(3) The Flow Recommendations would not be fully met as a result of operations that would increase minimum Navajo Reservoir releases from 250 cfs to 500 cfs. The target flow range (500 to 1,000 cfs) would be exceeded more frequently than under the 250/5000 Alternative, and hydrologic modeling suggests that the Flow Recommendations criteria for endangered fish flows during the spring peak period could not be met.

(4) Potentially adverse impacts would occur to Indian and non-Indian water development. Projected shortages might suggest that no additional streamflow could be developed for future uses under the 500/5000 Alternative.

(5) Potentially adverse impacts would occur to New Mexico's and Colorado's abilities to fully develop and consistently use their Colorado River Compact apportionments.

INDIAN TRUST ASSETS

This section addresses the potential impacts to Indian Trust Assets that could result from actions associated with the modified operations of Navajo Dam and Reservoir under the alternatives considered.

Issue: How would the No Action and action alternatives affect Indian Trust Assets?

Overview

Scope

The scope includes Indian trust water rights associated with Navajo Reservoir and the San Juan River and on surrounding trust/reservation lands of the Navajo and Jicarilla Apache Nations and the Ute Mountain Ute and Southern Ute Indian Tribes.

Summary of Impacts

No Action Alternative: Without ESA-related approval, future Indian water development projects in the Basin would probably not proceed as planned, and the development of several ongoing Indian water projects and settlements that have received environmental clearance could also be impacted.

250/5000 Alternative: Positive impacts would occur for projects and settlements that have received environmental clearance, and therefore this alternative has the best potential for future water development.

500/5000 Alternative: There would be occasional shortages to existing projects and settlements and less likelihood of future water development when compared to the 250/5000 Alternative.

Impact Indicators

An impact is considered to exist for any action that would

- ❑ Adversely affect the value, use, or enjoyment of an ITA
- ❑ Disregard the government-to-government relationship which exists between the United States and Indian Nations/Tribes

Introduction

The United States has a trust responsibility to protect and maintain rights reserved by or granted to Indian Tribes by treaty, statutes and executive orders. This trust responsibility requires that Federal agencies such as Reclamation take actions reasonably necessary to protect ITAs. Department of the Interior Secretarial Order Number 3215, dated April 28, 2000, further states:

> The proper discharge of the Secretary's trust responsibility requires, without limitation, that the Trustee, with a high degree of care, skill, and loyalty: Protect and preserve Indian Trust Assets from loss, damage, unlawful alienation, waste, and depletion.

The Reclamation ITA policy states that Reclamation will carry on its activities in a manner which protects ITAs and avoids adverse impacts to ITAs when possible. When Reclamation cannot avoid adverse impacts, it will provide appropriate mitigation or compensation (Reclamation, 1994).

A basic description of ITAs is as follows:

- ❑ ITAs are legal interests in assets held in trust by the Federal Government for federally recognized Indian Tribes or Nations.

- Assets are anything owned that has monetary value. The assets need not be owned outright, but could be some other type of property interest, such as a lease or a right to use something. Assets can be real property, physical assets, or intangible property rights.

- A trust has three components: the trustee, the beneficiary, and the trust asset(s). The beneficiary is also sometimes referred to as the beneficial owner of the trust asset. In this trust relationship, title to ITAs is held by the United States (trustee) for the benefit of a Tribe.

- Legal interest means there is a property interest for which a legal remedy, such as compensation or injunction, may be obtained if there is improper interference.

- ITAs do not include things in which a Tribe has no legal interest. For example, off-reservation sacred sites in which a Tribe has no legal property interest are generally not considered ITAs.

- ITAs cannot be sold, leased, or otherwise alienated without the United States' approval. While most ITAs are located on the reservation, they also can be located off-reservation. Examples of things that could be ITAs include lands, minerals, water rights, hunting and fishing rights, other natural resources, money, or claims.

ITAs have been identified for four federally recognized Tribes within the San Juan River Basin: the Navajo and the Jicarilla Apache Nations and the Southern Ute Indian and Ute Mountain Ute Tribes. ITAs that potentially would be affected by this proposed Federal action appear to be limited to water rights. The proposed action is not expected to affect any treaty-based fishing, hunting or gathering, or similar rights of access and resource use on traditional Tribal lands.

ITAs for these Tribes were examined in the 2000 Final Supplemental Environmental Impact Statement (FSEIS) for the ALP Project (Reclamation 2000a). Information from that report is used in this document.

In *Winters* v. *United States*, the U.S. Supreme Court laid the foundation for Indian water rights which have become known as Winters Doctrine rights. The Court held that the establishment of an Indian reservation carries with it an implied amount of water necessary to satisfy the purposes of the reservation. A water right granted to a Tribe under the Winters Doctrine is given a priority date no later than the time when the reservation was established and, unlike water rights permitted, licensed or adjudicated under State statutes, such rights under the Winters Doctrine cannot be lost through non-use.

Native American human remains, Native American Graves Protection and Repatriation Act (NAGPRA) cultural items, and other cultural property may be considered ITAs by association with land status, treaty or some other statute, but are not considered ITAs by virtue of NAGPRA alone. Therefore, cultural resource issues, including sacred sites and NAGPRA issues, are addressed separately in the "Cultural Resources" section in this chapter.

Affected Environment

Approximately 60 percent of the land in the Basin is entrusted to the Indian reservations of the Navajo and Jicarilla Apache Nations and the Southern Ute Indian and Ute Mountain Ute Tribes. Winters Doctrine water rights settlements have been negotiated for three of the four Tribes. Reserved water rights under the Winters Doctrine for the Navajo Nation have not been quantified or settled. The State of New Mexico and the Navajo Nation have entered formal negotiations to attempt to reach a settlement of the Nation's water rights claims to waters of the San Juan River Basin in New Mexico. Existing and future Tribal uses of San Juan River water are shown in table III-3.

A discussion of the affected environment for each Tribe follows.

Navajo Nation

The affected environment for this analysis includes much of the eastern and northern portions of the Navajo Nation (where adequate domestic water service is lacking), the lands within the NIIP service area, lands served by the Hogback, Fruitland-Cambridge, and Cudei irrigation projects, and irrigation along the tributaries to the San Juan River.

The Navajo Indian Reservation was established by treaty in 1868 (15 Stat. 667), and was expanded by Executive Orders and statutes between 1868 and 1934. The Navajo Nation lands total approximately 26,897 square miles and extend into New Mexico, Arizona, and Utah. The San Juan River runs through the original 1868 reservation, is a major source of water for Navajo Nation agricultural and domestic use, and is the only water source in the northern portion of the reservation capable of being readily developed. Basin water also is used for Tribal mineral development such as the Navajo Mine and production of coal-bed methane. About one-half of all Navajo lands lie within the Basin.

Table III-3.—Summary of major existing and future Tribal uses of San Juan River Basin water

Description	Diversion (acre-feet per year)	Depletion (acre-feet per year)	Included in environmental baseline[1] for recent ESA consultations
Existing Uses - Navajo Nation[2]			
Navajo Indian Irrigation Project (Blocks 1–8)[3]		149,420	Yes
Hogback Project		12,100	Yes
Cudei Irrigation Project		900	Yes
Fruitland		7,898	Yes
Existing Uses - Navajo Nation (New Mexico State water rights)			
Shiprock Helium Plant (permit 2472)		1,400	Yes
Kerr McGee (uranium processing) (permit 2875)		700	Yes
Kerr McGee (permit 2807)		500	Yes
Navajo Methodist School (Navajo Academy)		139.5	Yes
Existing Uses - Jicarilla Apache Nation			
Decreed for historic and existing uses, 1880 priority date	5,683	2,195	Yes
Small third party water service contracts	770	[4]770	Yes
Evaporation - Stock ponds and reservoirs		2,187	Yes
Existing Uses - Ute Mountain Ute Tribe			
Dolores Project	25,100		N/A[5]
Existing Uses - Southern Ute Indian Tribe			
Water allocated to the Tribe from the Florida River	2,000		Yes
Pine River 181.7 cfs and 1/6 interest in Vallecito Reservoir			Yes
San Juan River, 5.64 cfs direct diversion rights, 1868 priority date	1,014		Yes
Piedra River, 2.0 cfs direct diversion, 1868 priority	600		Yes
Future Uses - Navajo Nation[1]			
Navajo Nation Municipal Pipeline (ALP Project)	4,680	2,340	Yes
Navajo Indian Irrigation Project (Blocks 9–11)		120,600	Yes

Table III-3.—Summary of major existing and future Tribal uses of San Juan River Basin water (continued)

Description	Diversion (acre-feet per year)	Depletion (acre-feet per year)	Included in environmental baseline[1] for recent ESA consultations
Navajo-Gallup Water Supply Project (includes 7,500 acre-feet per year for the City of Gallup)	37,764	[2]35,893	No
Hogback Project restoration		16,420	No
Future Uses - Jicarilla Apache Nation		1,875	No
PNM Third Party Water Service Contract (pursuant to the 1992 Water Rights Settlement Act)	16,200	16,200	Yes
Water Rights Settlement Act of 1992 (from San Juan-Chama Project)	6,500	6,500	Yes
Jicarilla Apache Nation Navajo River Water Supply Project	[6]12,000	6,654	Yes
Water Rights Settlement Act of 1992 (Remaining from Navajo Reservoir or Navajo River)	[6]4,530	1,876	No
Future Uses - Ute Mountain Ute Tribe (see table I-1, ALP FSEIS for details on Colorado Ute Settlement)			
Animas-La Plata Project		16,525	Yes
San Juan River, 10 cfs direct diversion rights, 1868 priority date	1,600		No
Mancos River direct diversion rights for 7,200 acres, priority date subordinated to 1985	21,000		No
Navajo Wash, 15 cfs direct diversion rights, priority date subordinated to 1985	4,800		No
Tributary groundwater, domestic and livestock wells		1,850	No
Future Uses - Southern Ute Indian Tribe (see table I-1, ALP FSEIS, p. 1-6 for details on Colorado Ute Settlement)			
Animas-La Plata Project		16,525	Yes
Florida River, 6.81 cfs direct diversion rights, priority date subordinated to 1976	1,090		Yes
Florida River, Project water	563		No
Stollsteimer Creek, 1,850 acre-feet per year storage, 2 cfs, 3.5 cfs	1,850 +		Yes[7]
Piedra River, 8.9 cfs direct diversion, 1868 priority date	995		No
Devil Creek, irrigation of 81 acres	183		No

Table III-3.—Summary of major existing and future Tribal uses of San Juan River Basin water (continued)

Description	Diversion (acre-feet per year)	Depletion (acre-feet per year)	Included in environmental baseline[1] for recent ESA consultations
San Juan River, 2.86 cfs direct diversion rights, 1868 priority date	516		No
Round Meadow Creek, 5.4 cfs direct diversion rights, 1868 priority date	975		No
Cat Creek, 8 cfs direct diversion, 1868 priority date	1,372		No
Tributary groundwater, domestic & livestock wells	2,000		No

Note: Blank spaces indicate information not readily available.

[1] The Service's biological opinions contain a baseline of depletions that are considered in recent ESA consultations. This table is not the same as the depletion table derived for this EIS (table II-1).

[2] The Navajo Nation has existing unquantified uses in the San Juan River Basin that are not listed in the table, including municipal water uses, irrigation on San Juan River tributaries, livestock uses, evaporation from reservoirs, and stock ponds, etc. These uses are included in the baseline table in chapter II.

[3] Includes 16,420 acre-feet per year transferred from Hogback and Hogback extension.

[4] This 770 acre-feet depletion is allowed under the 3,000 acre-feet minor depletion account allowed for through ESA (Section 7) consultation under the SJRBRIP.

[5] This 25,100 acre-feet is imported from the Dolores River Basin and consumed in the Basin.

[6] The proposed diversion is a variable amount up to 12,000 acre-feet per year. The maximum new diversion will depend on the available water in that year. The Nation, as a member of the Hydrology Committee, will introduce for the Hydrology Committee's consideration, a method to calculate available water. The sum of this diversion and the remaining water settlement act water supply will not exceed 16,530 acre-feet per year.

[7] 530.6 acre-feet of the storage right and the 2 cfs and the 3.5 cfs are included in the environmental baseline for recent ESA consultations.

The Navajo Nation claims substantial quantities of water resource ITAs in the Basin, based on historic use and reserved water rights (Winters Doctrine rights). These claims are addressed in a proposed water rights settlement that was approved by the New Mexico Interstate Stream Commission and the Navajo Nation. The Navajo Nation claims a priority date of no later than 1849 for its water rights, based on the treaty made with the United States in that year (Interior, 2000a),[12] even though the reservation was not established until 1868. Because significant areas of arable Navajo lands lie within the Basin, the Navajo Nation claims a significant amount of the water in the San Juan River. This is based on the practicably irrigable acreage (PIA) standard enunciated in the Supreme Court case of *Arizona* v. *California*. The ultimate claim will depend on the results of a PIA analysis being done by the Bureau of Indian Affairs (BIA) and final adjudication of Navajo water rights in the Basin.

[12] The States of Colorado and New Mexico do not necessarily agree with the Navajo Nation's claimed priority date (Colorado Water Conservation Board letter dated April 15, 2002).

Only the NIIP, the three San Juan River projects in New Mexico[13] and a small project near Aneth, Utah, might be affected by alternative dam operating criteria. While no detailed analyses have been completed, the economics of constructing pipelines and pumping San Juan River water to many irrigation tracts or projects scattered throughout the Navajo Indian Reservation are questionable; no plans have been put forward for such pumping and it is unlikely that any such projects will be constructed in the foreseeable future.

Operating Navajo Reservoir to meet the Flow Recommendations criteria could affect existing and planned Navajo Nation water development projects as well as the Navajo Nation reserved water rights that have not been quantified. Descriptions follow for several of the largest existing and planned Indian water development projects in the Basin; however, the Navajo Nation's water development interests are not limited to these projects (Navajo Nation, 2000a).

Navajo Indian Irrigation Project.—Navajo Reservoir is the principal water storage facility for the NIIP. Public Law 87-483, enacted in 1962, authorized the Secretary of the Interior to construct, operate, and maintain the NIIP for the purpose of furnishing irrigation water to approximately 110,630 acres; the project was to have an average annual diversion of 508,000 acre-feet. The agreement between the United States and the Navajo Tribe of Indians for Delivery of Water from Navajo Reservoir, executed in 1976, repeats this authorization language from P.L. 87-483, Section 2. However, the diversion amount of 508,000 acre-feet per year was the design diversion amount for flood irrigation of 110,630 acres, a large portion of which were to be located west of Chaco Wash and from Shiprock to the north to Newcomb to the south. The NIIP was later reconfigured to place all the project acreage east of the Chaco River, which greatly reduced overall canal length and water conveyance losses for the project, and to install pressure sprinkler irrigation, which improved irrigation efficiency and reduced farm delivery requirements.

The BIA in its 1999 NIIP Biological Assessment estimated that the average annual diversion requirement for the NIIP as reconfigured is about 337,500 acre-feet if the full authorized project acreage was to be irrigated each year. A Department of the Interior, Office of the Solicitor, memorandum from the Deputy Secretary to the Under Secretary, dated December 6, 1974, concluded that under Section 2 of P.L. 87-483, the Navajo Tribe is entitled to an amount of NIIP water that would be considered reasonably necessary to irrigate the 110,630 acres, whether that amount actually turns out in the operation of the project sprinkler system to be 370,000 acre-feet, or some other figure (either greater or less

[13] Hogback, Fruitland, and Cudei Projects.

than 370,000 acre-feet); and the Navajo Tribe may use water authorized to be diverted by Section 2 only in relation to the principal purpose of the NIIP (i.e., irrigation). The Interstate Stream Commission concurs with these conclusions.

The NIIP includes a water storage and delivery system, lands, roads, utilities, and other facilities for irrigation of project lands located south of Farmington, New Mexico. The Navajo Agricultural Products Industry (NAPI) is a Tribal business enterprise formed in 1970 to develop, farm, operate, and manage the NIIP lands. Both NIIP and NAPI were established to provide profit and employment to the Navajo people. NAPI currently provides approximately 250 permanent jobs and 800 seasonal jobs.

NIIP is being developed in 11 separate blocks of approximately 10,000 acres of irrigable land each. Congress began funding NIIP construction in 1963 and the project began operation in 1976 with the first 10,000-acre block. The project was scheduled for completion in 1986, but funding delays postponed completion. In 2001, facilities to deliver irrigation water to about 65,000 acres in Blocks 1–8 were complete. The acreage through Block 8, scheduled for completion and to be in full operation by 2002, totals about 77,040 acres. Construction on Blocks 9, 10, and 11 is scheduled to be completed by 2012, with full irrigated acreage to be reached in 2032.

San Juan River Irrigation Projects.—These irrigation projects along the San Juan River were initiated between 1900 and 1937. In 2000, these projects provided irrigation water to about 5,300 acres. The diversion and delivery facilities of these irrigation projects have deteriorated, and a study by Reclamation estimated the cost of rehabilitation at $20 million.

(1) The Hogback Irrigation Project supplies water for lands on the north side of the San Juan River, from the Hogback, located approximately 9 miles east of Shiprock, to about 17 miles northwest of Shiprock. In recent years, the acreage irrigated under the Hogback Project has ranged from an estimated 2,540 acres to about 3,060 acres. In 1991, 16,420 acre-feet per year of depletion was transferred from inactive portions of the Hogback Project to NIIP for ESA consultation purposes.[14]

(2) The Cudei Project supplies water for lands on the south side of the river about 6 miles northwest of Shiprock. In recent years, the acreage irrigated under the Cudei Project has ranged from an estimated 240 acres to about 330 acres. The Cudei diversion dam was removed early in 2002, and the water supply to the project is now provided from the Hogback main canal.

[14] The 16,420 acre-feet of transferred depletion comes from both the Fruitland and Hogback Projects with an unspecified amount for each. For modeling purposes, the transfer came from the Hogback Project.

(3) The Fruitland-Cambridge Irrigation Project diversion dam and headworks are located two miles west of Farmington on the south bank of the San Juan River. In recent years, the acreage irrigated under the Fruitland Irrigation Project, including Cambridge, has ranged from an estimated 2,140 acres to about 2,380 acres. The Cambridge Irrigation Project is supplied by the Fruitland Project and is located downstream of the last Fruitland canal wasteway. The Cambridge Project canal is about 3 miles long, beginning at the end of the Fruitland Project, and in 2000 about 60 acres were irrigated in the Cambridge Project area.

Navajo Nation Municipal Pipeline.—The Navajo Nation Municipal Pipeline (NNMP) is authorized as a structural component of the ALP Project to augment a 30-year old pipeline which serves almost 60 percent of the current domestic water uses occurring along the San Juan River between Farmington and the City of Shiprock on the Navajo Reservation. The pipeline will deliver 4,680 acre-feet per year of water diverted from the Animas River to supply a depletion of 2,340 acre-feet per year (Reclamation 2000a).

Navajo-Gallup Water Supply Project.—The proposed NGWSP is currently planned by the Navajo Nation, Jicarilla Apache Nation, City of Gallup, and Reclamation, in coordination with the BIA and New Mexico. It would provide a safe, reliable, and sustainable municipal and domestic water supply to portions of the Navajo Nation in northwest New Mexico and northeast Arizona, including 43 Navajo Chapters, and the southwestern part of the Jicarilla Apache Nation reservation. The project would also serve the City of Gallup, New Mexico. Although Gallup is not located on the reservation, many Navajos live or work there. Feasibility studies for this project were authorized by Congress in P.L. 92-199, enacted December 15, 1971, and the NGWSP is currently undergoing ESA and NEPA analysis.

Reclamation is working with the Navajo and Jicarilla Apache Nations, the City of Gallup, and the States of New Mexico and Arizona to identify adequate sources of water. Parties involved in the development of the project are working to resolve issues associated with the delivery and use of Upper Colorado River Basin water diverted in the Upper Basin for use in the Lower Basin.

As currently envisioned, the project would divert 37,764 acre-feet per year from the San Juan River and deplete 35,893 acre-feet per year, including 7,500 acre-feet per year of diversion and depletion to the City of Gallup, 1,200 acre-feet of diversion and depletion for the Jicarilla Apache Nation, and 29,064 acre-feet per year diversion and 27,193 acre-feet per year depletion for the Navajo Nation. NGWSP is included in the proposed Navajo Nation Water Rights Settlement Agreement, which is supported by the Navajo Nation and the State of New Mexico.

Jicarilla Apache Nation

The Jicarilla Apache Indian Reservation was created by a series of Executive orders between 1874 and 1908. The reservation covers about 880,000 acres (1,375 square miles) in north-central New Mexico. The reservation lies in both Rio Arriba and Sandoval counties and includes 137,150 acres of land purchased by the Jicarilla Apache Nation.

About 80 percent of the reservation is on the west side of the Continental Divide in the Basin. The western boundary of the reservation is approximately 15 miles east of Navajo Reservoir. The Navajo River, which is tributary to the San Juan River, is a perennial stream on the reservation. The San Juan-Chama Project diverts approximately 52 percent of the average annual flow of the Navajo River upstream from the Jicarilla Apache Reservation. Downstream from the reservation, the Navajo Reservoir impounds water. The Jicarilla Apache Nation initially was not included as a beneficiary of either Federal water resource development project.

Settlement negotiations between the Jicarilla Apache Nation and the United States began in 1985. Central to the negotiation effort was an updated hydrology study which resulted in the Secretary of the Interior submitting to Congress a 1988 Hydrologic Determination for the Upper Colorado River Basin. According to the Hydrologic Determination, water was available within New Mexico's Upper Basin apportionment for development and settlement of the Jicarilla Apache Nation's Federal reserved water rights claims.

In October 1992, the Jicarilla Apache Tribe Water Rights Settlement Act (Settlement Act) became law (106 Stat. 2237). The water delivery provisions for future uses in the Settlement Act mandated certain requirements to be fulfilled before the water could be made available for Tribal use. All of these requirements were met, and on February 23, 1999, the Jicarilla Apache Nation water rights in the San Juan River Basin were adjudicated in District Court, San Juan County, New Mexico.

As a result, supplying project water to the Jicarilla Apache Nation under the Settlement Act is authorized by Congress, enabling the Nation to seek delivery or to market that water under the Settlement Contract (Reclamation 2000a).[15] Water to be supplied under the

[15] The Jicarilla Apache Nation has suggested that the authorized purposes of the Navajo Unit have been amended by the Settlement Act so that the Navajo Unit authorized purposes now include providing water to the Nation. While Reclamation agrees that under the terms of the Settlement Act the Secretary is authorized to provide project water to the Nation, Reclamation respectfully disagrees that the Settlement Act has created a separate and distinct project purpose. In order to create a new project purpose, the authorizing legislation for the Navajo Unit (the CRSP) must be amended. The Jicarilla Settlement Act, by its own terms, does not amend the CRSP: "Nothing in this Act shall be construed to alter, amend, repeal, construe, interpret, modify, or be in conflict with the provisions of . . . the Colorado River Storage Project Act. . ." (Jicarilla Apache Tribe Water Rights Settlement Act of October 23, 1992, section 11).

contracts with the Secretary of the Interior are of the same priority as the water rights for Navajo Reservoir and NIIP, and must share shortages with other contractors of the Navajo Reservoir Supply, including NIIP. The Settlement Act also allows the Jicarilla Apache Nation to market water through third-party contracts, consistent with Federal and State laws. Consistent with the Settlement Act, the Department of the Interior works with the Nation to facilitate use of water pursuant to the Nation's water supply contracts with the Secretary.

Under the partial final decree in the San Juan River adjudication, the Jicarilla Apache Nation has a reserved water right for historic and existing uses not to exceed an annual diversion of 5,683 acre-feet or the quantity of water necessary to supply a depletion of 2,195 acre-feet, whichever is less, and a net evaporation of 2,187 acre-feet. These water rights retain a priority date of 1880.

In addition, the Settlement Act authorizes the Secretary of the Interior to contract with the Jicarilla Apache Nation for the delivery of 33,500 acre-feet per year with a corresponding depletion of 25,500 acre-feet per year from the Navajo Reservoir supply, and 6,500 acre-feet per year of diversion (to be fully depleted from the Basin) from the San Juan-Chama Project.

A variety of development options for these water rights are being pursued by the Jicarilla Apache Nation, including third-party water leases and on-reservation water use. The Jicarilla Apache Nation has leased water to several small contractors and to the PNM. The PNM third-party lease will put to beneficial consumptive use 16,200 acre-feet of the Jicarilla Apache Nation's Navajo Reservoir contract water beginning in 2006.

The Jicarilla Apache Nation is also pursuing use of its remaining portion (approximately 1,876 acre-feet) of the 25,500 acre-feet of depletion of Navajo Reservoir water supply, including implementation of the proposed JANNRWSP. At full project development, the Nation intends to divert up to 12,000 acre-feet per year from the Navajo River, resulting in a depletion of 8,500 acre-feet per year on average. Of the 8,500 acre-feet per year average depletion, 6,654 acre-feet per year on average is considered a new depletion. The Nation plans to use 1,846 acre-feet per year of depletion on average from its historic uses under the February 22, 1999, partial Final Judgement and decree in the San Juan River Adjudication (Decree). This project has recently completed ESA compliance. The Nation is also investigating participation in the NGWSP, using 1,200 acre-feet of depletion on the Nation's Reservation and possibly contracting with the City of Gallup, allowing the city to use up to 7,500 acre-feet of depletion.

Colorado Ute Tribes

The original Ute Indian reservations were carved out of the historical Ute homelands in 1868.[16] The present lands of the Ute Mountain Ute and Southern Ute Indian Tribes are in southwestern Colorado and northwestern New Mexico. The Ute Mountain Ute lands include 890 square miles in Colorado and New Mexico and approximately 10 square miles in Utah. Southern Ute Indian trust lands include 470 square miles within the Tribe's 1,250 square miles of checkerboard reservation. Seven rivers in southwestern Colorado flow through the Southern Ute Indian and Ute Mountain Ute reservations. Given the seniority of the Tribes' reserved water rights in the San Juan and Dolores Basins in Colorado, the resolution of these reserved water rights claims was central to all water users in both basins in Colorado. The Colorado Ute Indian Water Rights Final Settlement Agreement was signed on December 10, 1986, and quantified the Colorado Ute Tribes' water rights on rivers in the San Juan and Dolores Basins in Colorado.

A large portion of the Settlement Act is being implemented by the Ute Mountain Utes through participation in the Dolores Project and by the Ute Mountain Ute and Southern Ute Indian Tribes' participating in the ALP Project; however, these two projects do not fully implement the Settlement Act. The Tribes also have water rights in other rivers that do not involve the Dolores or ALP Projects, which they are presently using or have plans to use.

No consensus was reached during what was called the Romer-Schoettler process on how to implement the Colorado Ute Indian Water Rights Settlement Act of 1988 (Settlement Act). As a result, on August 11, 1998, the Secretary of the Interior presented an Administration Proposal to implement the Settlement Act. Because the proposal represented a significant modification of the ALP Project evaluated previously, Reclamation decided that a supplemental environmental impact statement (SEIS) would have to be prepared. The SEIS resulted in the selection of a Preferred Alternative for ALP.[17] Congress subsequently authorized legislation to implement the Preferred Alternative (Title II of P.L. 106-554, the Colorado Ute Settlement Act Amendments of 2000 [2000 Amendments]). Specifically, the Preferred Alternative provides for an off-stream reservoir of 120,000 acre-feet total capacity (including a conservation pool of approximately 30,000 acre-feet per year) at Ridges Basin, a 280-cfs pumping plant, a pipeline from the pumping plant to the reservoir, and a pipeline to transport M&I water to the Shiprock area for the benefit of the Navajo Nation. Most importantly, the legislation entitles both the Southern Ute Indian Tribe and the Ute Mountain Ute Tribe to deplete up to 16,525 acre-feet per year. In addition, Congress authorized the appropriation of $4 million per Colorado Ute Tribe per year, for 5 years (2002–06), to establish a "resource fund" for each of the two Ute Tribes. The Tribes

[16] Memorandum of September 9, 1999, from the Office of the Solicitor, Washington, D.C., re Southern Ute Tribe's water rights priority date.

[17] For a detailed explanation, see chapter I, "II. Background."

will be able to use the funds, in accordance with a Secretary of the Interior approved "Resource Acquisition and Enhancement Fund," to protect, acquire, enhance, or develop natural resources of benefit to their members, including municipal water systems.

The ALP Project settles the Colorado Ute Tribes' reserved water rights claims on the Animas and La Plata Rivers, provided the ALP Project is built in a timely manner. Since the ALP Project had not delivered water as of January 2000, the Tribes originally had until January 1, 2005, to determine whether to retain their ALP Project water allocation or to commence litigation or renegotiation of their reserved water rights claims on both the Animas and La Plata Rivers. However, the 2002 Amendments provide the Attorney General the authority to amend the original Settlement Agreement and to extend the deadline for the Tribes to commence litigation of their reserved rights claims on the Animas and La Plata Rivers.

Methodology

Much of the ITA analysis was based on the review of documents concerning potentially impacted ITAs, with a focus on water rights. These documents included the 1986 Colorado Ute Indian Water Rights Final Settlement Agreement; the 1988 Colorado Ute Indian Water Rights Settlement Act; the Colorado Ute Settlement Act Amendments of 2000; the 1992 Jicarilla Apache Tribe Water Rights Settlement Act; Secretarial Orders 3175, 3206, and 3215; the proposed Navajo Nation Water Rights Settlement, various Interior and Reclamation guidelines and procedures; available economic development, water development, and natural resource management plans for the Ute Mountain Ute and Southern Ute Indian Tribes and the Navajo and Jicarilla Apache Nations; Act of June 13, 1962, authorizing the construction, operation and maintenance (O&M) of the NIIP and the initial stage of the San Juan-Chama Project as CRSP participating projects ; and the 2000 FSEIS for the ALP Project. Correspondence between the Indian Tribes and Nations and Reclamation concerning ITAs was also reviewed.

In addition, Reclamation held meetings with Tribal representatives and their legal counsel to obtain their interpretations and assessments of ITAs that could be affected by the proposed Federal action. Information about water-related issues was obtained from the Navajo Nation's Department of Water Resources and Fish and Wildlife Department, the Jicarilla Apache Nation's Water Commission and Natural Resources Department, the Ute Mountain Ute Tribe's Planning and Development Department and Environmental Programs Department, and the Southern Ute Indian Tribe's Department of Natural Resources.

Indian Trust Assets Impacts Analysis

No Action Alternative

If no action is taken by Reclamation to operate Navajo Dam and Reservoir to meet the Flow Recommendations criteria, future Indian water development in the Basin might not proceed as planned, and several existing or proposed projects could be affected as well (see below). ESA consultations could be re-initiated on several existing projects such as the ALP Project, NIIP Blocks 7–11, Jicarilla Apache Nation third-party contracts, and the JANNRWSP. It is uncertain whether the Service would issue favorable biological opinions on these projects or any other Indian water development projects in the Basin. If the water supply available from Navajo Reservoir is insufficient to meet additional future water uses pursuant to Indian water rights, this could result in negative impacts to the following Tribal water development projects and Tribal water uses:

Navajo Nation.—

- ❑ NIIP (Blocks 7–8[18] and 9–11)
- ❑ NGWSP
- ❑ Rehabilitation of the Hogback and Fruitland Projects
- ❑ Future development of Navajo Nation water rights in the Basin that have not yet been quantified
- ❑ NIIP Blocks 1–6 may require reconsultation

Jicarilla Apache Nation.—

- ❑ Contract to supply 16,200 acre-feet per year to PNM
- ❑ 770 acre-feet per year for small third-party water service contracts
- ❑ NGWSP

[18] In 1991, 16,420 acre-feet per year of depletion was transferred from the Hogback Project to NIIP for ESA compliance purposes to allow construction on NIIP Blocks 7-8 to proceed while research on endangered fish recovery took place. This water would no longer be available for use on NIIP and reconsultation would be required.

- ❑ JANNRWSP (12,000 acre-feet per year diversion)

- ❑ Other future water development to fully utilize the Jicarilla Apache Nation water rights pursuant to the Nation's contract with the Secretary of the Interior for water from the Navajo Reservoir supply.

Colorado Ute Tribes.—

- ❑ ALP Project

- ❑ Current and future development of up to approximately 38,000 acre-feet per year direct diversions provided for in the Colorado Ute Indian Water Rights Final Settlement Agreement that are not part of the ALP or Dolores Projects

The continuation of Tribal water development and uses may be put at risk if the No Action Alternative is selected, including the existing Florida River allocations and water from the Pine River and from Vallecito Reservoir. Water delivery and associated contracts from Lemon and Vallecito Reservoirs could be at some risk since there have been no ESA consultations on the operations of these projects.

Other Projects.—Also at possible risk are existing Federal projects in New Mexico that have not yet undergone ESA consultation, including the San Juan-Chama Project. The Jicarilla Apache Nation has a contract allocation for water from the San Juan-Chama Project.

San Juan Pueblo also has a contract allocation for delivery of water from the San Juan-Chama Project. In addition, an allocation of San Juan-Chama Project water is reserved for possible use in the Taos area, by exchange, to assist in negotiating a settlement of the water rights claims of Taos Pueblo. Nambe, Tesuque, Pojoaque, and San Ildefonso Pueblos also have contracts for San Juan-Chama water throughout the Rio Pojoaque unit.

250/5000 Alternative (Preferred Alternative)

The hydrology modeling results for the 250/5000 Alternative show that the Flow Recommendations could be met, including providing for all existing depletions, plus 57,100 acre-feet per year of depletion for the ALP Project and a 120,600 acre-feet per year depletion for NIIP Blocks 9–11. This would be a positive impact for the Colorado Ute Tribes and the Navajo Nation, as it fulfills requirements of the biological opinions issued for these two water development projects. This alternative also would result in a positive impact for the Jicarilla Apache Nation. It would support the delivery of 16,200 acre-feet per year to the

PNM, 770 acre-feet for other small third-party water service contracts from the Jicarilla Apache Nation's contract right to the Navajo Reservoir supply, and the JANNRWSP. The third-party water service contracts are to provide water to continue existing uses or depletions.

Positive impacts of this the 250/5000 Alternative on future Tribal water development include:

Colorado Ute Tribes

- Depletions of 16,525 acre-feet per year each by the Ute Mountain Ute and Southern Ute Indian Tribes under the ALP Project

Navajo Nation

- Depletion of 120,600 acre-feet per year under the NIIP, Blocks 9–11
- Depletion of 2,340 acre-feet per year under the ALP Project, via the NNMP
- NGWSP

Jicarilla Apache Nation

- Depletion of 16,200 acre-feet per year for a third-party contract to supply water to the PNM.
- Small third-party water service contracts
- NGWSP

Although the Service may consider other factors in future ESA consultations on water development projects (see future water development discussion in chapter II), implementation of this alternative provides the best chance to derive benefits that could include depletions for projects that currently have not undergone ESA consultation. This includes the following proposals: depletions of up to 35,893 acre-feet per year for the NGWSP; depletions of approximately 16,400 acre-feet per year for rehabilitation of the Hogback Project; full use of direct diversion rights of about 37,000 acre-feet per year pursuant to the Colorado Ute Indian Water Rights Final Settlement Agreement; full use of the Jicarilla Apache Nation's 25,500 acre-feet of depletions per year contract allocation from Navajo Reservoir; and possibly other Navajo Nation water uses depending on water rights negotiations or litigation.

500/5000 Alternative

Hydrology modeling indicates that the 500/5000 alternative would result in occasional shortages to existing and authorized water projects (including the NIIP and the ALP Project), would at times of prolonged drought in the years modeled draw Navajo Reservoir down to a level below the NIIP inlet works, and would not fully meet the Flow Recommendations criteria.[19] The 500/5000 Alternative provides less likelihood than does the 250/5000 Alternative of being able to fully proceed with future Tribal water development.

Indian Trust Assets Economic Impacts

Based on existing biological opinions, the impacts analysis in this EIS shows that alternatives that do not meet the Flow Recommendations could negatively impact the Colorado Ute Tribes and the Navajo and Jicarilla Apache Nations (Tribes and Nations). Conversely, the alternatives that meet the Flow Recommendations would have a positive impact by allowing the Tribes and Nations to develop portions of their reserved water rights and to benefit from their respective Indian water rights settlement agreements.

Depending on future biological opinions associated with ESA consultations, negative, long-term effects to Tribal water developments could occur with any of the alternatives, including the No Action Alternative. Future water uses under ESA would be addressed according to principles[20] developed by the SJRBRIP that explain and outline the process under which additional water projects and depletions will be evaluated:

> . . .The SJRBRIP will produce a list of actions defined in a long-range plan that can be implemented to assist in the recovery of the endangered fish. When ESA consultation is initiated on a new water depletion, the Service will determine if progress toward recovery has been sufficient for the program to serve as a reasonable and prudent alternative or measure. The Service will also consider whether the probable success of the SJRBRIP is compromised as a result of a specified depletion or the cumulative effects of depletions. The Service will assess the sufficiency of program actions in proportion to the potential impacts—that is, the smaller the impact of the action, the lower the level of actions by the SJRBRIP or others needed to avoid jeopardy and/or destruction or adverse modification of critical habitat. The Service will determine whether progress by the SJRBRIP is sufficient to provide a reasonable and prudent alternative. . ..

[19] The drought years 2002–03 show that this could happen under the Preferred Alternative, although not as frequently.

[20] *Principles for Conducting ESA Section 7 Consultations on Water Development and Water Management Activities Affecting Endangered Fish Species in the San Juan River Basin* (adopted by the Coordination Committee, SJRBRIP, June 19, 2001).

As stated in previous sections of this EIS, the purpose of implementing the Flow Recommendations is to conserve the two endangered native fish species and to enable water development to continue in the Basin. Currently, ESA consultations have been completed for the following activities that include development and use of Indian water rights: (1) ALP Project, (2) NIIP (Blocks 9–11), (3) Jicarilla Apache Nation third-party water contracts, and (4) the JANNRWSP. The biological opinions issued by the Service for each of the four activities include the reoperation of Navajo Dam to meet the Flow Recommendations as a requirement to avoid jeopardy to endangered fish and thus to allow the projects to proceed.

It was outside the scope of this analysis to discuss impacts of future unidentified Tribal water development past the point of acknowledging the importance of such development, as Reclamation is only analyzing those projects that have received all necessary environmental clearance to move forward. The information needed for this analysis, such as the quantification of all water rights and associated settlements and identification of reasonably foreseeable water use plans, is not available. Water rights settlements are in place for the Jicarilla Apache Nation and the two Colorado Ute Tribes. The Navajo Nation and State of New Mexico are formally negotiating to work out terms of a water rights settlement of the Navajo Nation's water right claims in the San Juan River Basin in New Mexico. A Federal negotiation team has been formed to work with the Navajo Nation and State of New Mexico.

Under the No Action Alternative, and possibly under the 500/5000 Alternative, some existing and future major economic development would be jeopardized to an undetermined extent, and additional income and employment impacts would be expected. The economic impacts for the ITAs do not include future non-binding or unspecified water development projects for Indian uses; however, estimated capital construction costs and some employment impacts are discussed.

The only alternative that meets the Flow Recommendations is the Preferred Alternative (250/5000 Alternative). It would positively benefit the above Tribes and Nations in the following ways:

ALP Project Construction

The positive impacts of this action are:

(1) The Colorado Ute Tribes will each receive $20 million ($40 million total) for water right acquisition or other development activities.

(2) Receive direct benefits from the expenditure of capital construction costs for the project and benefit from construction costs of and revenues from non-binding end uses (ALP Project, FSEIS, July 2000).

(3) Both Tribes will be able to divert 33,050 acre feet of water per year from the Animas River (66,100 acre-feet total diversion for a 33,050 acre-feet total depletion per year). Estimated annual revenue generated from water sales could exceed approximately $4,532,000.[21]

(4) The Navajo Nation would receive an annual diversion of 4,680 acre-feet from the Animas River with a corresponding depletion of 2,340 acre-feet. The estimated annual revenue generated from water sales could exceed $320,900.[22]

(5) A new pipeline, the NNMP as described in the ALP FSEIS (Reclamation 2000a), is proposed to deliver municipal water (identified in item 4, above) to the following seven Navajo Nation Chapters: Shiprock, Cudei, Hogback, Nenahnezad, Upper Fruitland, San Juan, and Beclaibito. In 2000, the estimated construction cost of this pipeline was $24 million, with associated income and employment benefits.

(6) The water supply to the Shiprock area and other ALP Project water users will enable the communities to further develop their economies.

A one-time benefit of $40 million to the Colorado Ute Tribes and a total annual dollar benefit derived from the ALP Project to the Tribes and the Nation would be approximately $4,853,000. These values do not include capital expenditures for project construction.

Navajo Indian Irrigation Project (NIIP) (Blocks 9–11)

The positive impacts of this action are:

(1) Allows for depletion of 120,600 acre-feet of water from the Basin and subsequent completion of the final three NIIP Blocks, 9–11. As stated in the "Socioeconomics" section of this EIS, projected annual gross crop revenues from completion of NIIP would exceed $32 million dollars.

(2) Benefits will also be derived from the capital construction cost for project facilities (estimated at $400 million over the next 15 years) (*Water Resource Development Strategy for the Navajo Nation*, Navajo Nation Department of Water Resources, July 2000).

[21] The $4,532,000 was calculated using a 2002 Colorado River Storage Project M&I rate of $68.57 raw water per acre-foot.

[22] The $320,900 was calculated using a 2002 Colorado River Storage Project M&I rate of $68.57 per acre-foot.

Total estimated annual dollar benefits derived from completion of NIIP Blocks 9–11 are approximately $32,729,000 (Blocks 7 and 8 would be completed and already in production; therefore, their revenues are not included). This value does not include capital expenditures for project construction or additional income and jobs that may arise as a result of vertical integration (e.g., building facilities on the reservation to process NIIP agricultural products).

Water Contracts Associated with the Jicarilla Apache Nation

The positive impacts of this action are:

(1) Being able to lease a depletion of 16,200[23] acre-feet per year through a third-party contract supplying industrial water to the PNM. Beginning in 2006, this contract will generate revenue of approximately $1,110,800[24] per year for the Jicarilla Apache Nation.

(2) Providing 770 acre-feet of water through five small, third-party water service contracts. These contracts presently generate approximately $44,200[25] per year for the Jicarilla Apache Nation.

(3) Continuing operation of the San Juan Generating Station and mine, which employs about 400 people, some of whom are Tribal members.

(4) Additional contracts are possible along with the JANNRWSP and the NGWSP.

The total annual dollar benefit derived from the Jicarilla Apache Nation water contracts is approximately $1,155,000. Annual dollar benefits to the Nation could exceed an additional $500,000 per year if it chooses to contract for the sale of 7,500 acre-feet to Gallup for Gallup's portion of the NGWSP.

The total estimated annual economic benefit that could be available to the Tribes and Nations from the development of the ALP Project, NIIP Blocks 9–11, and Jicarilla Apache Nation water service contracts, as associated with the Preferred Alternative (250/5000 Alternative), could exceed $39,237,000. This value does not include the $40 million the Colorado Ute Tribes will receive as a one-time payment. There is additional potential, when endangered fish are recovered, for economic development.

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[23] In this instance, 16,200 acre-feet of water is diverted and 16,200 acre-feet is depleted.

[24] The $1,110,800 was calculated using a 2002 CRSP M&I water rate of $68.57 per acre-foot.

[25] The $44,200 was calculated using a 2002 CRSP M&I water rate of $68.57 per acre-foot times 560 acre-feet, and a CRSP irrigation water rate of $27.53 times 210 acre-feet.

Indian Trust Assets Economic Impacts Summary

Under the No Action and 500/5000 Alternatives, the Navajo Nation's currently developed 65,000 acres (Blocks 1–8) of NIIP would not continue to receive their full water service. Additionally, Blocks 9–11, consisting of an additional 45,630 acres, could not be developed without reconsultation under the ESA. Water supply that was transferred to the NIIP from the Fruitland and Hogback Projects for completion of NIIP Blocks 7 and 8 under an earlier ESA consultation would no longer be available. This would effectively revert the NIIP to the irrigated area of Blocks 1–6 for a total acreage of 54,500, leaving the project 56,130 acres short of full development. This would result in an estimated future loss of $40.3 million in annual gross crop revenues and eliminate more than 1,000 direct and indirect employment opportunities for the Navajo Nation.

Additionally, under the No Action and 500/5000 Alternatives, the development for the ALP Project would not be able to continue without reconsultation under the ESA, potentially negatively impacting the Southern Ute Indian and Ute Mountain Ute Tribes and the Navajo Nation. This could result in a possible impact on projected water development capital expenditures, not including construction costs of and revenue from non-binding end uses.[26] Additional future losses to the Navajo Nation could also occur as a result of non-completion of the NNMP.[27] Specific details and estimates for non-completion of the ALP Project and the associated impacts to the Southern Ute Indian and Ute Mountain Ute Tribes, and the Navajo Nation are in the ALP FSEIS [Reclamation, July 2000].)

The Jicarilla Apache Nation under the No Action and 500/5000 Alternatives may not be able to continue its third-party leasing of 16,200 acre-feet of water to PNM under the current ESA consultation. This contract is currently scheduled to begin in 2006, providing annual income of $1,110,800 to the Nation. Employment of 100 Native Americans and their incomes from PNM and the coal mine could also be impacted. The additional 770 acre-feet of water being used in unspecified contracts also falls under this same ESA consultation and might not be available along with its accompanying $44,200 of annual income.

Mitigation/Environmental Commitments

As discussed in the introduction to this section of the EIS, Reclamation ITA policy states that Reclamation will carry on its activities in a manner which protects ITAs and avoids

[26] The capital expenditure amount of $203 million was determined by Reclamation in the ALP FEIS. In January 2003, the ALP cost estimate increased significantly.

[27] The capital construction cost amount of $24 million was determined by Reclamation in the ALP FEIS. In January 2003, the ALP cost estimate increased significantly.

adverse impacts to ITAs when possible. When Reclamation cannot avoid adverse impacts, it will provide appropriate mitigation or compensation (Reclamation, 1994).

Positive effects are anticipated from the Preferred Alternative; any reduction in potential negative effects to future water development would depend in part on the recovery of endangered fish and on subsequent action taken by the Service.

ENVIRONMENTAL JUSTICE

This section addresses the potential impacts to environmental justice that could result from actions associated with the modified operations of Navajo Dam and Reservoir under the alternatives considered.

Issue: How would the No Action and action alternatives affect environmental justice?

Overview

Scope

The scope includes areas of minority and low-income populations in northwestern New Mexico, southwestern Colorado, and southeastern Utah.

Summary of Impacts

No Action Alternative: Provides the least likelihood for any substantial future water development to occur and thus would hinder Tribal economic development for the area.

250/5000 Alternative: This alternative would avoid the greater impacts of the No Action and 500/5000 Alternatives because it provides the best opportunity for accomplishing future water development.

500/5000 Alternative: Under this alternative the Flow Recommendations would not be fully met and additional ESA consultation would be required, thus limiting the opportunity for future water development.

Impact Indicators

An impact is considered to exist for any action that would create disproportionately high and adverse human health and environmental effects or other negative project-related impacts to minority and low-income populations.

Introduction

Executive Order 12898, dated February 11, 1994, established the requirement to address Environmental Justice (EJ) concerns within the context of agency operations:

> To the greatest extent practicable and permitted by law, and consistent with the principles set forth in the report on the National Performance Review, each Federal agency shall make achieving EJ part of its mission by identifying and addressing, as appropriate, disproportionately high and adverse human health and environmental effects of its programs, policies, and activities on minority populations and low-income populations in the United States.

Upon signing the Executive order, the President also directed that all Federal agencies include EJ as part of the analysis associated with NEPA compliance. The Executive order on Environmental Justice requires that the responsibilities set forth shall apply equally to Native American programs. Therefore, when minority and low-income populations are discussed, Indian populations should also be included. Key indicators reviewed for Environmental Justice include income, poverty rates, and the minority population within a community. Six general principles for EJ under NEPA include:

(1) Identify minority and low-income populations in the area affected by the proposed action

(2) Consider relevant public health data and industry data regarding potential multiple and cumulative exposure of minority and low-income populations to human health or environmental hazards

(3) Recognize interrelated cultural, social, occupational, historical, or economic factors that could amplify environmental effects of the proposed action

(4) Develop effective public participation strategies that overcome linguistic, cultural, institutional, geographic and other barriers

(5) Assure meaningful community representation in the process

(6) Seek Tribal representation consistent with the government-to-government relationship between the United States and Tribal governments

Affected Environment

Within the area of effect, four low-income Tribal populations are identified: the Jicarilla Apache Nation located in northern New Mexico; the Ute Mountain Ute and Southern Ute Indian Tribes located in southwestern Colorado and northern New Mexico; and the Navajo Nation located in northwestern New Mexico, northeastern Arizona, and southeastern Utah. In addition to Tribal populations, numerous Hispanic communities live along the San Juan River.

Since this action has the greatest potential impact on Tribal communities, a discussion of the affected environment for each Tribe/Nation follows.

Navajo Nation

The Navajo reservation, established in 1868, comprises 26,897 square miles within the States of Arizona, New Mexico, and Utah, making it the largest Indian reservation in the United States. According to the Navajo Division of Community Development, in 1999 the population on the reservation was 172,399 and is expected to increase to nearly 500,000 by the year 2040 (Navajo Nation, 2000b). Between 1980 and 1990, the Navajo off-reservation population in New Mexico, Arizona, and Utah grew by 125 percent, and the Navajo population in the other 47 States grew by 71 percent, while the on-reservation population grew by only 22 percent.

A report from the Navajo Auditor General identifies coal mining as the single most important revenue generating source on the reservation, often producing 75 percent of the total annual general Tribal revenues. The balance of the economic base of the Navajo Nation relies on some manufacturing (artisan industry—for example, jewelry, rugs, and pottery), tourism, and government services.

In 1999 the Navajo Division of Economic Development reported that the median family income was only $11,885 while the U.S. median family income was more than $30,000. The average per capita income for the Navajo Nation was less than $6,200 while the per capita income for the State of Arizona was approximately $25,000. The Navajos have a high level of poverty, with 49 percent having incomes below the poverty level, and a high unemployment rate of 58 percent (Reclamation, 2000a and 2000b).

The Navajo Nation faces serious water resource problems. Many homes lack indoor plumbing. More than 50 percent of Navajo homes lack complete kitchens and

approximately 40 percent of Navajo households are without running tap water in their homes, relying solely on water hauling to meet daily water needs.

Many of the domestic water systems on the reservation are deteriorating, have reached maximum sustainable withdrawal capacity, and have poor water quality and/or are susceptible to drought. The Navajo Nation currently relies predominantly on groundwater to meet its needs (Navajo Nation, 2000b).

Water use on the reservation ranges between 10 and 100 gallons per capita per day (gpcd) depending on the availability and accessibility of the water supply. These figures contrast to an average per capita use for neighboring non-Indian communities in Arizona of 206 gpcd. Based on an annual growth rate of 2.48 percent and a per capita water demand of 160 gpcd, the total annual municipal water demand on the reservation will exceed 89,000 acre-feet by the year 2040 (Navajo Nation, 2000b).

The Navajo Nation has completed a water development strategy to provide a safe, reliable water supply for its agriculture and M&I water supply needs, and Reclamation has agreed to assist the Navajo Nation with its water development strategy.

The City of Gallup, Navajo Nation, and Jicarilla Apache Nation, in concert with Reclamation and in coordination with the BIA and other entities have proposed a water supply system (NGWSP) that would deplete up to 35,893 acre-feet per year of San Juan River water to provide for uses in Gallup, in communities on the eastern portion of the Navajo Reservation, and the southwest area of the Jicarilla Apache Nation.[28]

Jicarilla Apache Nation[29]

The Jicarilla Apache Nation encompasses about 1,375 square miles (880,000 acres) of land spanning the Continental Divide in northern New Mexico. The Tribal population is approximately 3,735 (Bureau of Indian Affairs, 1995). Principal elements of the economy include oil and gas production, timber, livestock production, tourism, hunting, and fishing. The Jicarilla Apache Nation has expanded their land holdings in recent years by purchasing several private ranches adjacent to the reservation, including a 32,000-acre ranch and hunting lodge near Chama, New Mexico (Jicarilla Apache Nation, 1999a).

[28] The State of New Mexico has not yet agreed to the depletion amount being planned by Reclamation for the NGWSP for uses in New Mexico. This subject is part of the water rights negotiations between New Mexico and the Navajo Nation.

[29] Information displayed is taken from the most currently available data provided by the Jicarilla Apache Nation Integrated Resource Management Plan (IRMP) Office, New Mexico Department of Commerce, 2000 Census, and information taken from the 1990 Census.

Reservation lands extend through western Rio Arriba County, with a small southern portion in Sandoval County. The population of the two counties increased 106 percent between 1980 and 2000.

Approximately 3,800 Indian and non-Indian people live within the reservation boundaries, according to the latest Tribal census estimates. In October 1999, the Nation listed 3,305 registered members, though between 450 and 550 currently reside off the Reservation.

The percentage of the reservation population under age 18 is 45.3 percent, while 29.5 percent of the total New Mexico State population is under age 18. The percentage of the population above the age of 65 on the reservation is 2.7 percent, compared to 10.8 percent for the entire State. The ratio of females to males of the reservation population is similar to that of the entire State. The growth rate is estimated at 13.9 percent in Rio Arriba County and 16.3 percent in Sandoval County. The projections indicate an average growth rate of 1.38 percent per year and a total growth of about 40 percent over the 40-year period from 1990 to 2030.

Median household and per capita income for residents of the reservation are $25,000 and $6,600, respectively. These figures are low compared to the State of New Mexico and the two counties, while unemployment on the reservation is much higher. Unemployment on the reservation is slightly over 40 percent, compared to about 6 percent for the State. The percentage of residents below the poverty level approximates 31 percent on the reservation, compared to 20 percent for New Mexico.

Major deficiencies exist with regard to adequate and sufficient water supplies available to residents of the Jicarilla Apache Nation. The existing municipal water system for the Town of Dulce is outdated and dilapidated, and it cannot adequately and safely serve the existing and future needs of the Jicarilla Apache Nation. This lack of a reliable potable water supply impedes economic development and has detrimental effects on the quality of life and economic self-sufficiency of the Jicarilla Apache Nation. Reclamation and the Jicarilla Apache Nation have developed plans to provide a more adequate water supply (Reclamation, 2000).

Colorado Ute Tribes

Ute Mountain Ute Tribe.—The Ute Mountain Ute Reservation is composed of more than 890 square miles (569,000 acres) in southwestern Colorado, northern New Mexico, and southeastern Utah. Ute Mountain Ute Tribal enrollment in 1997 was 1,943, with the majority of the members living on the reservation in Towaoc (population 1,343 in 1998) and the White Mesa community (population 289 in 1998). The Tribal census shows that

73 percent of members are 34 years of age or younger. Most recent employment analyses indicate a potential resident employable population of 813 people, of whom 498 are employed, leaving a current unemployment rate of 39 percent (Reclamation, 2000a).

Tribal resources include income from oil and gas wells and Tribal enterprises that revolve around tourism, including a gambling casino, agriculture, an RV park, an archaeological park, and a pottery factory. The Tribe employs over 900 people in its enterprises and is a major contributor to the regional economy (Reclamation, 2000a).

Southern Ute Indian Tribe.—The Southern Ute Indian Reservation encompasses an area of more than 450 square miles (288,000 acres) in La Plata and Archuleta Counties, Colorado. Tribal headquarters are located adjacent to the town of Ignacio.

The Tribal enrollment in 1997 was 1,330, with the majority of members living on the reservation in La Plata County. The Tribal census shows that 38 percent of the membership is under 20 years of age and 76 percent is under 40 years of age. Natural resources on the reservation include extensive gas reserves, coal, timber, and water for agriculture. These resources provide the basis for the establishment of a diversified Tribal economic base.

Tribal energy resources in the form of natural gas have played the largest role in the reservation economy over the past decade (93 percent of Tribal revenues in 1994 came from energy resource development) (Reclamation, 2000a).

The reservation's proximity to Durango and other tourist destinations in southwestern Colorado allows for tourism development. The reservation land includes part of the Navajo State Park, Lake Capote, and the Sky Ute Casino and Motel. The Tribe sponsors casino gaming, cultural tours, fishing, hunting, and the Tribal Cultural Center and Museum. These enterprises play a role in diversifying the overall economy. The Southern Ute Indian Tribe employs more than 1,000 people and is a significant contributor to the regional economy (Reclamation, 2000a).

Methodology

An action that creates disproportionately high and adverse human health and environmental effects or other negative project-related impacts, such as might result from reducing available water supplies, on minority or low-income populations, would be considered significant. Also, an action which disregards the government-to-government relationship which exists between the United States and Tribes may be considered significant under EJ principles.

The principal EJ issue identified in this EIS is the amount of dependable water supply in the Basin available to maintain existing Tribal uses and meet Tribal water development needs. Since the action alternatives do not impact the Hispanic acequia communities more than this impacts the general community, Hispanic and non-Hispanic communities were accorded the same level of analysis.

Information for the descriptions and impact assessments related to EJ was obtained from U.S. census records, Tribal documents and discussions with Tribal representatives.

Also, the San Juan Basin hydrologic model was used to assess the Flow Recommendations criteria and to analyze the effects of the ALP Project, and also to analyze the effects of modifying the operating rules for Navajo Dam to mimic a natural hydrograph for the benefit of endangered fish. A more detailed model is being developed that can be used to assess the Flow Recommendations as more information is learned about the San Juan River and the endangered fish.

Environmental Justice Impacts Analysis

Any potential adverse impacts would be expected to be shared equally by all races and income groups. Environmental Justice issues were analyzed for the Navajo Nation, the Jicarilla Apache Nation, and the Colorado Ute Tribes.

Economic development is critical on all four reservations in order for the Tribes to maintain their cultures and provide economic opportunities on the reservations for Tribal members. In order to have economic development occur, a safe and reliable water supply is key. Formulation of an alternative that will aid in ESA compliance is critical in order to allow some Tribes to maintain their adequate water supply while aiding other Tribes in obtaining an adequate supply. The following is a summary of how each alternative would affect the continued development of a adequate water supply for each of the Tribes.

No Action Alternative.—The No Action Alternative provides the least likelihood of any substantial future Tribal water development occurring, because further development of water from the San Juan River would be difficult to do, as Flow Recommendations would not be met and ESA compliance may be difficult to obtain. This could hinder the economic development for all four Tribes.

250/5000 Alternative (Preferred Alternative).—The 250/5000 Alternative provides the best opportunity for accomplishing future Tribal water development. This alternative

would avoid the greater impacts of the No Action and 500/5000 Alternatives to ITAs; it would do so by providing for some future Tribal water development while meeting flow and habitat needs of endangered fish species, thus providing for ESA compliance for further water development.

500/5000 Alternative.—The 500/5000 Alternative provides greater opportunity for future Tribal water development than the No Action Alternative, but less opportunity than the 250/5000 Alternative because Flow Recommendations would not be fully met and existing ESA consultation would be affected.

AQUATIC RESOURCES

This section addresses the potential impacts to aquatic resources that could result from actions associated with the modified operations of Navajo Dam and Reservoir under the alternatives considered.

Issue: How would the No Action and action alternatives affect aquatic resources?

Overview

Scope

The scope includes non-native (game and non-game fish) and native fish in both Navajo Reservoir and in the San Juan River from Navajo Dam to Lake Powell.

Summary of Impacts

No Action Alternative: The reservoir fishery and the downstream tailwater trout fishery would be maintained similar to the fisheries established during operations that occurred from 1973–91. Under this alternative, however, downstream native fish populations would be negatively impacted in a manner similar to what occurred during that time frame.

250/5000 Alternative: Would result in minor impacts to aquatic life in the reservoir. This alternative would significantly reduce trout habitat from Navajo Dam to the end of the Quality Waters section (4.4 miles below the dam). The related reduction in trout numbers within the Quality Waters would be

somewhat less than the impact to habitat but nevertheless significant. Below the Quality Waters section to the Hammond Diversion the trout fishery would also be impacted by loss of physical habitat and a deterioration in water quality. Physical habitat reductions for native fishes would occur from the Hammond Diversion to the Animas River. Below the Animas River confluence, beneficial effects would occur to native fish including the federally protected Colorado pikeminnow and razorback sucker. Flexibility, which would be used in the interim to increase minimum releases, as discussed in chapter II, would reduce impacts to aquatic resources.

500/5000 Alternative: Would have the largest impact on the reservoir fishery, assuming use of the depletions identified in the analysis of the action alternatives. However, it would maintain the existing tailwater trout fishery while having some benefits to native fish populations (e.g., flannel-mouth and bluehead sucker).

Impact Indicators

For Navajo Reservoir, failure of reproduction and recruitment of resident warmwater game fish and associated reduced angler catch rates would constitute indicators. For the downstream tailwater trout fishery, a long-term loss of adult trout populations and/or a reduction of usable trout habitat of greater than 20 percent would be considered an adverse impact. In addition, a reduction in trout health of greater than 20 percent associated with changes in flow would be considered a significant adverse impact. The same threshold has been assigned to impacts on native fish populations and their habitat. In addition, within the trout fishery extending to the Hammond Diversion, a deterioration of water quality conditions to the point that trout could not survive would also be an indicator.

Affected Environment

Navajo Reservoir

Game Fish.—A wide variety of game fish[30] occur in Navajo Reservoir to satisfy recreational fishing demand, including both warm and coldwater species. None of the

[30] Game fish are species of fish listed by the State as having recreational value in terms of a desire by anglers to catch them; game fish are protected by State fishing regulations.

game fish identified below are endemic to the San Juan River Basin; they were specifically introduced to Navajo Reservoir to establish a recreational fishery. Warmwater species include both smallmouth (*Micropterus dolomieu*) and largemouth bass (*Micropterus salmoides*), bluegill (*Lepomis macrochirus*), green sunfish (*Lepomis cyanellus*), black crappie (*Pomoxis negromaculatus*), white crappie (*Pomoxis annularis*), channel catfish (*Ictalurus punctatus*), black bullhead (*Ictalurus melas*) and northern pike (*Esox lucius*). Yellow perch (*Perca flavescens*) are also relatively common in Navajo Reservoir and have been sampled from the Piedra River upstream of Navajo Reservoir (Steve Whiteman, personal communication, 2000).[31] Coldwater species primarily include rainbow (*Onchoryhnchus mykiss*) and brown trout (*Salmo trutta*) and kokanee salmon (*Onchorhynchus nerka*).

Currently, the only fish routinely stocked in Navajo Reservoir are rainbow trout and kokanee salmon. Populations of the other species are maintained through natural reproduction and recruitment. Successful reproduction and recruitment[32] are strongly associated with seasonal reservoir drawdowns, especially during the spring and early summer. Excessive, rapid drawdowns occurring after the eggs are deposited can result in exposing the eggs to the air, causing dessication. Historically, the operation of Navajo Reservoir has varied, allowing for some years to be better game fish recruitment years than others, particularly for crappie and smallmouth bass, which are adversely affected by drawdowns more than the other species.

Drawdowns can also have an adverse impact on crayfish, the main forage base in the reservoir, especially during periods in the winter when they are dormant. Drawdowns during this time frame can expose burrows to the atmosphere leading to the dessication of the crayfish in exposed burrows. Operation of Navajo Reservoir to benefit downstream native fish populations since 1991 has better stabilized reservoir levels in the spring, benefitting warmwater fish reproduction in the reservoir. Because there are no significant populations of non-game forage fish in the reservoir, predation on other game fish by fish at higher trophic levels, such as the northern pike, is common. Bluegill, yellow perch and crappie are all preyed upon by predatory fish.

Nongame Fish.—Non-game fish are those fish species not specifically listed by the State as a game species and comprise both native and non-native fish species.[33]

[31] Yellow perch were either accidentally or illegally stocked in the reservoir as they have never been purposely stocked by the NMDGF.

[32] Recruitment is providing suitable habitat conditions that allow a given species to survive to reproductive age.

[33] Native fishes are those fish that naturally occurred within the San Juan Basin. Non-natives are those that were introduced into Navajo Reservoir either purposely or accidentally from other river drainages.

Native Fish.—A few native fish can be found in portions of Navajo Reservoir associated with major tributaries (Pine, Piedra and San Juan Rivers.) The more common native fishes found in these areas are the flannelmouth sucker (*Catostomus latipinnis*), bluehead sucker (*C. discobolus*), and the roundtail chub (*Gila robusta*). The roundtail chub, although not federally protected, is listed as endangered by the State of New Mexico and is also protected within the Southern Ute Indian Tribal Reservation. The roundtail chub was one of the most common fishes collected from Navajo Reservoir within the first few years after the dam began filling in the mid- 1960's (Olson and McNall, 1965.) It is now rarely collected, suggesting that much of its reproductive habitat was destroyed by the reservoir.

Non-Native Fish.—Several non-native fish species occur in Navajo Reservoir or the drainages feeding it. The two most common species of non-native fishes in the reservoir are common carp (*Cyprinus carpio*) and white sucker (*Catostomus commersoni*). Both of these fishes compete with game fish and native fish for food and habitat and directly impact other fish species by feeding on their eggs.

San Juan River-Navajo Dam to Animas River

Navajo Dam to Archuleta, New Mexico.—Within this reach, non-native fishes impacted would include coldwater species such as rainbow and brown trout, and warm-water species such as common carp, mosquitofish (*Gambusia affinnis*) and fathead minnow (*Pimephales promelas*). The last three occur in a unique wetland complex immediately below the dam. Because of the cold water releases from Navajo Reservoir, native fish populations are rare within this river reach.

The 6.6-mile stretch of river between the dam and Archuleta provides near optimum habitat for trout and other coldwater fish species. The State of New Mexico has designated the first 4.4 miles as the Quality Waters (also termed Special Regulation Waters) section. Below this section, sediment deposition and seasonally elevated water temperatures begin to degrade trout habitat, resulting in fewer trout as the river flows downstream.

Within the Quality Waters section, the rainbow trout population is largely maintained through the routine stocking of fingerling fish (three to four inches in length) by the New Mexico Department of Game and Fish (NMDGF), although limited successful natural reproduction by both rainbow and brown trout has been documented. The relatively common brown trout that persist in this section of river, mostly downstream of Texas Hole (1.5 miles below Navajo Dam), are the result of natural reproduction, since they have not been stocked for several years. Rapid trout growth rates in this section of river are due to the high productivity of the deep water releases through Navajo Dam. Aquatic

macroinvertebrates inhabiting this reach of river, while not overly diverse, are extremely dense, providing an excellent trout food base that results in elevated trout growth rates. (Reclamation, 1998; Sublette, 1977).

Whirling Disease was confirmed in the Quality Waters section in 1999. The presence of this parasite (*Myxobolus cerebralis*) in the system has necessitated the stocking of larger rainbow trout fingerlings (greater than five inches in total length). At this size, they are more resistant to the adverse effects of this parasite. To date, there have been no observable adverse effects within the Quality Waters section to trout due to the effects of the disease.

Archuleta to Hammond Diversion.—Downstream of Archuleta, trout habitat is reduced because of sediment deposition from numerous intermittent tributaries, water depletions caused by water diversions, and seasonally elevated water temperatures. Aquatic insect diversity increases in this reach. To supplement fishing demand, the NMDGF stocks catchable-size rainbow trout at several points along the river although most stocking occurs near Archuleta. Brown trout populations comprise a higher percentage of the overall trout population due to higher successful natural reproduction. As the river nears the Hammond Diversion, 16.4 miles downstream of Navajo Dam, the fish fauna is composed primarily of native fishes, although recent data show a decline of native fish in this reach may be occurring (Wethington and Wilkinson, 2003). The dominant native fishes include flannelmouth and bluehead suckers, although non-natives such as the common carp can also be found.

Hammond Diversion to the Animas River.—This 27.2-mile section of river provides marginal trout habitat due to the same limiting factors described above. Changing water quality conditions favor native fish species, but population numbers are limited due to the effects of several water diversions. In addition, agricultural return flows increase in this reach, elevating salinity levels and other water quality constituents. Non-native fishes are also common within this section of river including channel catfish and common carp and to a lesser extent white sucker. Smaller non-native fishes such as fathead minnows, mosquitofish, and plains killifish (*Fundulus zebrinus*) also occur.

San Juan River-Animas River to Lake Powell

This approximate 180-mile section of the San Juan River maintains the most natural hydrologic conditions downstream of Navajo Dam, primarily due to the influence of the Animas River. This section of river includes designated critical habitat as defined under the ESA for the federally protected Colorado pikeminnow *(Ptychocheilus lucius)* and razorback sucker *(Xyrauchen texanus)*. The Flow Recommendations were prepared to aid recovery of these endangered fishes in this section of the river. Since 1991, flows downstream of the Animas River confluence have been altered to more closely mimic a natural hydrograph.

Due to the lack of adult Colorado pikeminnow and razorback sucker, a biological response associated with a change in flow patterns from these species has not been measured (these species are discussed in more detail under the "Special Status Species" section). A program of stocking both Colorado pikeminnow and razorback suckers has been started on the river.

The relative effect of the test flows after 1991 on other native fishes, especially the bluehead and flannelmouth sucker, was not conclusive, although studies conducted under the SJRBRIP have shown that catch rates of adult native suckers declined after 1991, but increased in the last few years. The roundtail chub is also known to inhabit this section of river; however, it is considered to be rare. Denser populations of roundtail chub occur in tributaries of the San Juan River below Navajo Dam, primarily within the La Plata and Mancos Rivers.

Non-native species such as the channel catfish and common carp also are common within this section of the San Juan River; other smaller non-native fishes include the fathead minnow, mosquitofish and, to a lesser extent, the plains killifish. Most often these species of fish are associated with backwater and low velocity habitats. An ongoing program under the SJRBRIP within this section of river is the removal of non-native fishes, in particular channel catfish and common carp. The eventual reduction in numbers of these fishes will be beneficial to native fishes by reducing predation and indirect competition.

Additional information on the fish community of the lower San Juan River can be found in a Service publication on 1991-1997 monitoring (2000b).

Methodology

Existing literature on the potential impact of fish species occurring in the San Juan River was reviewed, and State, Federal, and private biologists were consulted. In addition, several studies were conducted to better describe both the existing ecological and habitat conditions and the impacts associated with implementing the alternatives. When it was not possible to measure impacts, models were developed to estimate impacts to both Navajo Reservoir fluctuations and downstream flow changes. The output from these models enabled Reclamation to predict the effect various alternatives would have on warmwater fish recruitment in Navajo Reservoir and trout habitat within the Quality Waters section.

Impacts Analysis

No Action Alternative

Navajo Reservoir.— Under the No Action Alternative, the reservoir would remain at relatively higher elevations and water level fluctuations during criterial spawning times

would generally be less than those of the action alternatives. During spring releases, the volume of water released would be less than predicted under either the 250/5000 or 500/5000 Alternatives. Therefore, the impact to newly deposited eggs by warmwater fish and to young-of-the-year fishes would be minimized.

San Juan River – Navajo Dam to Archuleta, New Mexico.—Base flows would be higher than 500 cfs and spring releases would be managed for longer durations but at levels more often less than 5,000 cfs (see tables II-4 and II-6 in chapter II). Trout habitat below the dam is optimized at about 1,200 cfs (VTN, 1978.) Although relatively rarely maintained at, or near, this level, flows provided downstream of the dam would generally provide more usable physical habitat than the action alternatives. Also, water quality conditions favoring coldwater fishes, especially maintaining colder water further downstream during the summer, would more often occur under this alternative.

San Juan River – Archuleta to Hammond Diversion.—Under the No Action Alternative, a minimum flow of 500 cfs would be maintained; however, excess water in the reservoir would be released over a longer period of time, resulting in flows somewhat higher than 500 cfs throughout the year. This would also result in lower-magnitude spring releases. The trout fishery would benefit from this flow pattern. Although more physical habitat would be provided for native fishes downstream of the trout fishery, colder water temperatures would likely have some adverse impact to native fish populations within this portion of the river.

San Juan River – Hammond Diversion to Animas River .—As described above, this section of river has a relatively large population of native fishes. The habitat that is provided for these native fishes, especially suckers, is considered to be an important component of the overall native fish habitat in the San Juan River. Although spring peak releases would be diminished under this alternative, higher base flows occur throughout the remainder of the year. These higher base flows would provide more available usable aquatic habitat for adult native fishes compared to the action alternatives because periods of low flow would be reduced. Few trout occur within this section of river, providing a modest fishery resource to relatively few anglers. Elevated seasonal water temperatures severely limit the extent of the trout fishery resource although this alternative would provide higher flows throughout the summer compared to the action alternatives.

San Juan River – Animas River to Lake Powell.—Trout are not a resource issue within this section of river due to water quality changes. Seasonal high water

temperatures, radical flow fluctuations, and high water turbidity all combine to make this section of river undesirable for trout. Implementation of the No Action Alternative would not appreciably affect these limiting factors.

This reach includes designated critical habitat for the Colorado pikeminnow and the razorback sucker. Non-native fishes, especially channel catfish, are known to impact these two endangered fishes. Non-natives are, therefore, considered undesirable. Implementation of this alternative would likely have a more favorable effect on non-native fishes than would the action alternatives because it does not attempt to mimic a natural hydrograph in the San Juan River downstream of the Animas River. In general, native fishes do not respond favorably to radical departures from natural flow patterns, and flows modified to a more natural pattern provide less favorable conditions for non-natives.

Native fishes within this reach would likely be adversely affected by returning to the flow regime provided prior to 1991 since it does not provide a more natural flow regime.

250/5000 Alternative (Preferred Alternative)

As discussed in chapter II, there is flexibility in irrigation season releases under the Preferred Alternative. This would reduce impacts in the San Juan River during an interim period; however, impacts discussed below are expected to occur in the long term.

Navajo Reservoir.—Implementation of the Preferred Alternative would result in minor impacts to aquatic life in Navajo Reservoir. Impacts to the reservoir's fishery are associated with rapid drawdown, occurring in the late spring. These rapid drawdowns would impact fish reproduction by exposing their eggs to the atmosphere causing dessication. The volume of water released during controlled operations in the spring would not normally cause an increase in the incidence of egg exposure and a reduction in game fish reproductive habitat unless inflow to the reservoir was well below normal. This impact would also occur under both the No Action and 500/5000 Alternatives.

San Juan River – Navajo Dam to Archuleta, New Mexico.—For the purpose of this discussion, it is assumed that flow reductions below the current minimum flow of 500 cfs would be implemented immediately after the Record of Decision is finalized. The 250 cfs minimum release from Navajo Dam proposed under the Preferred Alternative could occur at any time of the year. The resulting impacts to the downstream aquatic resources can be described as either chronic (long term) or acute (short term). Long-term impacts

would be related to changes in physical habitat, fish health, water quality, and trout food availability. Native fish are not commonly found in this segment of the river because of cold water temperatures resulting from releases from the dam.

Any reduction in flow below the current 500 cfs minimum release from Navajo Dam would result in the reduction of usable physical habitat for trout. In the Quality Waters section, average water depth would be reduced by 4 ½ inches and river surface area reduced by 5 to 10 percent when minimum releases dropped from 500 to 250 cfs. Based on the results of a trout habitat model applied that simulates available trout habitat associated with flow, it is estimated that when 500 cfs and 250 cfs flows are compared, as much as 30 percent of the adult trout habitat would be lost between the dam and Texas Hole (a 1.5-mile reach) and 37 percent of the adult trout habitat would be lost from Texas Hole to the end of the Quality Waters section near Archuleta, New Mexico (4.4 miles).[34] See table II-6 for information on the frequency of 250 cfs flows and the frequency of flows over 500 cfs for this alternative. It should be noted that reducing flows to 250 cfs in the irrigation season (March to October) will not occur as frequently as shown until water demands or additional water development within the Basin requires it. Irrigation season habitat losses would be reduced by approximately half when releases were increased from 250 to 350 cfs. Between the Quality Waters section and Archuleta, also known as the Regular Waters section, similar flow reductions would be expected.

The reduction in usable physical habitat would not immediately impact trout populations. A corresponding decrease in population numbers would take months or years and would most likely not be in direct proportion to the loss in habitat. For that to occur, the adult trout population impacted would need to be at, or near, carrying capacity. It is concluded that although the actual loss to the trout population would be less than the projected loss of trout habitat, this loss would still be above the 20 percent threshold considered adverse. Also, the data gathered during the 1996-97 and 2000-01 trout health assessment showed that both condition factors (length to weight ratio) and tissue lipid content were not statistically different in trout tested at the 500 cfs release as opposed to the 250 cfs release. Therefore, an overall trout health index did not show major differences in trout health and, in particular, these two key indices strongly support the conclusion that trout were not overly stressed during the 4-month 250 cfs winter flow test.

Other studies were initiated commencing in 1996 to assess potential impacts to the downstream aquatic community. Within this section of river, studies focused on potential effects to the tailwater trout fishery as a result of a 250 cfs dam release. Among these were a trout health assessment conducted during the 1996-97 Winter Flow Test (Winter Flow Test).

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[34] Original habitat analysis is recorded in a Reclamation (1998) report. The 1998 report indicated a 24 percent reduction in trout habitat above Texas Hole and a slight increase downstream from Texas Hole when flows are reduced from 500 to 250 cfs. This analysis has been updated to better reflect habitat suitability (Valdez, 2002). The new analysis showed increased impacts on trout habitat. Reclamation believes that the new analysis more accurately reflects impacts on habitat.

A significant difference in trout health was noted between the two studies. A similar trout health assessment was completed during the winter of 2000-2001 to assess trout health associated with a 500 cfs dam release.

There were no readily discernible differences in several parameters of trout health associated with the two flows tested. This strongly indicates that trout populations associated with a 500 cfs release were, and likely continue to be, at levels less than absolute carrying capacity, meaning that trout populations were not over-crowded during the four-month 250 cfs release.

Also, during the Winter Flow Test, changes in macroinvertebrate levels were monitored and even though a 35 percent reduction in macroinvertebrate numbers was measured there was not, as stated above, significant reduction in trout condition as assessed monthly throughout the four-month test period. This would indicate that macroinvertebrate numbers were not a limiting factor to trout within this section of river (Reclamation, 1998).

It has been documented that angling can have a significant adverse effect to trout populations. (Bouck and Ball, 1966; Schill, et al, 1986; Nuhfer and Alexander, 1992). While no site specific studies have been conducted within the San Juan River Quality Waters section, angling is believed to be the single largest source of mortality to the San Juan River trout population. It was noted and observed that during the 1996-97 and 2000-01 trout health assessments a majority of the adult trout sampled showed signs of hooking damage associated with angling. Trout in this section of the river are subjected to repeated stress as a result of catch-and-release fishing, which will result in some trout mortality.

In summary, and compared to a 500 cfs release, chronic trout habitat reductions resulting from a 250 cfs release are projected to be up to 30 percent greater (above Texas Hole) and 37 percent greater (below Texas Hole); these reductions are considered to be significant adverse impacts.

The reduced available trout habitat associated with a 250 cfs release under this alternative could be potentially offset by increasing physical habitat independent of flow. This could be done by increasing pool habitats and/or placing structure in the river to increase the availability of trout habitat. The greatest opportunities for this habitat restoration work are between Navajo Dam and Texas Hole.

Acute effects to the trout fishery are associated with a rapid onset of adverse conditions that would have an immediate lethal impact. Two examples are trout stranding and rapid deterioration in water quality conditions. Trout stranding was assessed in the 1996-97 Winter Flow Test and again during the Summer Low Flow Test conducted in July 2001. In neither case was it deemed a significant loss. Within this section of the river, none of the water quality parameters measured during either the winter or summer test flows exceeded

tolerance limits for trout. Based on results of the Summer Low Flow Test, it was assessed that there were no discernible acute impacts to the trout fishery associated with a 250 cfs dam release.

San Juan River – Archuleta to Hammond Diversion.—Additional flow reductions downstream of Archuleta would further reduce available physical habitat for trout. Citizens Ditch, located 1.3 miles downstream of Archuleta, may divert up to approximately 160 cfs. At times when releases from Navajo Dam would be reduced to 250 cfs, this could leave, at a minimum, 90 cfs in the river downstream of Citizens Ditch. Although this section of river has not been modeled to provide habitat/flow relationships, visual observations indicate available physical habitat would be severely diminished as documented during the Summer Low Flow Test (Reclamation, 2002).

This section of river was monitored intensively during the Summer Low Flow Test to determine whether trout stranding and water quality degradations occurred. During the Summer Low Flow Test, flows below Citizens Ditch were measured at 134 cfs, no fish stranding was observed and water quality for trout was adequate but approached levels that were marginal.

In the future, flows that bypass the Citizens Ditch may at times be less than the measured 134 cfs. Some water quality parameters could exceed tolerance limits for trout. For example, dissolved oxygen levels, especially during night time periods, and daytime elevated water temperatures might result in conditions lethal to trout. If so, much of the trout fishery downstream of Citizens Ditch could be lost. In addition, high sediment inflow would be diluted less by the lower flows that occasionally occur in this reach. If this were to occur, the short-term potential impacts to trout within this section of river could only be mitigated by providing additional flow to offset deteriorating water quality. Interim increased releases, as included in the proposed plan, will reduce impacts in the short term.

Non-native, non-salmonid fish, such as common carp, mosquitofish and fathead minnows, within this section are generally considered to be an undesirable part of this ecosystem, and have an adverse effect on native fishes. Thus, any adverse impacts to these fishes are considered acceptable.

Native fishes including the bluehead and flannelmouth sucker are known to occupy this reach. It is a transitional area and their numbers are not nearly as high as in other reaches further downstream. They are considered to be highly tolerant of changing habitat availability both physically and qualitatively. It is unlikely they would be impacted by a 250 cfs release from Navajo Dam. It should also be noted that the Hammond Diversion is a physical barrier to fishes attempting to migrate upstream. Physical passage is not a flow-related issue.

San Juan River – Hammond Diversion to Animas River.—Within this reach of river, especially during summer periods, the usable habitat for trout, both quantitatively and qualitatively is degraded, both naturally and man-induced, to the point that trout are not a viable fishery resource. This area would be additionally impacted by reduced dam releases to 250 cfs, but the additional resulting loss of trout habitat would not be considered adverse.

Native fishes within this area can be found in high numbers. In particular, it is considered one of the more important sections of the river in terms of percentage of native fish numbers. Water quality changes associated with reduced flows probably would not impact the native fishes present since native fishes are more tolerant of higher water temperatures and lower dissolved oxygen levels. During the Summer Low Flow Test, sampling of an array of water quality parameters did not indicate that water quality associated with reduced flows would adversely impact natives fishes. Reduced flows and associated physical habitat loss would likely reduce native fish populations and may also impede these fishes' ability to move freely within this section of river. Under a worst-case scenario, at the upper end of this reach, summer flows as low as 60 cfs or less could occasionally be expected. For native fish populations in this reach, the only effective way to reduce impacts associated with reduced flow would be to increase flow. In the interim period during the irrigation season, these flows may be increased by 100 cfs, and this could reduce impacts.

The non-native, non-salmonid fish within this section are generally considered to be an undesirable part of this ecosystem and are also not overly abundant. Any impacts to these species are determined to be minimal. Their presence has both indirect and direct adverse effects on native fish species so they are considered to be undesirable.

San Juan River – Animas River to Lake Powell.—Trout are not a resource issue within this section of river due to existing water quality conditions. Implementation of the Preferred Alternative would, therefore, have no additional adverse effect on trout within this section of river

The non-native, non-salmonid fish, such as common carp and channel catfish, are commonly found throughout this section of river. This river reach includes designated critical habitat for both the Colorado pikeminnow and the razorback sucker. The occurrence of several non-native fishes in this reach has both direct and indirect impacts to these two endangered fishes and they are, therefore, considered undesirable. Implementation of the 250/5000 Alternative may have an adverse impact on some non-native fish populations, such as the common carp and red shiner, by creating physical changes in the aquatic habitat that inhibit successful reproduction and/or recruitment. A more natural hydrograph occurs as a result of a relatively natural flow regime from the Animas River combined with modified releases from Navajo Dam.

Other non-endangered native fish populations are also assumed to benefit in this section of river as a result providing a more natural hydrograph. Of these, flannelmouth and bluehead suckers should benefit the most of all of the non-endangered native fish present.

500/5000 Alternative

Navajo Reservoir.—Impacts to the reservoir's fishery, primarily in terms of reproductive success, would be greater than those described under the 250/5000 Alternative, because average water levels would be approximately 5 feet lower and reservoir level fluctuations higher under the 500/5000 Alternative.

San Juan River – Navajo Dam to Archuleta, New Mexico.—Under the 500/5000 Alternative, flow released from the dam would remain essentially the same as flow that has been released since 1991. Although trout habitat below the dam would not as often experience the benefits of flows between 500 and 1,000 cfs, as compared to the No Action Alternative, an excellent trout fishery would be retained for several miles below the dam. However, under certain conditions insufficient water supply may exist in Navajo Reservoir necessitating releases below 500 cfs which would have a detrimental effect to the trout fishery. These conditions include full development, use of the depletions identified in the analysis of the action alternatives, and very infrequent extended drought periods.

San Juan River – Archuleta to Hammond Diversion.—In terms of the physical habitat provided, fish populations would benefit from this alternative as opposed to how it would be operated under the Preferred Alternative due to higher flows. This benefit could be somewhat offset because of the cooler water temperatures occurring further downstream that, although not lethal to native fishes, could negatively impact natural reproduction. Nevertheless, the increase in usable physical habitat is believed to be a greater benefit than the possible adverse effects of cooler water temperatures. Therefore, this alternative, as well as the No Action Alternative, would likely have the greatest beneficial effect on native fishes and would maintain the trout fishery at present levels except during periods of prolonged reduced releases below 500 cfs, as described previously.

San Juan River – Hammond Diversion to Animas River.—Under the 500/5000 Alternative, higher minimum flows would be provided as compared to the 250/5000 Alternative. Again, compared to the 250/5000 Alternative, more physical habitat would be provided for native fishes within this reach; however, shorter-duration and less frequent spring releases would likely have some adverse impact to native fish habitat within this portion of the river. The impacts to non-native fishes within this section of river would be

less than those occurring under the 250/5000 Alternative because of the higher base flows that support more usable physical habitat. Compared to the No Action Alternative, the flows would be more natural and native fish populations would be expected to benefit. This alternative and the No Action Alternative would likely have the greatest beneficial effect on native fishes within this reach.

San Juan River – Animas River to Lake Powell.— Few trout occur in this section of the river because of poor water quality. Implementation of this alternative would, therefore, have no additional effect on trout in this section of river.

Because of the high spring dam releases timed to coincide with the Animas River's peak flow, this alternative and the 250/5000 Alternative would likely have an adverse effect on the non-native fish commonly found in this section of river. Because a more natural hydrograph would be provided, native fish would benefit.

RECREATION

This section addresses the potential impacts to recreation that could result from actions associated with the modified operations of Navajo Dam and Reservoir under the alternatives considered.

Issue: How would the No Action and action alternatives affect recreation?

Overview

Scope

The recreation analysis includes Navajo Reservoir and the San Juan River corridor from Navajo Dam to the Clay Hills rafting take-out area near Lake Powell in the Glen Canyon National Recreation Area.

Summary of Impacts

No Action Alternative: Would have little or no adverse impact to reservoir or river recreation.

250/5000 Alternative: Would have a minor adverse impact on reservoir recreation and a more significant impact on river recreation, in particular, the trout fishery.

500/5000 Alternative: Would have lesser adverse impacts on river recreation but more adverse impacts on reservoir recreation than the 250/5000 Alternative.

Impact Indicators

Impacts were measured using various indicators, including changes in: visitor recreation experience, traditional uses (e.g., fishing, camping, and rafting), fishery habitat, and river flow levels.

Affected Environment

The study area is analyzed in four segments: (1) Navajo Reservoir, and, on the San Juan River (2) Navajo Dam to the Hammond Diversion, (3) Hammond Diversion to Montezuma Creek (Sand Island), and (4) Montezuma Creek to the Clay Hills rafting take-out.

Navajo Reservoir

About 80 percent of Navajo Reservoir and its associated lands are located in New Mexico and approximately 20 percent are in Colorado. The reservoir and lands that immediately surround it offer a variety of water-based recreation opportunities, at least half of which center on abundant fishing opportunities for a variety of fish including bass, trout, crappie, northern pike, and kokanee salmon. As the lake waters warm in summer, usage shifts to water-based sports such as water skiing. In recent years, there has been a noticeable increase in the number of family groups on summer vacation from Colorado visiting the reservoir. Other popular activities are boating, swimming, picnicking, camping, water skiing, and, to a lesser degree, hiking, wildlife viewing, and hunting.

While the United States owns all of the reservoir and lands within the reservoir boundary, recreational uses are administered primarily by the Colorado Division of Parks and Outdoor Recreation (CDPOR) and New Mexico State Parks Division (NMSPD). The parks are open year-round with seasonal closures in some areas to conserve natural and park resources. Navajo State Park and Navajo Lake State Park are on the Colorado and New Mexico portions of the reservoir area, respectively.

Developed Recreation.—Developed recreation facilities at Navajo Reservoir include visitor centers, full service marinas, boat launch facilities, developed and primitive campgrounds, picnic areas, hiking trails, watchable wildlife areas, and other amenities. Recreation facilities at Navajo State Park (Colorado) have recently undergone extensive rehabilitation, however, recreation facilities at Navajo Lake State Park (New Mexico) have

only received limited improvements. Most of the developed recreation facilities at Navajo State Park are located near the town of Arboles, Colorado. Developed recreation facilities at Navajo Lake State Park are located near Navajo Dam at the Pine River, Sims Mesa, and San Juan River Recreation Areas.

Undeveloped Recreation.—As compared to the limited areas with developed recreation facilities, the reservoir has 150 miles of shoreline and tens-of-thousands of acres of undeveloped land above the normal high water line. Dispersed recreation at the reservoir is very popular and primarily associated with boat access. However, certain designated roads and parking areas in Colorado, and numerous roads in New Mexico (natural gas production roads), also provide vehicle access to the reservoir for dispersed recreation. Primitive camping at Navajo State Park in Colorado is only allowed in designated areas, but is not restricted in undeveloped areas at Navajo Lake State Park in New Mexico. Power boating and water skiing are allowed on most of the reservoir, except in some narrow and/or shallow canyons which are designated as wakeless zones. Off-road vehicle use and other resource damaging activities are prohibited at both state parks at Navajo Reservoir.

Visitation Levels.—Visitation to Navajo Reservoir has increased by 61 percent since 1990, an average rate of 8.6 percent per year. Visitation data in table III-4 show some variability in growth, but, overall, annual visitation to Navajo Reservoir has increased by nearly 300,000 since 1990.[35] Residents of New Mexico account for most of the visitation to the reservoir (approximately 71 percent versus Colorado's share of 29 percent). Of the 1999 total visitation of 534,099 in New Mexico, approximately 248,782 visits were recorded at the Pine River Recreation Area; 41,884 visits at the Sims Mesa Recreation Area; and 54,000 visits at the San Juan River Recreation Area below the dam. Boating and camping uses on the reservoir are concentrated within a 4-month period, while the river attracts heavy use on a year-round basis.

Table III-4.—Navajo Reservoir annual visitation for Colorado and New Mexico

	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999
CO	146,117	147,654	153,063	170,214	178,669	203,339	226,984	215,204	230,520	227,661
NM	323,277	301,463	351,638	358,348	366,805	451,409	547,041	539,444	561,016	534,099
Total	469,394	449,117	504,701	528,562	545,474	654,748	774,025	754,648	791,536	761,760

Source: CDPOR and NMSPD, 1999.

[35] It should be noted that the numbers shown in table III-4 do not include visitors to undeveloped areas of the reservoir who pay no fees and are therefore difficult to count. An estimate of these visitor numbers, based on informal visitor counts made in 1995, is approximately 40,000 to 50,000 per year.

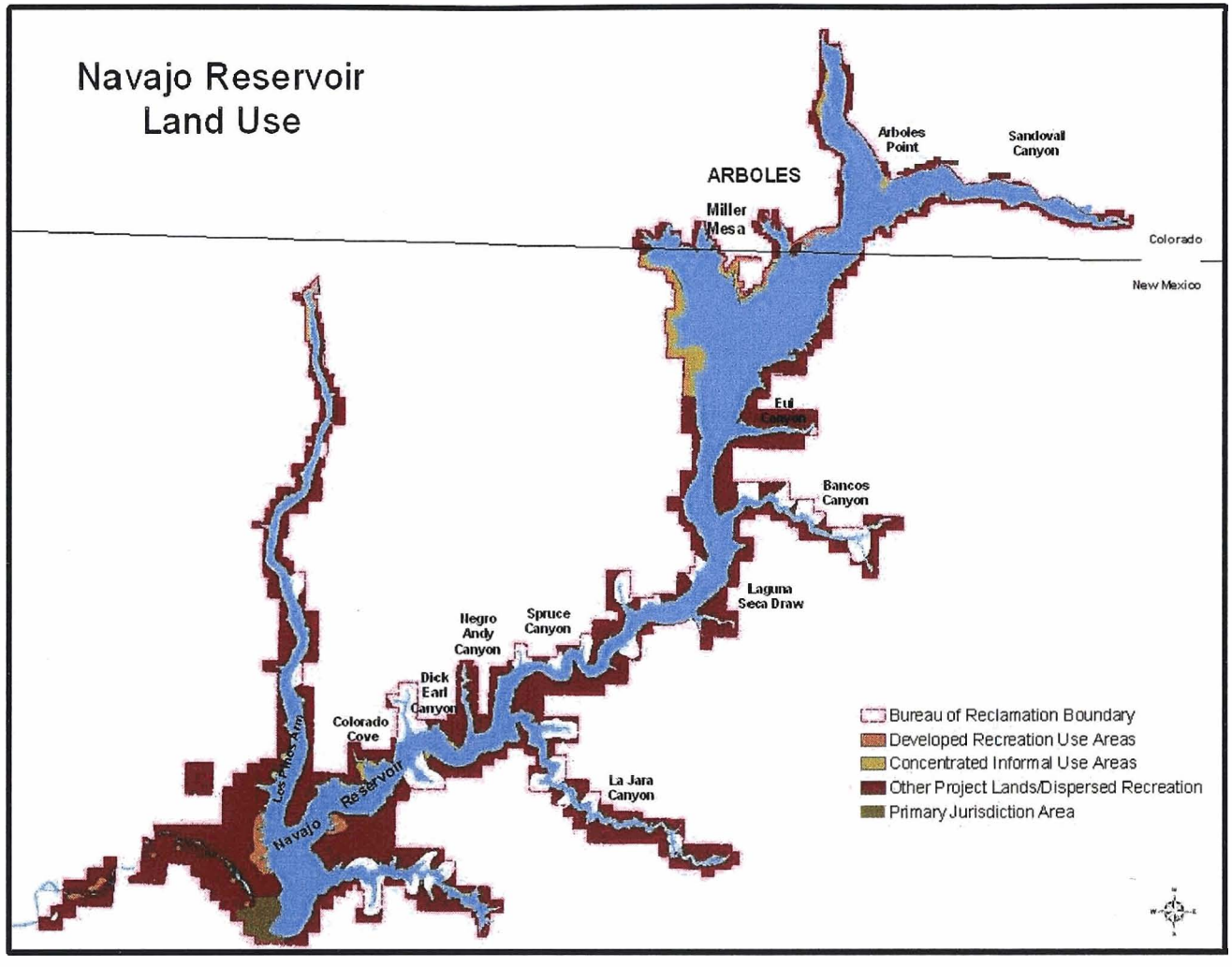


Figure III-3.—General depiction of recreation and other areas around Navajo Reservoir.

Visitor Profile.—Visitor surveys in the New Mexico portion of the reservoir show that the reservoir is the primary destination for most visitors. The largest percentage of this visitor group (primary destination) originates from out of State, while the second largest includes campers over 60 years of age who are seeking developed camping opportunities. This group's average length of stay is 1 month during the warm months of May through August. During the prime season, 82 percent of respondents camp at the reservoir, while the remaining (18 percent) are day users only (Reclamation, 1999b).

Visitor Activities and Satisfaction Levels.—Fishing, swimming (swimming locations are not designated), picnicking, boating, and hiking/walking are popular activities in the reservoir area (figure III-4).

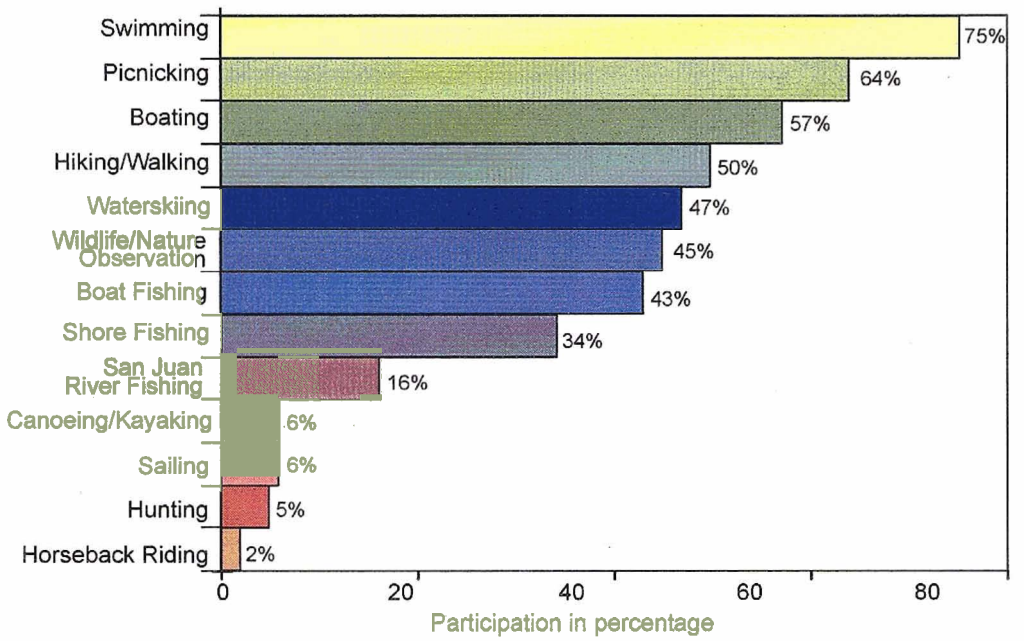


Figure III-4.—Recreational activities in the reservoir area (Reclamation, 1999b).

Significant numbers of visitors chose dispersed camping in undeveloped areas because there were fewer people; some (a minority of 34 percent) believe that the reservoir is often crowded, and just over half (52 percent) believe it is sometimes crowded (Reclamation, 1999b).

San Juan River

Trout Fishing Area (Navajo Dam to Hammond Diversion).—Below the dam, the San Juan River Recreation Area of Navajo Lake State Park provides a significant recreation opportunity based on the year-round trout fishery. Hunting activities on the river are restricted to waterfowl and small game, while the surrounding areas offer opportunities such as camping, picnicking, hiking, wildlife viewing, and bird watching. Along this reach, day-use areas provide fishing access to the river, and in some cases, boating access (figure III-5).

Although tailwater trout fisheries are common below western dams, few have been as successful as the fishery below Navajo Dam. Trout grew rapidly after stocking, and, encouraged by anglers, the NMDGF began managing a portion of the tailwater as "Quality Waters," restricted to artificial flies and lures and with restricted bag and size limits. This section of the river extends 3.5 miles downstream from the dam. The remaining section of river (0.5 mile) in the park is not restricted by the special fishing regulations. In addition, NMDGF also acquired a fishing easement for a section of the river immediately downstream from the park boundary (0.4 mile). One angler study notes, "Most respondents came to the San Juan because it had lots of big fish and a reputation for having them" (NMDGF, 1994a). It is one of the most popular trout fisheries in the western United States, as can be attested by the visitation numbers.

No recreational boats are allowed for the first 1.5 miles below the dam and beyond that float fishing is popular. Currently, 43 outfitters and 89 guides are licensed to operate on this reach of the San Juan River. Outfitters are not limited on the number of days they can operate. Most outfitters (93 percent) that use dory boats put in at the Texas Hole Day Use Area and take out at the Gravel Pit Day Use Area at the end of the Quality Waters.

Further downstream, a very good brown and rainbow trout fishing stretch exists below Citizens Ditch[36] to the Hammond Diversion. Because the river is bounded by private lands in this area, fishing data are not available. Within the Quality Waters along the San Juan River, over half of all visitors to the river were from out of State, primarily from Texas, Colorado, Arizona, or California. Only 25 percent of visitors to the river are of local origin. Downstream from the Quality Waters, out-of-State users have made up 8 to 15 percent of users in recent years. Total angler days in the first 7.5 miles of river varied from an estimated 44,000 to 61,000 between 1995 and 2001, and averaged 53,800.[37] The months of July through October have the highest use. Approximately 6,000 to 7,000 of these visitors use guides or outfitters.[38]

[36] Citizens Ditch is 7.9 miles below Navajo Dam.
[37] Communication to Reclamation from Nic Medley, NMDGF, April 18, 2002.
[38] Communication to Reclamation from Navajo State Park Superintendent, 1999.

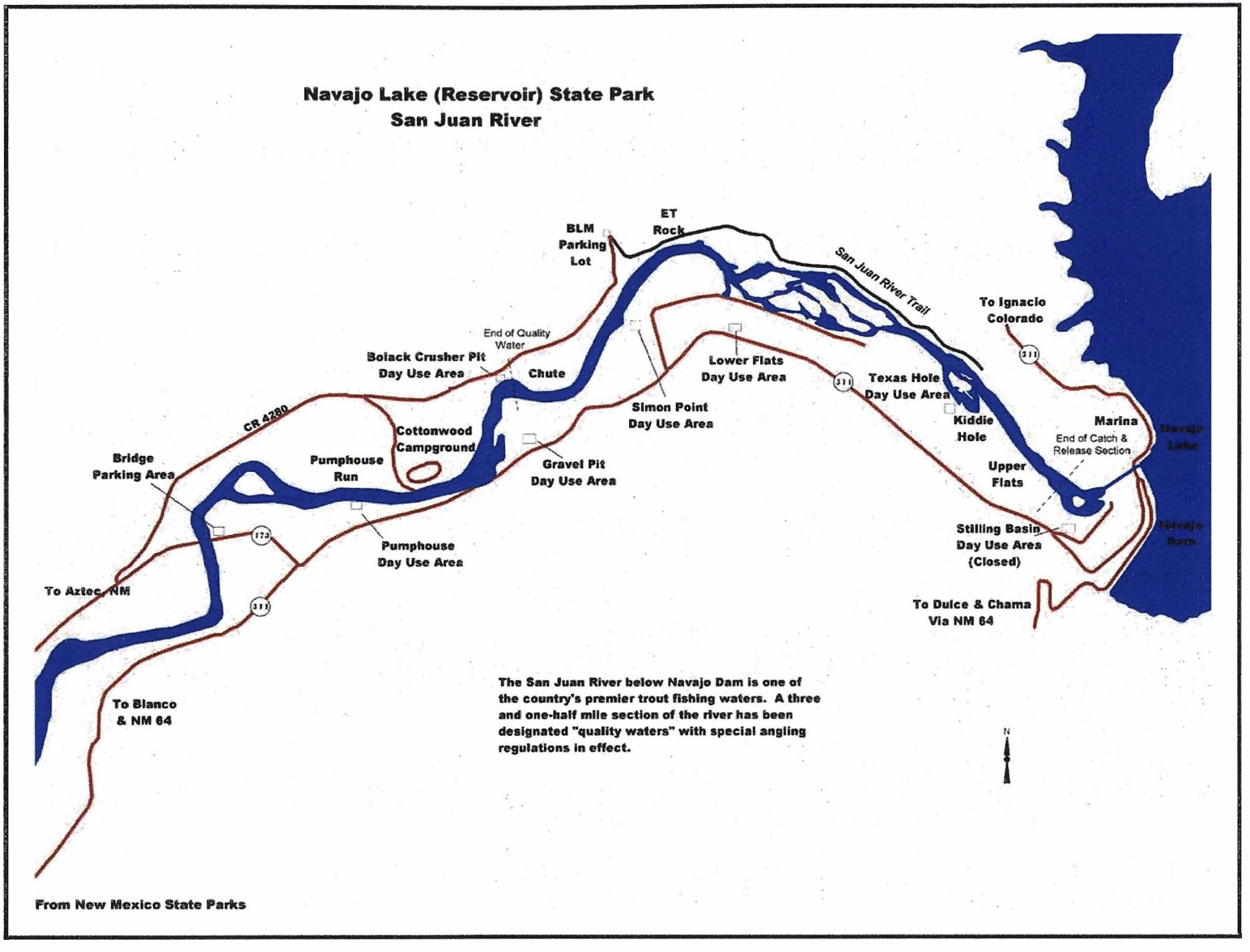


Figure III-5.—Navajo Lake (Reservoir) State Park (not to scale).

A survey found that 72 percent of respondents felt the river was moderately to extremely crowded; 43 percent of the respondents indicated that they had to pass up good fishing water 50 percent or more of the time because another angler was already there (Reclamation, 1999b).

Hammond Diversion to Montezuma Creek.—Below the trout fishing area that ends at the Hammond Diversion, the San Juan River is not managed for recreation purposes by any public entity. The river is predominantly flanked by private lands to just past Farmington, where it is then bordered on the north by private lands and on the south by Navajo Nation Reservation Lands (Navajo Lands). This land ownership pattern continues for several more miles until the river is adjoined on both sides by the Navajo Lands. Recreation in this area is minimal; there is little fishing and float boating. The numerous water diversions make floating difficult and dangerous.[39]

When the river enters the Navajo Reservation, recreation management is administered by the Navajo Nation Parks and Recreation Department. Although the department does not issue rafting permits or track rafting numbers, it does issue about 450 camping and hiking permits annually for the river corridor at a cost of $5 per permit. Besides camping and hiking, these visitors also engage in catfishing. A lack of river access limits rafting in this stretch.

Montezuma Creek to Clay Hills.—The BLM has management responsibilities along the river for 104 miles from Montezuma Creek to Clay Hills in conjunction with the Navajo Nation and the National Park Service. Most rafting occurs between the Sand Island launch site near Bluff, Utah, the Mexican Hat put-in take-out site near Mexican Hat, Utah, and the Clay Hills take-out site in the Glen Canyon National Recreation Area (general locations are on the frontispiece map). The take-out site at Clay Hills is affected by Lake Powell water levels and river flows. In particular, large sediment deposits and low flows can make it very difficult to access the take-out site.

- The Sand Island launch site is the put-in site for floats trips to Mexican Hat or Clay Hills. Use at this site consists of 11,165 users per year (48,369 total user days) for 1,225 total trips. The trips average 9.1 users per trip and 6.5 days per trip between Sand Island and Clay Hills. Maximum launches include 75 people per day or 7 groups, except for May and June when the launch maximum is 65 people per day or 6 groups, whichever comes first; this includes commercial groups.

[39] Personal communication to Reclamation from BLM, Farmington, NM, 2001.

- ❑ The site near the small community of Mexican Hat is both a put-in and take-out site. Maximum launches are 50 people per day, or 5 groups, except for May and June when the launch maximum is 50 people per day, or 3 groups; this includes commercial groups.

- ❑ The Clay Hills take-out area is remotely located and not directly accessible by any main, paved roads. Raft pick-up vehicles are normally shuttled to this site.

Launch allocations are split 40/60 between commercial and private, respectively, but actual use more closely resembles a 35/65 distribution because of outfitter cancellations and private users picking up these launch dates. The BLM has a moratorium on additional outfitters; currently, there are 11.

Commercial Rafting.—The BLM manages commercial trips by issuing permits based on historical use and allowing changes at the outfitters' request and within guidelines. At Sand Island, the commercial sector is allowed one or two launches per day. The core season for rafting companies is June, July, and August; however, there is additional use during March, April, May, September, and October.

Private Rafting.—Private rafting is managed by requiring permits all year, and about 900 permits are issued each year (approximately 4,000 applications are received). Applications are primarily selected by a lottery. August to March permits are first-come, first-served, while lottery draws fill the launch calendar from mid-April to the end of July.

Methodology

The 1999 data were used in this analysis because more current information was not available in a complete form when the analysis was conducted. In addition, it was assumed that for all alternatives, based on historical trends, there would be continued increases in fly fishing demand, continued pressure on BLM to issue more river rafting use permits during the summer, and increased reservoir recreation (about 5 to 6 percent annually).

The following criteria were used to determine the impacts to recreation from changes in the operation of Navajo Dam:

- ❑ Visitor recreation experience (angler crowding; fluctuating water levels; size and catch rate of fish)

- ❑ Visitation related to the traditional uses on the river (i.e., fishing, camping, and rafting)

- ❑ Fishery habitat changes
- ❑ River flow levels

Impacts were evaluated by developing baseline information, using the hydrologic model, modeling trout physical habitat, and extrapolating results from consequences of canceling the low flow test in 2000, the 2001 Summer Low Flow Test, and the 1996-97 Winter Flow Test.

Development of baseline information consisted of researching the local recreation resource by consulting various Federal, State, county, and city agencies, and publications; holding public and working meetings with affected permittees, groups, individuals, and cooperators; and maintaining close communication with key members of the user groups.

Summer Low Flow Test results and opinions expressed by local guides and outfitters about the effects of potential range of flows were used in an attempt to project long-term impacts on recreation resources.

Impacts Analysis

No Action Alternative

This alternative does not represent the San Juan River flow patterns; rather, it generally represents Reclamation's historical operation of the reservoir (from 1973 to 1991).

Reservoir Recreation.—Generally, higher reservoir levels under the No Action Alternative would be expected to result in improved conditions for reservoir recreation compared to the action alternatives, although many other variables are involved in measuring visitation.

River Recreation.—Impacts to river recreation under the No Action Alternative would be minimal. Since spring peaks would be lower and the non-peak releases would be maintained in a more uniform manner throughout the year than under the action alternatives, outfitters and other anglers would have better fishing conditions in the tailwater area as compared to the Preferred Alternative. River conditions under this alternative would be expected to accommodate more angler use than under the action alternatives. The higher flows would provide more fishable area and more trout habitat.

Because average dam releases would often be twice as high as those of the action alternatives, the No Action Alternative would also maintain the water level for rafters in the Bluff area for longer periods and allow outfitters to better plan their season and reservations. However, as shown in table II-7, there would be infrequent periods of low flow (less than 500 cfs) within the rafting area, making rafting more difficult. For example, April and September flows would be below 500 cfs approximately 12 percent of the time.

250/5000 Alternative (Preferred Alternative)

This alternative would have a minor impact on reservoir recreation and the greatest impact on river recreation when compared to the No Action and 500/5000 Alternatives. As discussed in chapter II, there is flexibility in irrigation season releases under the 250/5000 Alternative. This would reduce impacts to recreation over an interim period; however, impacts discussed below are expected to occur in the long term.

Reservoir Recreation.—Average reservoir elevation reductions of approximately 10 feet would occur under the 250/5000 Alternative during the recreation season (April through October) as compared to the No Action Alternative. In dry periods this reduction could average as much as 30 feet. Lower water levels and accompanying exposure of mud flats, gravel bars, tree stumps, and rocks could adversely affect boating, fishing, and reservoir aesthetic values, especially in the Colorado portion where the waters are generally shallower.

Access to the reservoir and boat launching in both Colorado and New Mexico would be impacted in dry periods due to large amounts of sediment deposited on the lower reaches of the boat ramps and/or the boat ramps may be too short to reach the water. During these dry periods, the recreation facilities at Navajo State Park (Colorado) would be impacted more than they would be impacted under the No Action Alternative, but not as much as they would be under the 500/5000 Alternative. However, access to the reservoir and boat launching at the Arboles marina would not be entirely lost since the concrete boat ramp extends to an elevation of 5978 feet,[40] which is approximately 12 feet below the top of the inactive pool. Although the overall area for boating and fishing is reduced when the reservoir experiences extreme drawdown, the overall fishing catch rate normally increases at lower reservoir levels.

River Recreation.—River recreation impacts under the 250/5000 Alternative would be adverse for trout fishing (for additional details, see the "Aquatic Resources" section).

[40] Hydrology modeling indicates that the reservoir would be drawn below 5,978 feet only once in 65 years.

Downstream rafting recreation impacts would be both positive and negative, but the overall impacts appear to be negative. Both of these river recreation impacts are discussed below.

Trout Fishing.—Table II-6 summarizes the seasonal frequency distribution of monthly Navajo Reservoir releases to the trout fishery immediately below Navajo Dam. As shown in this table, flows under the 250/5000 Alternative would range from approximately 250 to 500 cfs 70 percent of the time. These lower flows would make dory boat fishing difficult. Wade fishing is facilitated at lower flows; however, this does not mean wade fishing use would increase. Lower flows would increase conflicts between wade and boat anglers as their areas of use would overlap more during low-flow periods. Low flows would also affect the fishery itself, as discussed in the "Aquatic Resources" section.

Some outfitters may continue float fishing trips at low flows and may choose to use rubber or vinyl rafts that are able to float the river at lower flows, representing a change from the more commonly used dory boats. Flows above 1,000 cfs present problems to wade anglers because areas safely accessible are reduced; however, these conditions would occur less often under the 250/5000 Alternative.

At present, minimum dam releases are normally 500 cfs. At and above this level, guided float trips use dory boats, begin at the Texas Hole, and then float-fish down river to the Gravel Pit day use area. A 500 cfs flow is the approximate minimum flow at which these types of boats can successfully navigate the river without hitting the river bottom. Since it is predicted riverflow would be at less than 500 cfs about 63 percent of the time during high-use months (March through November), these dories would not be able to easily float down river from Texas Hole, concentrating use at that popular location. If total angler use does not decline, recreational experience for clients and the number of guided anglers could be significantly reduced.[41] Difficulties with floating may be somewhat offset by guides acquiring and using new equipment that requires less draft, as discussed previously.

Actual fishing use depends on many factors such as catch rate, size of fish, angler crowding, economic conditions, regional human population growth, and other considerations; therefore, it is not possible to accurately predict changes in fishing use.

In the short term, it is anticipated that more shore or wade fishing would be substituted for a portion of the dory boat use which would be reduced because of navigation problems (i.e., dory boats would be scraping the bottom of the riverbed). Neither the Summer Low Flow Test nor the Winter Low Flow Test showed a decrease in angler use (table III-5).

[41] Crowding in the special trout waters is a problem as stated in the 1994 Angler Survey. Overcrowding was identified as the most significant problem in the angler survey.

Table III-5.—Creel census and pressure counts for July 1998–2001 and the Summer Low Flow Test

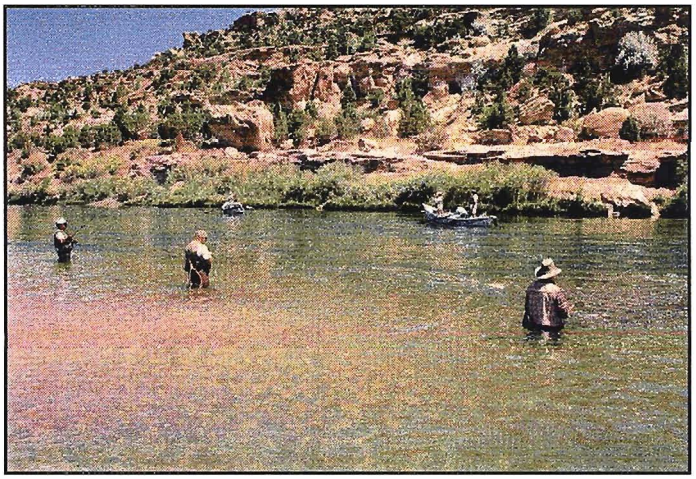
Date	Quality Waters		Regular waters		Total	
	Angler hours	Catch rate per hour	Angler hours	Catch rate per hour	Angler hours	Catch rate per hour
July 2001	26,164	1.72	3,450	0.49	29,614	1.11
July 9 - 15 (Summer Low Flow Test)	4,706	2.16	1,155	0.49	5,861	1.33
July 1 - 8, 16 - 31	19,699	1.45	5,166	0.49	24,865	0.97
July 2000	21,949	1.07	7,748	1.6	29,697	1.34
July 1999	21,043	1.24	9,118	0.39	30,161	0.82
July 1998	27,674	1.23	7,459	0.39	35,133	0.81

Provided by Marc Wethington, NMDGF, and Rick Vinton, Reclamation.

Notes: (1) Angler hours for the month of July 2001 are not additive as the result of deriving full-month data based on a formula and the test weeks numbers being actual counts. (2) The low flow data were gathered daily during the 7-day test; the previous years' data for the same week was only gathered two times during the week and the weekend, so data comparisons would not be based on the same number of sampling days. (3) Comparisons can only be made on the total monthly data and the catch rates. (4) There is no explanation why July 1998 and July 2001 angler hours are higher than July 1999 and 2000. (5) The high catch rate for the regular waters in July 2000 is due to public knowledge of the stocking date and place and the resulting catch rate (being at the right place at the right time).

In the long term, adult trout habitat reduction is assumed to result in fewer fish and this would reduce the quality of the recreation experience and perhaps angler use. The following points need to be considered when assessing impacts to angler visits:

- Trout habitat is expected to be reduced 30 to 37 percent when dam releases decline from 500 to 250 cfs
- Average river depth would be reduced by 4.5 inches and wetted perimeter by 5 to 10 percent when dam releases decline from 500 cfs to 250 cfs
- Trout numbers are not expected to decline proportionally to habitat reduction, but would be reduced significantly
- Dam releases below 500 cfs make float fishing more difficult and may require switching from dories to rafts, and flows above 1,000 cfs make wade fishing more difficult



Anglers in the San Juan River.

- Dam releases below 500 cfs make more of the river accessible to wade fishing, although overall fishable area may be reduced
- Outfitters suggest that reductions in guided dory float trips could be as much as 50 percent
- Creel census and pressure surveys conducted during the short-term Summer Low Flow Test and Winter Low Flow Test showed no reduction in angler us

It is concluded that the quality of the angler experience, particularly for people float fishing, would be reduced under the 250/5000 Alternative. Because of many variables involved, changes in actual angler numbers cannot be predicted accurately. Losses could be 5,500-plus angler days if use were directly related to changes in stream surface area or they could be 20,000 angler days if use changes were directly related to changes in trout habitat. Dory angler day losses would be a greater percentage of present use than those to wade fishing as a result of low flows.

Downstream from Citizens Ditch, negative impacts on angling would be proportionately greater because of further reduced flows. Angler use figures for this reach of the river are not available, so losses have not been projected. Much of this reach is privately owned, but it does provide angling opportunities and some commercial outfitting trips. Long-term angler use losses downstream from Citizens Ditch could represent a very high percentage of present use because of the adverse effects to this section of the river, as discussed in the "Aquatic Resources" section.

Some flexibility in maintaining minimum releases above 250 cfs during the irrigation season, as described in chapter II, would reduce recreation effects by reducing impacts to the trout population and by providing higher flows for floating.

Rafting.—The rafting community in the lower San Juan River would be adversely impacted by the low flows because higher flows create a better recreational rafting experience. Optimum flows for rafting average 1,000 to 3,000 cfs and most commercial rafters do not put in below 500 cfs because of safety concerns and problems with river navigation. Between 500 and 800 cfs, they use smaller boats, reducing load capacity, and, therefore, increasing costs.

Outside the spring runoff season, Reclamation, under the 250/5000 Alternative would generally maintain average flows above 500 cfs downstream of Farmington. However, commercial outfitters suggest that in order for a viable rafting industry to be sustained, raftable flows above 1,000 cfs would be needed during the core season.[42] As discussed previously, minimum rafting flows are considered to be 500 cfs for the purposes of this analysis and flows above 800 cfs allow larger rafts and a higher-quality recreation experience. Table II-7 presents the percentage of time river flows would be above 500 or 800 cfs for each alternative. As can be seen from the table, flows over 800 cfs would decrease substantially, particularly in the September through March period.

The river downstream from Farmington should remain floatable throughout most of the recreation season under the 250/5000 Alternative because one of the Flow Recommendations criteria is to maintain flows above 500 cfs for endangered fish throughout this reach. Because the 500 cfs minimum goal is measured as an average of gaging stations over several days, flows may periodically fall below 500 cfs in some reaches of the river.

Flows between 500-800 cfs would increase in occurrence. However, because flows above 800 cfs would be reduced, a number of changes could occur in the following: the type of rafting equipment used, the quality of the recreational experience; duration of the trip; and the total number of rafters.

Flows of less than 500 cfs that would occur occasionally under the No Action Alternative would not occur as frequently under the 250/5000 Alternative, thus increasing some rafting opportunities under the latter alternative.

Positive effects would occur at Clay Hills under this alternative because of more frequent and higher spring flows that flush accumulated sediments further into Lake Powell, thereby making the river more navigable.

Overall, compared to the No Action Alternative, the 250/5000 Alternative would reduce the percentage of time when flows were above 800 cfs, increase the percentage of time when flows were between 500 and 800 cfs, and attempt to maintain non-spring time average flows below 500 cfs above Farmington.

500/5000 Alternative

The 500/5000 Alternative would have the greatest impact to reservoir recreation when compared to the No Action and 250/5000 Alternatives.

[42] Based on low flow test public meetings (March 2000) and conversations with commercial rafting outfitters during the 2001 Summer Low Flow Test.

Reservoir Recreation.—There would be average reservoir elevation reductions of approximately 15 feet during the recreation season (April through October) as compared to the No Action Alternative. In dry periods, this reduction could average as much as 50 feet. Lower water levels can adversely affect boating, fishing, and reservoir aesthetic values, especially in the Colorado portion where the waters are generally shallower.

During these dry times, large amounts of sediment would be deposited on the lower reaches of the boat ramps and/or the boat ramps may be too short to reach the water. However, access to the reservoir and boat launching at Navajo State Park (Colorado) marina would not be completely lost because the concrete boat ramp extends to an elevation of 5978 feet,[43] which is approximately 12 feet below the top of the inactive pool. In addition to boat launching impacts, the overall area for fishing is reduced when the reservoir experiences extreme drawdown; however, the overall fishing catch rate normally increases at lower reservoir levels.

River Recreation.—River recreation impacts would be more adverse than those under the No Action Alternative and less adverse than those under the 250/5000 Alternative.

Trout Fishing.—Maintenance of a minimum flow of 500 cfs combined with a spring peak would be expected to maintain the existing trout fishery and associated recreation. As a result, it is not anticipated that the number of anglers would be reduced and river recreation use would be expected to continue essentially unchanged, except that during very infrequent periods of severe drought, dam releases would drop below 500 cfs.

Rafting.—When compared to the No Action Alternative, downstream rafting recreation impacts would be both positive and negative. From a positive perspective, significantly more opportunities would exist for rafting at flows between 500 and 800 cfs, although they would not be as great as those under the 250/5000 Alternative. Conversely, flows above 800 cfs would be reduced, and experienced rafters, especially those seeking opportunities for a more challenging experience, would be impacted.

Positive effects would occur at Clay Hills under this alternative because of more frequent and higher spring flows that flush accumulated sediments further into Lake Powell, thereby making the river more navigable.

[43] Hydrology modeling indicates that the reservoir would be drawn down below 5978 feet only once in 65 years.