according to the 1990 Census was 564.

KANE COUNTY, UTAH

The population of Kane County was 6,000 in 1996, according to an estimate provided by the U.S. Census Bureau. This was up from 5,169 in 1990. According to the 1990 U.S. Census, the demographics for the county are as follows: 97.3 percent Caucasian, 0.2 percent African-American, 0.8 percent Native-American, 1.6 percent Asian or Pacific Islander, and 0.2 percent other (U.S. Census 1990b). The median household income for the county in 1990 was \$21,134, which is relatively low compared to the state median household income of \$36,184 and the U.S. median household income of \$35,945 (U.S. Census Bureau 1990a).

The total workforce for Kane County for 1996 was 1,837 (Table 9). Government was the largest industry sector in 1996, with 609 employees, or 33.2 percent of the total work force (U.S. Census Bureau, 1996). The second largest industry sector was retail trade, with 551 employees, or 30.0 percent of the total workforce. This sector contributed \$7.82 million in annual payroll and consisted largely of grocery stores, gas stations, and eating establishments. The third largest contributor to the economy was the services sector, with 443 employees, or 24.1 percent of the total workforce. The total annual payroll within this sector was \$6.78 million. The main industries within the services sector were hotels and other lodging establishments and health services. The construction sector of the economy employed 84 people, or 4.5 percent of the total workforce and contributed \$1.26 million in annual payroll. The important industries within this sector included general building contractors and highway and street construction. The manufacturing, transportation/public utilities, and wholesale trade sectors of the economy are not well developed in Kane County.

While retail trade, services, and construction industries account for the largest number of employees in Kane County, non-labor income, comprised mostly of retirement and investment income, accounts for the greatest share of total personal income in Kane County, when combined with Garfield County, Utah (Alpert et. al., 1999). This is the result of retirees and others who move into the area to take advantage of the scenic vistas and access to recreation and wildlife.

Kanab and Big Water

Two communities within Kane County are within 50 miles of the reservoir: Kanab and Big Water. Kanab is a community of 3,895 (Utah Department of Workforce Services 1998) and has been described as the hub in the "Grand Circle of National Parks." The Grand Circle is a loose term used to describe an area roughly encompassing the western half of the Colorado Plateau (or Southern Utah and Northern Arizona), where there are large numbers of National Parks¹. Established in 1870 by Mormon pioneers, Kanab grew from a sleepy ranching town at the turn of the century to "Utah's

¹The Grand Circle includes the following popular destinations: Grand Canyon National Park, Petrified Forest National Park, Monument Valley Navajo Tribal Park, Zion National Park, Bryce Canyon National Park, Capitol Reef National Park, Canyon Lands National Park, Arches National Park, Escalante - Grand Staircase National Monument, Canyon de Chelly National Monument, Hovenweep National Monument, Glen Canyon National Recreation Area, Navajo National Monument, Rainbow Bridge National Monument, Sunset Crater National Monument, Walnut Canyon National Monument and Wupatki National Monument.

Little Hollywood” by the middle of the 20th century. Kanab’s economy was once based primarily on mining, ranching and lumber manufacturing and has made the transition during the 1990's to a tourism based economy. In the early 1990's Kanab lost more than 500 jobs in timber and uranium mining (Grand Canyon Trust 1997). Today, Kanab is a major stopping place for travelers visiting the North Rim of the Grand Canyon, Zion National Park, Bryce Canyon National Park, and Escalante National Monument, as well as GCNRA. The community supports 15 motels, 11 restaurants, 7 fast-food establishments, and a few gas stations. Big Water is a community of approximately 487 people and its economy depends almost entirely on tourism. The town has a boat storage business, a cabinet shop, two motels, one convenience store, but no gas stations (pers. comm., Big Water town office, 1999).

Table 9: Kane County, Utah - Industry Sectors by Percentage of Total Workforce

Sectors and Industries (Sectors shown in bold)	Number of Employees	Percentage of the Total Workforce
Government	609	33.2%
Retail Trade	551	30.0%
• Grocery Stores	125	
• Gas Stations	119	
• Eating and Drinking Establishments	105	
Services	443	24.1%
• Hotels and other Lodging Places	212	
• Health Services	96	
Construction	84	4.5%
• General Building Contractors	62	
• Highway and Street Construction	18	
Other Industries - (includes manufacturing, transportation, public utilities, wholesale trade, finance, insurance, real estate and unclassified establishments).	150	8.2%
Total:	1837	100%

Source: U.S. Census Bureau. 1996. County Business Patterns. Utah Department of Workforce Services. 1998.

SAN JUAN COUNTY, UTAH

The population of San Juan County was 13,917 in 1996, up from 12,621 in 1990 (U.S. Census Bureau 1996). According to the 1990 U.S. Census, the demographics for the county are as follows: 43.4 percent Caucasian, 0.2 percent African-American, 54.3 percent Native-American, 1.1 percent Asian or Pacific Islander, and 1.9 percent for all other races (U.S. Census 1990b). The median household income for the county in 1990 was \$17,289, which is low compared to the state median

household income of \$36,184 and the U.S. median household income of \$35,945 (U.S. Census 1990a). Major employers in San Juan County include the San Juan County School District, Hall's Crossing Resort and Marina, Monument Valley Lodge, Four Corners Regional Care Center, and the Navajo Nation. Three cities within San Juan County are outside the defined zone of impact, but probably experience some direct socioeconomic impacts from the reservoir: Monticello (1,941 in 1998), Blanding (3,243 in 1998), and Bluff (193 in 1998) (Utah Dept. of Workforce Services 1998).

The total work force for San Juan County in 1996 was 3,445 people (see Table 10) (U.S. Census Bureau, 1996). The largest industry sector in San Juan county in 1996 was government, with 1,502 employees, or 43.6 percent of the total workforce. The second largest industry sector was services, with 635 employees or 18.4 percent of the total workforce. Within this sector, the largest industries (in terms of employment) were health services and hotels and other lodging establishments. The third largest sector of the economy is retail trade with 430 employees or 12.5 percent of the total workforce. This sector contributes \$4.41 million in annual payroll and consists largely of grocery stores, gas stations, and eating and drinking establishments. The fourth largest sector, transportation and public utilities, employs 259 people or 7.6 percent of the total workforce. This sector contributes \$3.2 million in annual payroll. The largest industries in this sector are school bus service, trucking and courier service, and non-scheduled air transportation. The sector of the economy that employs the fifth largest number of employees is manufacturing, with a total of 235 employees, or 6.8 percent of the total workforce. This sector contributes \$3.78 million in annual payroll. Important industries within this sector include hats, caps and other millinery; logging; sawmills and planing mills; and pottery products. The mining sector is a contributor not so much in number of employees, but in the amount of annual payroll. This sector employs 82 people, but contributes \$4.23 million in annual payroll. The largest industry within this sector is oil and gas field services. Other industries that contribute significantly to the economy include general building contractors, special trade contractors, and excavation work (U.S. Census Bureau 1996).

Table 10: San Juan County, Utah - Industry Sectors by Percentage of the Total Workforce

Sectors and Industries (Sectors shown in bold)	Number of Employees	Percentage of the Total Workforce
Government Jobs	1,502	43.6%
Services	635	18.4%
• Health Services	335	
• Hotels and other Lodging Places	181	
Retail Trade	430	12.5%
• Grocery Stores	138	
• Gas Stations	20-99	
• Eating and Drinking Places	188	
Transportation and Public Utilities	259	7.6%
• School Bus Service	100-249	
• Trucking and Courier Service	20-99	
• Non-scheduled Air Transportation	20-99	
Manufacturing	235	6.8%
• Hats, Caps and Millinery	20-99	
• Logging	0-19	
• Sawmills and Planing Mills	20-99	
• Pottery Products	20-99	
Other Industries - (manufacturing, transportation, public utilities, wholesale trade, finance, insurance, real estate and unclassified establishments)	384	11.1%
Total:	3445	100%

Source: U.S. Census Bureau. 1996. County Business Patterns.

GARFIELD COUNTY, UTAH

The population of Garfield County was 4,092 in 1996, up from 3,980 in 1990 (U.S. Census Bureau 1996). According to the 1990 U.S. Census, the demographics for the county are as follows: 96.9 percent Caucasian, zero percent African-American, 2.4 percent Native-American, 0.33 percent Asian or Pacific Islander, and 0.28 percent other (U.S. Census 1990b). The median household income for the County in 1990 was \$21,160, which is relatively low compared to the state median household income of \$36,184 and the U.S. median household income of \$35,945 (U.S. Census 1990a). Major employers in Garfield County include Ruby's Inn, Garfield County School District, Garfield Memorial Hospital/Clinic, Utah Forest Products, South Central Utah Telephone, Garfield County, NPS. U.S. Natural Resources, Kaibab Industries, Offshore Marina Inc., Turnabout Ranch, Inc., Ticaboo Lodge, New Western Motel, Utah State Human Services, and K and D Forest Products (Utah Department of Workforce Services 1998).

The total workforce for Garfield County in 1996 was 881 people (U.S. Census Bureau 1996). (See Table 11.) In 1996, the county's largest employment industry sector was government, with 539 jobs, or 38.0 percent of the total workforce for that year. The second largest industry sector was the services industry, with 439 employees, or 30.9 percent of the total workforce in 1996. Within this sector, the main industry was hotels, motels, and other lodging establishments. The third largest sector of the economy was retail trade with 157 employees, or 11.0 percent of the total workforce. This sector contributed \$2.06 million in annual payroll and consisted largely of grocery stores, gas stations, and eating establishments. The fourth largest sector was manufacturing, which employed 143 people, or 10.1 percent of the total workforce. The main industries in this sector were logging companies, sawmills, and planing mills. Other industries that contributed significantly to Garfield County's economy included general building contractors, carpentry work, excavation work, and telephone and radio communications (U.S. Census Bureau, 1996).

While government jobs and services account for the majority of employees in Garfield County, non-labor income, comprised mostly of retirement and investment income, accounts for the greatest share of total personal income in Garfield County (Utah Department of Workforce Services, 1999). This is the result of retirees and others moving into the area to take advantage of scenic vistas and access to recreation and wildlife.

Ticaboo

The only community in Garfield County within the zone of impact is Ticaboo. This "community" is located on the north side of the reservoir, about 20 miles north of the shoreline from Hall's Crossing on Hwy 276. The population of Ticaboo is approximately 100 people in the winter months, with an increased summer population due to recreational and tourist activity (pers. comm., lodge manager, Ticaboo Lodge, 1999).

Table 11. Garfield County, Utah - Industry Sectors by Percentage of Total Workforce

Sectors and Industries (Sectors shown in bold)	Number of Employees	Percentage of the Total Workforce
Government Jobs	539	38.0%
Services	439	30.9%
• Hotels and other Lodging Places (includes camps and RV parks)	313	
Retail Trade	157	11.0%
• Grocery Stores	36	
• Gas Stations	20-99	
• Eating Establishments	20-99	
Manufacturing	143	10.1%
• Logging	0-19	
• Sawmills and Planing Mills	100-249	
Other Industries (construction, wholesale trade, finance, insurance, real estate and unclassified establishments)	142	10.0%
Total:	1420	100%

Source: U.S. Census Bureau. 1996. County Business Patterns

IV. THE IMPACT OF GLEN CANYON DAM AND LAKE POWELL ON LOCAL NATIVE AMERICAN GROUPS

Eight Native American groups have historic ties to the Colorado River Corridor within GCNRA and Grand Canyon National Park: the Havasupai Tribe, Hopi Tribe, Hualapai Nation, Navajo Nation, Kaibab Band of Paiute Indians, Paiute Indian Tribe of Utah for the Shivwitz Band, San Juan Southern Paiute Tribe, and Pueblo of Zuni (SWCA 1999). It is assumed that out of these eight groups, the Havasupai Tribe and Pueblo of Zuni probably do not have historic ties to the section of the Colorado River Corridor that is above Glen Canyon Dam and currently inundated by reservoir water. Out of the other six Native American groups, only one - the Navajo Nation - is examined in this section of the report, with the focus being on economic and cultural impacts resulting from the construction of Glen Canyon Dam and the creation of the reservoir behind the dam.

ECONOMIC IMPACTS

Before construction of Glen Canyon Dam, the northeastern most border of the Navajo Nation reached the Colorado River in what was Glen Canyon. In 1958, Congress authorized a land exchange with the Navajo Nation for reservation land that would be inundated by the reservoir (Public Law 85-868). Under this exchange, land inundated by the reservoir was traded, acre for acre, for land on McKraken Mesa, in Utah. While the land exchange seems to be a fair deal "on the

surface,” both the Federal Government and Utah State Government were unwilling to give the Navajo Nation rights to the minerals on McKraken Mesa (pers. comm., S. Pollak, Navajo Nation Department of Justice, 1999). Therefore, the Navajo Nation retained the mineral rights of the land under the reservoir. The economic value of mineral resources in the area now inundated by the reservoir is unknown. Since extraction of mineral resources from under the reservoir would be extremely difficult, if not impossible, the land trade may have resulted in a negative economic impact resulting from the loss of potential mineral resource development for the Navajo Nation, although the significance of such an impact cannot be determined at this time.

The Navajo Nation comprises 26,897 square miles within the states of Arizona, New Mexico, and Utah, making it the largest Indian reservation in the United States. While there are approximately 232,723 members of the Navajo Tribe, the population of the Navajo Nation is approximately 170,259, of which 163,555 are Native Americans (Navajo Nation Division of Economic Development 1996). Approximately 30 percent of all Navajo people live off the reservation, which is probably a result of poor employment opportunities and economic conditions on the reservation. The Navajo tribe experiences high levels of poverty, with 48.8% of Navajo having incomes below the poverty level (U.S. Bureau of the Census 1995), and high unemployment rates, with estimates ranging from 42% (U.S. Bureau of the Census 1995) to 27.9% (Navajo Nation Division of Economic Development 1996). These figures far exceed the national averages of 13.0% in poverty and 4.29% unemployed. Economic development is needed on the reservation to help create a more stable and viable economy to help raise the Navajo Nation’s standard of living.

The construction of Glen Canyon Dam and Navajo Generating Station had an initial positive impact on the economic conditions of Navajos in the area. Incomes, levels of employment, and levels of education in the area were all higher compared to sections of the Navajo Nation away from the developments (Callaway, et. al. 1976). However, these were short term impacts resulting from younger, more skilled workers migrating into the vicinity of the town of Page to take advantage of the jobs available during the construction phase of Glen Canyon Dam and the Navajo Generating Station. While Navajo workers are currently employed at the generating station, the numbers are not as large as those during the construction phase. In general, the impacts of energy-related industries (e.g., coal fired power plants and associated coal mines) within the Navajo Nation were not expected substantially aid the Navajo Nation in its attempt to raise the Navajo standard of living to the national average (Robbins 1975)

Sustained economic developments are necessary to produce lasting social and economic changes throughout the Navajo Reservation. One limiting factor for such development has been the availability of water. The Navajo Nation’s water rights are held pursuant to *Winters v. United States* (207 U.S. 564, 1908), commonly known as Winters doctrine rights, where the Supreme Court laid the foundation for Indian water rights. The Court held that when land was withdrawn and reserved from the public domain for Indian reservations, enough water to fulfill the purposes of that reservation was implicitly reserved. This right was given a priority date of the time when the reservation was established and, unlike state water rights, the right is not measured by the criterion of beneficial use and cannot be lost through nonuse.

The Navajo Nation's water rights under the Winters doctrine have not been quantified. Consequently, while the reservoir marks the northeasternmost edge of the reservation, and thus provides relatively easy access to water, the Navajo Nation has been able to make little use of that water to better the economic condition of its people. However, plans for use of reservoir water in the future could positively impact the economy of the Navajo Nation. These plans include proposed construction of pipelines from the reservoir to deliver much needed water to areas on the reservation, and the construction of a marina on reservation land to provide the Navajo Nation greater access to economic benefits stemming from reservoir recreation.

Water Supply

Drinking water supplies have been inadequate on large portions of the reservation, with over 40 percent of Navajo families having to haul water from windmills and springs that do not meet federal water quality standards for domestic water needs (Bureau of Reclamation n.d.). While the Navajo Nation has not directly used reservoir water to meet the demand for domestic, industrial and agricultural water use, the reservoir does have some indirect impacts. For example, the existence of the reservoir helps the Upper Basin to meet its commitments to Lower Basin states, which, in turn, "firms up" the water for use by the Navajo Nation, including the Navajo Agricultural Product Enterprise and the Navajo Indian Irrigation Project (NAPI/NIIP) (pers comm, S. Pollak, Navajo Nation Department of Justice, 1999). In addition, the reservoir also allows firm water supplies for Eastern Navajo Agency municipal and industrial (M&I) water supply projects using water from the San Juan River, including the proposed Navajo-Gallup Pipeline (Bautista 1997).

The reservoir is considered the most accessible site to divert water for agriculture and mining usage by the adjoining section of the Navajo Nation. To date, no such water has been accessed, with the only direct usages of reservoir water going to the City of Page and the Navajo Generating Station.

Under the Western Navajo Water Supply Project (WNWSP; Arizona Department of Water Resources 1998), a pipeline with a capacity to deliver 2,830 acre feet of water would be built to deliver water from the reservoir to Navajo communities between LeChee and Cameron. The project is dependent upon the outcome of settlement negotiations among the parties to the Little Colorado River Adjudication to resolve Indian and non-Indian claims to the water in the Little Colorado River Basin. Under this agreement, the Navajo Nation would subordinate its reserved water rights to existing upstream non-Indian water users in exchange for funds from federal and state parties that would partially support the pipeline. The project is expected to cost approximately \$42,000,000 (1996 dollars), with at least \$26 million coming from federal contributions. To determine the extent of the potential impact, the projected Navajo Nation water usage needs to be ascertained. In addition, the legalities of piping the water from Lake Powell need to be reviewed to determine the Navajo Nation's ability to take such action under their current, unquantified water rights.

At the same time that the WNWSP was being evaluated by the Navajo Department of Water Resources, a second pipeline, the North Central Arizona Water Supply Project (NCAWSP; Arizona Department of Water Resources 1999) was also evaluated. This project proposes supplying water to the Western half of the reservation, in the areas of LeChee, Coppermine, Bodaway/Gap, and

Cameron, as well as other communities in the central plateau region of northern Arizona, such as Flagstaff, Williams, Tusayan as well as the Kaibab National Forest and Grand Canyon National Park.

Legislation has been drafted on a third pipeline not addressed in the above reports. This pipeline is referred to as the Lake Powell - Peabody Pipeline (pers. comm., J. Leeper, Navajo Department of Water Resources 1999). This pipeline would provide water to the Black Mesa area to supplement water used for coal mining and the slurry line to reduce the impact that such activities have on the aquifer in the area. However, a recent lawsuit by the Navajo Nation against Peabody Western Coal Company has put the project on hold.

While the above water delivery systems would positively impact the Navajo Nation and non-Indian communities, there have been ongoing concerns about the lack of water allocated to the Navajo People. The reservoir has been filled for over 20 years, and the Navajos have yet to benefit from the water that is at their doorsteps.

Business Opportunities

As with water use, there has been little development of business enterprises by the Navajos in the region. This is partly a result of the "Bennett Freeze," which was imposed by the Federal Government in 1966 (BOR 1995). This freeze was recently lifted, and reservoir-based enterprises are beginning to develop. In 1970, the Navajo Nation, NPS, BIA, and BOR signed a Quadrilateral Agreement that recognizes the desire of the Navajo Nation to develop recreational opportunities on Navajo Nation lands along the southern shoreline of the reservoir (pers. comm. J. Leeper, Navajo Division of Water Resources, 1999; T. Boyd, Navajo Office of Economic Development, 1997), specifically, for the development and operation of resort and marina facilities at Antelope Point. Funded primarily by a grant from the Arizona State Lake Improvement Fund, Phase I of the development project was completed on July 6, 1999. This marked the opening of Antelope Point, which consists of a launch ramp, two docks, parking, restroom facilities, a beach access road, and a fee station. Future development phases include a marina similar to other Lake Powell marinas, including boat slips, boat rentals, interpretive and scenic boat tours, fuel stations, pump out facilities, and other marina facilities. A lodge, campground, and other tourist amenities are also anticipated.

Since the opening of Antelope Point is a recent occurrence, the nature of the economic impact to the Navajo Nation is not yet known and needs to be assessed. An economic study, known as the SEVA report, had been completed on the project (pers. comm. J. Leeper, Navajo Department of Water Resources, 1999; T. Boyd, Navajo Office of Economic Development, 1997)². It is expected that the marina would employ 300 people, and cost between 60 to 65 million dollars. Navajos would be employed to "the fullest extent that their qualifications and law permit" with "every reasonable effort [being] made to train Navajos in the skills and abilities required to perform such operations" (MOU 1994, p. 9). While this stipulation ensures that many of the jobs created by Antelope Point would

² The Navajo Office of Economic Development has been contacted to obtain this report, but it has not yet been received by the time of this draft for evaluation.

be filled by Navajo workers, a private developer and operator would be selected jointly by the Navajo Nation, BIA, and NPS, and would be responsible for constructing, furnishing, and operating the commercial components of the project. While the Navajo Nation would benefit from the business site lease and entrance/recreation fees (MOU 1994, p. 2), the benefits from operation of the project would be experienced by a private entity. It can be assumed that if the marina constructed under the final phases of the project is comparable to size and facilities as other marinas on the reservoir, the economic impact would be similar. However, the location of Antelope Point is relatively isolated, making it potentially a less visited marina than other reservoir marinas, such as Bullfrog and Wahweap. In order to fully assess economic impact of Antelope Marina on the Navajo Nation, the SEVA document needs to be obtained, assessed, and updated.

A few activities are currently impacting the Navajo Nation economy. The largest of these is the operation of Navajo Generating Station, located just outside of Page, Arizona, and owned by BOR, the Salt River Project (SRP), Los Angeles Department of Water and Power, Arizona Public Service Company, Nevada Power, and Tucson Electric Power (see Table 6). The generating station uses approximately 28,000 acre-feet of water a year, which is primarily used to replace the water lost to evaporation from six cooling towers. This water is currently acquired directly from the reservoir.³ According to an economic study conducted by SRP (1997), the Navajo Generating station employs 580 full time employees, 316 of whom are Native Americans, and 386 seasonal employees, 359 of whom are Native Americans.

The Kayenta Mine is associated with the operation of the Navajo Generating Station. It is operated by Peabody Coal Company and supplies the coal for the operation of the station. According to SRP figures, Kayenta mine has 490 full-time employees, 455 of which are Native Americans. Together, the Navajo Generating Station and Kayenta Mine employ 1,456 Native American workers, most of whom are Navajo.⁴ The overall annual payroll for these two industries is \$57,700,000 a year, with an additional \$21,000,000 mine royalty fees paid to the Navajo Nation.

A \$600 million lawsuit against Peabody Coal Company by the Navajo Nation may have implications for jobs at both the Kayenta Mine and Navajo Generating Station. According to the law suit, Peabody paid less than 2 percent in royalties to the tribe and, by 1983, the Navajos received only \$2,700,000 dollars in royalties, not nearly the annual amount of \$21,000,000 cited by the SRP report. The exact amount of royalties that the Navajo Nation is receiving needs to be identified. It is uncertain at this time if the law suit would have any implication to the continued operation of Kayenta mine and the Navajo Generating Station. As stated earlier, the law suit has resulted in a delay in presenting legislation on the construction of a pipeline from the reservoir to Black Mesa, which suggests that there may be some potential for the action to impact the coal industry operated by Peabody.

³ It has been suggested that Navajo Generating station is not dependent upon reservoir water and could acquire water directly from the river, or use a different form of cooling system.

⁴ The SRP study also cites 585 employees (485 Native American, and 15 non Indian) employed by the Scrubber Construction Project, which is associated with the Navajo Generation Station and would be impacted if that plant were shut down. However, since these jobs are temporary, concluding by mid-2000, they are not included in this study.

Other areas of economic impact to the Navajo Nation include those communities along Highway 89 and other approaches to the reservoir that have tribally owned businesses dependent upon tourist dollars. These include such communities as Grey Mountain, Cameron, Tuba City, The Gap, Cedar Ridge, and Bitter Springs. In addition, a number of jewelry stands/curio shops on Highway 89 and other approaches to the reservoir are dependent upon tourist dollars. However, many tourists who stop at such places are not reservoir visitors, but on their way to or from either the North or South Rim of the Grand Canyon. This makes it difficult to determine the impact of the reservoir on these industries.

CULTURAL AND SOCIAL IMPACTS

Filling of the reservoir inundated religious and cultural sites that were held sacred by the Navajos and the Hopis. One well known site is Rainbow Bridge within southeastern Utah's San Juan County. Prior to the filling of the reservoir, this National Monument was rarely visited by recreationists as individuals needed to hike 13 miles from the nearest road or six miles from the Colorado River channel in order to reach the site. Today, reservoir waters extend to the boundaries of the monument, or even pass beneath the bridge during times of high water, making it easily accessible by boat. Thus, visitation has increased tremendously, with numbers reaching 195,916 in 1998 (NPS 1999).

Rainbow Bridge has spiritual and cultural significance to both the Navajos and Hopis. For the Hopi, Rainbow Bridge explains the origins of the Hopi people and their existence on the Hopi mesas. The Navajos consider Rainbow Bridge a sacred site where many traditional water and protection ceremonials should be held. Additionally, Rainbow Bridge figures prominently in many Navajo myths, including the Navajo creation story (Johnson 1995 p. 149). Because both the Hopis and Navajos consider Rainbow Bridge a sacred place, they are often angered and offended by modern visitors who do not display the "proper" respect (Johnson 1995). In *Badoni v. Higginson* (1980), a case brought before the U.S. district Court of Utah by members from three Navajo Nation chapters, the plaintiffs argued that BOR, NPS, and the States of Utah and Colorado, and both the Colorado and Southwestern Water Conservation Districts had violated their religious rights under the Free Exercise Clause of the First Amendment. The plaintiffs argued that the defendants' operation of Glen Canyon Dam had flooded numerous religious sites in Rainbow Bridge National Monument. This flooding of religious sites, along with increased visitation by tourists, had caused the sites to be desecrated. They argued that this desecration restricted the plaintiffs' rights to conduct religious activities in the private conditions necessary for successful ceremonies. The court ruled in favor of the defendants, ruling that "the federal government's interests in the Glen Canyon Dam and Reservoir as a major water and power project outweigh the plaintiff's religious interests in the Monument."

Despite the legal setbacks, the Navajo Nation and Hopi Tribe have been involved in consultation with the NPS to help maintain the sacredness of Rainbow Bridge. The NPS makes a strong effort to involve local Indian organizations in monument management decisions. For example, the NPS 1993 Management Plan (U.S. Department of Interior 1993) notes 15 consultations with Indian leaders and groups between 1988 and 1991 and acknowledges the concern over bridge visitors walking under the bridge which is considered offensive without proper prayer. In response, NPS

erected signage to educate visitors about walking under the bridge. One objective of the management plan is to have more than half of the visitors understand that the site is still considered sacred by various local Native American groups; however, NPS does not restrict visitor travel beneath the bridge, partially due to the magnitude of visitation.

V. IMPACTS OF LAKE POWELL-RELATED RECREATION ON REGIONAL ECONOMIES

The areas that are most impacted by reservoir-related recreation are contained in four counties: Coconino County, Arizona and Kane, Garfield and San Juan counties, Utah. In terms of land area, these counties include a high concentration of National Parks, National Monuments and other outdoor recreational areas; public lands (both Federal and State); and Indian reservation lands. These counties are sparsely populated and consist of small communities with tourism- and recreation-based economies. The heart of the Colorado Plateau has 27 National Park Service Units (i.e., National Parks, Monuments and Recreation Areas). Visits to these units have increased 94%, from 8.6 million visitor days in 1981 to 16.7 million visitor days in 1994. This compares to a growth of 11% in visitor days to all U.S. National Park Units over the same period (Grand Canyon Trust 1996).

With the tremendous growth in National Park Unit visitation in the area, it is not surprising that the communities within the area have grown dependent upon tourism dollars, as well as government jobs generated by the management of federal lands. The most important industry sectors in the communities in the zone of impact are government, services and retail trade. All of the cities within these counties (and within the 50 mile radius of GCNRA) have populations under 10,000 people, and most of the cities are under 5,000 in population. Kane and Garfield counties, Utah have populations that are almost entirely Caucasian, while Coconino (64.5% Caucasian and 25.9% Native American) and San Juan (43.6% Caucasian and 54.3% Native American) counties have significant Native American populations.

The construction of Glen Canyon Dam resulted in area economic impacts from two main forms of recreation: reservoir and river recreation. Construction of the dam resulted in the creation of the nation's second largest reservoir. Over two million people a year bring tourist dollars to the region. The other form of recreation, river recreation, is impacted as a result of Glen Canyon dam's modifying the river's natural flow downstream of the reservoir, and dramatically decreasing water temperature.

RESERVOIR RECREATION

Economic impacts from reservoir recreation within GCNRA include direct, indirect, and induced effects on employment and income stemming from visitor expenditures in the area. It has been estimated by Congressman Cannon (House Resolution 380 1998) that reservoir recreation generates approximately \$500 million in tourism revenue; however, the source of this estimate has not been disclosed. This number was probably determined by estimating the average daily expenditures made per visitor, and multiplying by annual number of visitor days. This is not a difficult assessment to

conduct. GCNRA visitation numbers are readily available from NPS. In 1998, 2,458,990 recreationists visited GCNRA, making up 4,305,709 visitor days (NPS 1999). Visitor numbers decreased by 0.2% from 1997, and have been decreasing steadily since 1993, except for 1996, with a total decrease of 32.1%. GCNRA visitation numbers, 1990 to 1999, are provided in Table 12, which also illustrates visitation by month to demonstrate the seasonal variability of GCNRA recreation.

Table 12. Glen Canyon National Recreation Area visitation

YEAR	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	TOTAL	% change
1990	77,617	109,042	135,039	253,638	289,993	501,288	467,981	483,023	350,026	227,061	129,691	78,750	3,103,129	-
1991	81,875	97,120	118,182	199,462	346,764	451,674	503,752	568,030	396,785	247,982	120,822	78,442	3,210,890	+3.4%
1992	83,044	114,889	139,787	246,993	346,727	525,610	572,869	659,809	478,032	245,565	122,386	82,847	3,620,558	+11.3%
1993	60,927	83,903	123,836	201,141	372,425	526,202	624,549	644,534	530,550	259,119	111,607	76,031	3,470,194	-2.9%
1994	69,663	120,307	174,272	264,265	364,826	576,355	665,583	439,177	321,961	212,729	99,097	63,607	3,371,842	-2.8%
1995	35,814	66,553	88,414	151,369	196,905	410,610	435,840	461,431	285,118	192,597	94,508	50,362	2,469,521	-26.8%
1996	41,303	50,553	96,296	209,243	231,655	419,288	447,417	442,180	268,266	187,949	89,670	48,269	2,532,087	+2.5%
1997	49,954	54,401	115,523	157,249	245,000	288,742	420,927	437,846	266,992	187,467	85,595	48,507	2,458,203	-6.9%
1998	39,241	55,538	89,971	171,234	267,509	369,167	445,423	398,776	277,520	123,450	55,738	40,077	2,458,990	-0.2%
1999	44,755	51,657	118,141	155,831	261,931									--

Data on the average visitor expenditures are more difficult to determine; however, there are some sources for average daily expenditures in the region. For instance, the Arizona Hospitality Research & Resource Center (AHRRC 1998) provides information on Arizona visitor expenditures for "Canyon Country" over-night visitors, which includes visitors to the GCNRA area. Ninety-two percent were leisure travelers who spent an average of \$100 per day in 1996. Expenditures were lower for Utah visitors, with an average of \$70 per day in 1996 (Utah Division of Travel Development 1998). Averaging these two numbers and adjusting them to 1998 dollars, the average expenditure by overnight visitors to the Arizona/Utah area is calculated to be \$88.30⁵. Multiplied by the number of visitor days experienced (4,305,709), visitation at GCNRA generated \$380,194,100 in 1998. This number is 24% less than that provided by Senator Cannon.

The above estimates, however, do not provide an accurate picture of the overall economic impact to the region for several reasons. First, the region of impact has not been identified. Second, it is not known if such expenditures were made within the impacted region. Third, these estimates do not take into account whether the expenditures were made by those living within the zone of impact (residents) or those living outside the zone (non-residents). Expenditures made by non-residents

⁵ To convert 1996 dollars to 1998 dollars, the consumer price index for 1996 (156.9) and 1998 (163.0) were used (U.S. Bureau of the Census 1999).

have a greater economic impact than expenditures made by residents. Consequently, the data on distance visitors travel to the reservoir needs to be determined in order to obtain an accurate estimate of the regional economic impact. And finally, the visitation numbers for GCNRA include visitation to Lee's Ferry and other sites within GCNRA other than the reservoir.

Douglas and his colleagues (Douglas et. al. 1999) are currently working a more refined economic impact of reservoir recreation. In their study, they have determined that there were 2.6 million trips to the reservoir in 1994, with 631,349 household visiting the reservoir, making an average of four trips per year to the reservoir, and spending an average of \$1,259.31 per visit (in 1998 dollars). Trip expenditures were based on the average amount each household spent in six categories: fuel, food, supplies/concessionaires, guides/outfitters, lodging, and boat, jet ski, or other equipment rental. In addition, they examined the distance traveled to the reservoir. Their data showed that 43.2 percent of visitors traveled 60 miles or less, and 29.1 percent traveled 30 miles or less.⁶ The distance traveled is provided in Table 13.

Table 13. Distance traveled to GCNRA

Distance traveled	Percent Visitors
0-30 miles	29.1%
31-60 miles	14.1%
61-120 miles	4.6%
121-240 miles	28.9%
>480 miles	15.5%

Source: Douglas et. al. 1999

These and other data from the study are currently being used by Douglas et. al (1999) to determine the economic impact reservoir recreation has on the region. However, the report region has yet to be determined, and will probably be larger than the zone of impact used in this report (pers. comm., A. Douglas, Midcontinent Ecological Science Center, 1999).

The majority of visitors to the reservoir are Caucasian (91.4%), between 30 and 55 years of age (70.6%), with at least some college education (85.4%), and an annual household income of \$50,000 a year or above (78.2 %). The main activity engaged in were swimming, sunbathing, and beach activities (87.2%), followed by water sports such as water skiing (75.5%) and power boating (68.6%). A breakdown of activities engaged in is provided below in Table 14:

⁶The percent of visitors traveling 30 miles or less (29.1%) seems high considering if there were 2.6 million visitors, then over 750,000 visitors would be visiting within the area; however, the population of the area 30 miles around the reservoir (e.g., Page, Big Water, Tocaboo, the marinas) is not that large. Consequently, the survey over-represented those traveling 30 miles or less, or this group included visitors who actually lived outside the zone of impact and were traveling en route to different locations.

Table 14. Activities Engaged in

Activity	Percent Participation
Swimming, sunbathing, beach activities	87.2%
Water sports (e.g., water skiing)	65.5%
Power boating	68.6%
Fishing	58.3%
Off-beach activities (hiking, exploring ruins)	58.1%
House boating	58.0%
Personal water craft (e.g., jet skis)	42.5%
Other	9.5%
Canoeing, kayaking, sailing	7.3%

Source: Douglas et. al. 1999

Many visitors surveyed responded that they engaged multiple activities, many of which involved the use of motorized water craft (e.g., power boats, house boats, personal water craft). For fuel and supply purposes, a good portion of expenditures made by these and other reservoir recreationist occurred at one of five marinas: Wahweep, Dangling Rope, Bullfrog, Hite, or Halls Crossing. A sixth marina, Antelope Point, was not in operation at the time of the study. Dangling Rope, located fifty miles up the reservoir from Wahweep, has only boat access and sells the most gasoline of any single retail site in the state of Utah. All gas and food products sold at Dangling Rope must be boated in from Wahweep. The marinas include employees of both the National Park Service and the concessionaire, Aramark. It has been estimated that the latter employs approximately 900 people in the summer months, with some layoffs during the winter months (pers. comm., J. Stavelly, Page Chamber of Commerce, 1999). NPS employs 234 people that work on the reservoir (pers. comm., M. Dolan, NPS Lake Powell Headquarters, 1999). No information has been obtained that discloses the actual number of employees during off-season months, the type of employment, or demographic make-up (e.g., age, sex, race, education, place of residence) of employees. Some information is available on the over all nature of wages for a group of the marinas from the Utah Department of Workforce Services. For instance, during the third and fourth quarters of 1998, the reservoir area (which includes Hite, Halls Crossing, and Bullfrog Marinas, and Ticaboo) averaged 11 firms with 69 employees, \$7,419 in average monthly wages, and \$1,535,000 in total wages for the third quarter, and 11 firms with 65 employees, \$10,142 in average monthly wages, and \$1,978,300 in total wages for the fourth quarter (Utah Department of Workforce Services 1998, 1999).

The City of Page experiences the most direct impacts from GCNRA visitation, with an estimated 65% of the city's business being generated from tourism (Tashiro Marketing & Advertising 1996).

While no report has been located that determines the average amount each visitor spends in Page,⁷ data on tourist expenditures in the region have been located (c.f., AHRRC 1998, Utah Division of Travel Development, 1998) and discussed earlier in this section.

Determining which state, county, and/or community is impacted by this amount is more difficult as it requires data on where visitors spend their money (e.g., which community, marina, etc.). Table 14 lists the amount of travel and recreation-related employment and spending by tourists in Kane, Garfield, San Juan, and Wayne Counties, Utah. Also included in Table 14 is a list of state and national parks/monuments other than GCNRA in the area, and visitation numbers for such sites. These sites provide possible alternative tourist destinations.

As Table 14 demonstrates, all Utah counties within the project area have other state and national parks/monuments that could be destinations for tourists. This suggests that GCNRA, specifically the reservoir, may not necessarily be the primary tourist destination, with a large portion of the 2,430,781 tourists who visit GCNRA not traveling to the area solely to visit the reservoir. Coconino County, the largest of the counties in the project area, is not represented in the above table because of the lack of available data, but similar patterns could also occur with visitation to that county. For instance, Grand Canyon National Park, which is located in Coconino County, attracted 4,239,682 visitors to the area in 1998, and is considered more of a destination tourist attraction than GCNRA.

The percent of jobs and tourism related dollars in Table 14 that are directly attributed to GCNRA tourists is thus difficult to determine because many tourists have other destinations. This is evident in those travelers taking the "Grand Circle" route. However, GCNRA offers a recreational activity that is different from that offered by the other state and federal parks/monuments (i.e., reservoir recreation). Consequently, a different type of tourist seeking a different type of recreational experience may frequent GCNRA instead of the other tourist destinations. For instance, many of those visiting GCNRA bring motorized water craft,⁸ go to Lake Powell as their primary destination, and plan to spend extended amounts of time at that one location. Such individuals would probably be from closer locations than tourists who visit other, nearby state and federal parks/monuments.

⁷ The Page-Lake Powell Chamber of Commerce reported \$52.98/day for each drive-in visitor using their own vehicle, \$84.90/day for each drive-in visitor using a rental car, and \$104.58 a day for each fly-in visitor (pers. comm., J. Stavely, Page Chamber of Commerce, 1999). Since these numbers seemed low compared to the regional visitor expenditures, and no documentation was provided to determine the validity of these numbers, they were not used in this analysis.

⁸ In 1998, an estimated 521,063 boats were recorded at the various Lake Powell marinas, although this number does not differentiate between the number of private boats and number of rented boats.

Table 15. Visitation numbers for sites other than GCNRA in Utah

County	Travel/Recreation related employment	Spending by Travelers	Utah Tourist Destinations State and Federal Parks	Visitation Numbers
Kane	1,000	54,460,838	GCNRA	2,430,781
			Bryce Canyon NP	1,174,824
			Zion NP	2,445,534
			Cedar Breaks NM	608,399
			Coral Pink Sand Dunes SP	164,544
Garfield	986	53,678,766	GCNRA	2,430,781
			Bryce Canyon NP	1,174,824
			Capital Reef NP	625,680
			Anasazi SP	49,307
			Escalante SP	76,514
			Kodachrome SP	63,958
San Juan	807	43,940,891	GCNRA	2,430,781
Wayne	212	11,562,358	GCNRA	2,430,781
			Canyonlands NP	432,697
			Capital Reef NP	625,680
			Fremont Indian SP	99,677
			Otter Creek SP	20,237
			Paiute Res. SP	29,470
			Goblin Valley SP	70,829

Source: Utah Division of Travel Development (1997 numbers)

RIVER RECREATION

Reservoir recreation is not the only form of recreation impacted by Glen Canyon Dam. Other forms of recreation downstream from the dam, specifically sport fishing and river rafting, have also been impacted. The construction of Glen Canyon Dam and the subsequent water releases from deep in the reservoir transformed the oftentimes muddy and variable-temperature river into a clear, cold-water stream, that is ideal for a "blue ribbon" trout fishery. This fishery did not exist prior to the construction of the dam. While river rafting below Glen Canyon Dam occurred prior to construction of the dam and reservoir, the nature of rafting had been altered due to the reduced fluctuation in flow levels.

Tailwater Fishery

The tailwater fishery extending from Glen Canyon Dam to Lee's Ferry (Lee's Ferry), approximately 15 miles downstream, is administered by NPS as part of GCNRA, and is managed by the Arizona Game and Fish Department (AGFD). Although trout fishing occurs downstream from Lee's Ferry, angler pressure is not as great, the river is not managed as a blue ribbon trout fishery, and there is little information on user numbers.

In 1976, approximately 10,000 angler days were recorded at Lee's Ferry. This increased to 52,000 in 1983. The fishery experienced a series of declines and increases in angler pressure as a result of biological, recreational, and social impacts, as well as the imposing of new fishing regulations (Niccum, et al. 1998). Angler pressure has never again reached the 1983 levels. Currently, use seems to be on the rise, with approximately 19,000 angler days in 1997, 22,000 in 1998, and 25,000 projected for 1999 (pers. comm., Scott Reiger, AGFD, 1999). The percent of resident and non-resident anglers also fluctuated throughout the years, with an estimated 9% non-resident anglers in 1964, 34% between 1977-78, and fluctuating between 20% to 40% between 1984 and 1997. More demographic information on Lees Ferry anglers was not available in the AGFD report (Niccum, et al. 1998), but is probably available from the creel data collected by AGFD, Region II.

A report prepared by Douglas and Harpman (1995) estimated that estimated trip expenditures by non-residents anglers visiting Lee's Ferry totaled \$2,336,780 in 1990 dollars, which would equal \$2,914,270 in 1998 dollars.⁹ Visitation by anglers in 1998 was approximately 25% less than in 1991 (22,000 user days compared to 33,000 user days), which means the economic impact would be \$2,185,702 in 1998 dollars.

Douglas and Harpman (1995) used IMPLAN to estimate the number of jobs created in the region by Lee's Ferry anglers, but combined their analysis with data from river rafters. Thus, they did not determine the number of direct or indirect jobs generated specifically as a result of visits by anglers at Lee's Ferry. Fishing guide services provide a direct employment opportunity in the area resulting from the tail water fishery. According to Glen Canyon Concessionaires (pers. comm., 1999), there are approximately 20 licensed fishing guides, 17 of whom currently have permits to work at Lee's Ferry in 1999. Two fishing guide companies that work out of Marble Canyon, Marble Canyon Guides and Lee's Ferry Anglers, have the majority of the sport fishing business. Marble Canyon Guides employs an average of six or seven individuals, with 599-650 river guide days and an annual income for 1998 at \$115,000 (pers. comm., D. Foster, Marble Canyon Guides, 1999). Figures for 1999 have already surpassed the 1998 figures in August, with a projected annual income of \$150,000. Lee's Ferry Anglers employs 12 guides (river guide day estimates not provided) and had an annual gross income for 1998 of \$900,000 (pers. comm., J. English, Lee's Ferry Anglers, 1999).

Whitewater Rafting

While angling is directly impacted by the existence of Glen Canyon Dam (i.e., there would be no mainstream trout fishery without the dam), the dependance of river rafting on the dam is more difficult to assess. Rafters ran the Colorado River through Grand Canyon before the dam was built, and rafters run the mostly unregulated stretch of Colorado River through Cataract Canyon above the reservoir. However, Glen Canyon Dam has changed the nature of the river-running experience in

⁹ To convert 1990 dollars to 1998 dollars, the consumer price index for 1990 (107.6) and 1998 (130.7) were used (U.S. Bureau of the Census 1999).

Grand Canyon. The stabilization of river flows has made rafting more predictable, allowing professional river guides to become familiar with each rapid. Also, the relatively stable, controlled river flow potentially allows for a longer commercial river season, especially for large, motorized craft. Before construction of Glen Canyon Dam, flows varied from less than 1,000 cubic feet per second (cfs) to well over 100,000 cfs, with rafting being questionable during the extreme ends because of safety concerns or insufficient water.

Bishop, et al (1983) examined the impact of various river flows on the economic value of white-water river trips down the Grand Canyon. They found that the ideal river flow for commercial white-water river trips is about 33,000 cfs, while for private trips it is about 29,000 cfs. The value of river trips fall precipitously above and below these ideal flows. This suggests that the steady flows offered by Glen Canyon Dam, although generally below the "ideal" flows, increase the economic value of river raft trips.

VII. RECOMMENDED FUTURE STUDIES

Recommendations for further studies necessary to complete the Lake Powell socioeconomic analysis are made below. This report has met the objective of describing the existing socioeconomic conditions of the reservoir region. Consequently, no recommendations for future studies in this area have been made. However, if it is determined that additional information on regional socioeconomic conditions is necessary, the data can be readily obtained through Internet searches with the Census Bureau and appropriate state and federal economic and revenue departments. The recommendations made in this section are directed toward gathering more information on the reservoir's impacts on Native American groups and the impacts of reservoir recreation to regional economies. Most of the recommendations are suggest further contact with various agencies and specific individuals within those agencies. Unless otherwise noted, individuals whose names have been provided were already contacted during the preparation of this report.

IMPACTS TO NATIVE AMERICAN GROUPS

Economic Impacts

A number of questions concerning the economic impact of the reservoir on the Navajo Nation remain unanswered due to insufficient information. Some forms of information may be obtained through further contact with appropriate agencies within the Navajo Nation, which can be accomplished under contract with a consulting agency, or by a Glen Canyon Institute employee, volunteer, or intern.

- Information relating to the economic impact of the land exchange (land now under the reservoir exchanged for land on McKraken Mesa) could be obtained through further contact with the Navajo Nation Division of Economic Development (e.g., Thomas Boyd), Navajo Department of Justice (e.g., Stanley Pollak), Navajo Department of Water Resources, or other related agencies within the Navajo Nation. Such contacts should be directed toward

obtain the following facts: 1) the estimated worth of the exchanged Navajo land prior to the closing of Glen Canyon Dam and the land on McKraken Mesa; 2) use of land now underneath the reservoir prior to the land exchange; 3) the current use of land on McKraken Mesa; and 4) the types and value of mineral resources associated with both pieces of land.

- To further examine the economic impact of the opening of Antelope Point, the SEVA report needs to be obtained from the Navajo Nation Division of Economic Development (Thomas Boyd). This agency should also be contacted to gather employment and wage information and visitation numbers for the marina's first few years of operation.
- An attempt should be made to contact Melvin Bautista of the Navajo Nation Division of Natural Resources. Mr. Bautista had not been contacted during the writing of this report but spoke during the oversight hearing on the Sierra Club's proposal to drain Lake Powell (September 23, 1997), and stated that draining the reservoir "would wreak disaster upon the economic and social welfare of the Navajo Nation". Contact with Mr. Bautista should be directed at gathering data that would substantiate these claims.
- Further information on the proposed water pipelines (WNWSP, NCAWSP, and Lake Powell- Peabody Pipeline) needs to be obtained to determine the feasibility of these water delivery projects. The Arizona Department of Water Resources (e.g., Dennis Sundie or Ellen Endebrock) and the Navajo Nation Department of Water Resources (e.g., John Leeper) are appropriate contacts for such information. Descriptions of proposed end uses of the water made available through these pipelines to the Navajo Nation need to be obtained before the exact nature of the economic impact can be determined.

Cultural Impacts

There are undoubtedly more cultural impacts that the reservoir has on Native American groups than described in this report. Such impacts can only be addressed fully by interviewing representatives from the Navajo Nation and other impacted Native American groups. This can be accomplished under contract with a consulting agency, or by a Glen Canyon Institute employee, volunteer, or intern.

- Further information on cultural, historic, and sacred sites now impacted by reservoir waters and/or increased visitation to the area could be obtained from interviews with representatives from the Navajo Nation Historic Preservation Department or similar departments from other Native American groups. Museum of Northern Arizona archaeological reports for the studies done in the area prior to filling of the reservoir may be useful in identifying the sites now inundated by the reservoir.
- Certain individuals who deal specifically with issues relating to GCNRA could be contacted to gain further information. For instance, pertinent information could be obtained from

individuals who are involved with GCNRA issues on a daily basis, such as with the Native American liaison for the Glen Canyon National Recreation Area (e.g., Pauline Wilson, who has not been contacted during the writing of this report).

IMPACTS OF RECREATION ON REGIONAL ECONOMIES

Reservoir Recreation

Information necessary to complete the assessment of the impacts of reservoir related recreation on regional economies can only be obtained through intense economic analysis. This can be accomplished by contract with a consulting agency or academic institution practiced in economic modeling.

- In order to determine the economic impacts of reservoir related recreation and tourism on the regional economy, an input-output (i-o) model would be an appropriate means of analysis. IMPLAN is a software package that utilizes an i-o model to predict how dollars spent in a local economy in one industry (or a few industries) will reverberate throughout the economy as dollars are respent and have indirect and induced impacts on other industries. IMPLAN allows the analyst to predict impacts to total output, value added and employment within a local or regional economy. IMPLAN data is available for any county within the United States or if a more local approach is desired, it is available by zip code.
- Douglas and his colleagues (1999) are currently working on analyzing the economic impact of the reservoir on the region, with plans to use IMPLAN in their assessment after the initial data collection and analysis is completed (pers. comm., A. Douglas, Midcontinent Ecological Science Center, 1999). Impacts on specific counties or communities within the region, however, are not being addressed in this study. Consequently, additional research efforts should be directed towards a more focused analysis of economic impacts of reservoir recreation on specific counties and/or communities.
- To conduct an impact analysis using IMPLAN on the city of Page (or any of the other communities within the zone of impact), information is needed on visitation rates, visitor spending patterns, visitor origins, travel destinations, duration of stay, activities engaged in, and visitation frequency. The City of Page Marketing Plan (Tashiro Marketing & Advertising 1996) does provide data on some of these variables, such as origin of Page visitors, average length of stay, activities participated in, and traveling patterns (previous stops prior to arriving in Page), but does not differentiate between visitors to Page who traveled to the area primarily for purposes of reservoir recreation, or those who were on route to other destinations. For instance, while 70.5 percent of visitors surveyed stated that they participated in "sightseeing" during their stay in Page, only 44.1 percent stated that "Lake Powell" was an activity they participated in. If the other 55.9 percent of visitors to Page were not in the area because of the reservoir, it appears that the majority of tourism dollars spent in Page are not reservoir related. However, this assumption cannot be made until a visitor

survey is conducted in Page (or any other community within the zone of impact) that is administered specifically to answer this question.

River Recreation

Information necessary to complete the assessment of the impacts of reservoir related recreation on regional economies can only be obtained through intense economic analysis. This can be accomplished by contract with an consulting agency or academic institution practiced in economic modeling.

- Douglas and Harpman (1995) used IMPLAN to examine the impact of river recreation below Glen Canyon Dam (fishing and rafting), and determined that river recreation generated 585 jobs in the region. This estimate was based on 1991 visitation numbers and 1985 estimates on trip expenditure patterns, converted to 1990 dollars. Since visitation numbers, relative prices, and expenditure patterns have changed since 1985, an updated study of visitor expenditures needs to be conducted. Special focus needs to be made to determine expenditure patterns by anglers who are directly impacted by the existence of Glen Canyon Dam. In addition, the impact of Glen Canyon Dam on the economic value of river rafting needs to be further assessed. While this was done extensively (Bishop et. al. 1985; GCES 1995), the data used in previous studies were based on a series of flows within the operation of Glen Canyon Dam. Similar studies should be conducted to determine the value of rafting trips based on historical flows (i.e., prior to the construction of Glen Canyon Dam) to determine the full range of impacts that the dam has on river recreation.

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