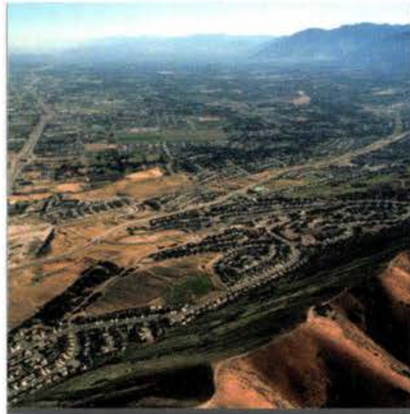

Utah Lake Drainage Basin Water Delivery System

Final Environmental Impact Statement Volume 2—Appendices

September 2004

UTAH RECLAMATION MITIGATION AND CONSERVATION COMMISSION

Utah Lake System EIS
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Appendix A
Utah Lake Drainage Basin Water Delivery System

List of Remaining Environmental Commitments on the Bonneville Unit of the Central Utah Project

No.	Environmental Commitment	Comments	Responsibility	Status	ULS Requirement
1	Strawberry Aqueduct and Collection System (SACS): Mitigate wildlife losses in accordance with the January 1987 "Wildlife Mitigation Plan for Strawberry Aqueduct and Collection System, Municipal and Industrial System, and Diamond Fork System, Bonneville Unit, Central Utah Project."	This comprehensive mitigation plan was developed to address impacts of three major systems of the Bonneville Unit. The plan focused on acquisition of private lands with subsequent management by public agencies for wildlife habitat values. Reformulation of the Diamond Fork System (DFS) as described in the 1990 and 1999 Final Supplements to the 1984 FEIS and 2000 Final EA for Proposed Action Modifications to the DFS resulted in a reduced mitigation need. Mitigation was met by adjusting mitigation acreage of other systems of the Bonneville Unit and by acquiring 161 additional equivalent acres of wildlife habitat. Wildlife habitats acquired adjacent to Strawberry River Creek angler access corridor as described in the 1999 Angler Access EA achieved this commitment. The 1987 Wildlife Mitigation Plan required mitigation for 630 acres of wooded riparian vegetation impacted by the M&I System. 165 acres have been mitigated through acquisition and habitat improvements on part of the Moon properties on Currant Creek, and 237 acres have been mitigated as part of the Camelot properties on the Strawberry River. The remaining 228 acres of riparian development is being achieved by the Provo River Restoration Project (PRRP).	Mitigation Commission	Completed. In 2000, 1,760 acres were acquired along the Strawberry River for angler access, SACS aquatic mitigation, and the final increment needed to complete the 1987 Wildlife Mitigation Plan terrestrial mitigation. All required lands have been acquired. Appropriate management plans (operating agreements) have been or will be implemented with Utah Division of Wildlife Resources or U.S. Forest Service. Ongoing. PRRP is approximately 75 percent complete. In addition, other acquisitions that have been made for the SACS Aquatic Mitigation Plan may provide additional riparian credits.	No
2	Strawberry Aqueduct and Collection System: Provisions for bypasses of sufficient water to protect 50 percent of historic trout habitat in Strawberry River, Currant Creek, Rock Creek, and West Fork Duchesne River.	The 1988 Working Agreement guaranteed 44,400 acre-feet, in addition to spills and bypasses, until 2000. The 1990 Final Supplement to the 1984 Diamond Fork FEIS also guaranteed the flow. Provisions for up to 54,900 acre-feet of water, including 10,500 acre-feet non-lapsing carry-over storage in Strawberry Reservoir, are provided by the 1990 amendment to the 1980 Streamflow Agreement. Sec. 303(a) of CUPCA commits sufficient water to maintain the minimum streamflows established pursuant to the Streamflow Agreement.	Central Utah Water Conservancy District (District) and U.S. Bureau of Reclamation (Reclamation)	Completed; ongoing	No
3	Strawberry Aqueduct and Collection System: Strawberry Exchange – restore natural streamflows in 16.3 miles of upper Strawberry River and 9.8 miles of Bjorkman Hollow, Hobble Creek and Willow Creek (10,000 angler days).	The Wasatch County Water Efficiency Project (WCWEP) and Daniel Replacement Project (DRP) have been constructed and start-up during June 2001 has resulted in restoring the natural streamflows in 16.3 miles of Strawberry River and 9.8 miles of Bjorkman Hollow, Hobble Creek and Willow Creek. Final disposition of the 2,900 acre-feet per year in the upper Strawberry River basin must still be decided. Section 303 (b) states that the Mitigation Commission and Fish and Wildlife Service (FWS) will decide where this water will go, what its use(s) will be, and how it will be released or operated.	Mitigation Commission Mitigation Commission and FWS	Completed. District completed removal and remediation of Daniel Irrigation Co. reservoirs, canals and diversion in 2002. Completed remediation of McGuire Draw and Bjorkmann headcuts in 2003. Decision Pending	No For the ULS DEIS it is assumed that 2,900 AF will remain in the Uintah Basin in accordance with Section 303 of CUPCA.

No.	Environmental Commitment	Comments	Responsibility	Status	ULS Requirement
4	Strawberry Aqueduct and Collection System: Acquisition of Angler Access Currant Creek upstream from U.S. Highway 40 – 9.4 miles (2,350 AD) Strawberry River (Camelot Resort) - 8.0 miles (2,400 AD) Strawberry River (Soldier Creek Dam to Camelot) - 11.2 miles (3,360 AD) Strawberry River (downstream from Starvation Dam) - 2.0 miles (600 AD) West Fork Duchesne River - 9.3 miles (2,325 AD) Duchesne River - 7.0 miles (1,750 AD) Rock Creek - 2.2 miles (550 AD) North Fork Duchesne River – 1.85 miles (463 AD)	The 1988 Aquatic Mitigation Plan for the Strawberry Aqueduct and Collection System of the Bonneville Unit of CUP identified the acquisition of approximately 51 miles of stream access on the West Fork Duchesne, Duchesne, Currant Creek and Strawberry Rivers to provide partial mitigation for lost angling opportunities. Angler access would be acquired where in-stream flows were being provided, and in some instances, where stream habitat improvements were made. An Environmental Assessment addressing the impacts of acquiring the remaining lands or easements and management of the angler-access corridors was released November 13, 1999. The EA revised stream segments and lengths slightly. The length of access on Currant Creek was reduced and length was added on North Fork of the Duchesne River. The Mitigation Commission entered into an agreement with the Utah Division of Wildlife Resources and Reclamation in 1996 to coordinate acquisition priorities and develop operating agreements for the acquired properties and easements.	Mitigation Commission; Reclamation	Nearly Completed. Approximately 49 miles of the required 51 miles of angler access has been acquired since the late 1980's. About 2 miles are under current negotiation.	1988 DPR; 1999 Final EA on the Angler Access Mitigation Program, SACS
5	Strawberry Aqueduct and Collection System: Fish habitat improvement measures Strawberry River downstream from Starvation Dam – 6.2 miles (3,124 AD) Currant Creek – 16.2 miles (1,368 AD) Rock Creek – 10 miles (914 AD) W. Fork Duchesne River (downstream from Vat Diversion Dam – 11.3 miles (partially completed; 75 AD) Strawberry River (upstream from Strawberry Reservoir) – 18.1 miles (304 AD for reach upstream of Daniels diversion only) Strawberry River (downstream from Soldier Creek Dam) – 6.0 miles (507 AD) Provo River (from Jordanelle Dam to Deer Creek Reservoir) – 9.3 miles (balance to be achieved by PRRP) Diamond Fork (Three Forks to Springville Crossing) – 6.6 miles (265 AD) North Fork Duchesne River – 10.0 miles (664 AD) West Fork Duchesne River (upstream from Vat Diversion Dam) – 10.0 miles (748 AD) South Fork Rock Creek – 3.0 miles (224 AD) Diamond Fork (upstream from Springville Crossing) – 4.0 miles (160 AD)	The 1988 Aquatic Mitigation Plan for the Strawberry Aqueduct and Collection System identified 14 stream segments totaling over 119 miles as potential sites for stream habitat improvement work. A limit of 9,790 angler days mitigation credit was imposed by the FWS for fish habitat improvements as a component of the Strawberry Aqueduct and Collection System Aquatic Mitigation Plan. Ninety miles of stream habitat improvements amounting to 8,253 angler days have been completed. An evaluation of the fish habitat improvement projects was funded by the Mitigation Commission and showed that although most projects were effective, a percentage of fish habitat structures did not function or are in need of initial repair. The FWS estimated in its January 30, 1998 Fish and Wildlife Coordination Act (FWCA) report on the PRRP that about 75 percent of the structures were performing as intended. This translates to 6,115 angler days achieved. A balance of 3,675 angler days is needed to complete this mitigation measure. The Mitigation Commission intends to complete the mitigation requirements for the SACS by implementing the PRRP. Strawberry Reservoir filled for the first time in 1998, fulfilling Reclamation's first-fill requirements on Soldier Creek Dam. Reservoir releases during summer, fall, and winter 1998-99 resulted in unseasonally high flows in the Strawberry River below Soldier Creek Dam.	Mitigation Commission	Completed. To date, 90 miles of stream habitat improvements have been installed. A review was conducted by the Mitigation Commission in 1995, which found that most of the fish habitat structures were functioning as planned. The FWS estimated in its January 30, 1998 FWCA report on the PRRP that about 75 percent of the installed structures were performing as intended, which provided mitigation for 6,115 AD of the needed 9,790 AD. The PRRP will provide the remaining 3,675 angler days of mitigation for fish habitat improvements. Final report on Middle Strawberry River (2001) has been completed. IBAT has reviewed the impact of interim operational flows with the SACS streams and determined that no compensatory mitigation is required.	No
6	Strawberry egg taking station (1,800 angler days) - Source - 12/13/88 Aquatic Mitigation Plan for the Strawberry Aqueduct and Collection System.	Construction was completed in 1987. Electric weir was installed in 1995.	Reclamation and Mitigation Commission	Completed.	No

No.	Environmental Commitment	Comments	Responsibility	Status	ULS Requirement
7	Strawberry Aqueduct and Collection System: Duchesne River Area Canal Rehabilitation (DRACR) Program (a SACS feature): Develop 140 acres of riparian and marsh vegetation adjacent to Starvation Reservoir to replace habitat losses for the DRACR Program, a part of the Starvation Collection System.	The project plan to develop wetland mitigation areas around the shoreline of Starvation Reservoir was determined to be infeasible in 1987. Reclamation and FWS revised plans for the required mitigation. Reclamation acquired 1,087 acres of land with water rights (known as the Riverdell property) for this mitigation. Initial plans for development and management of the property by the FWS have been withdrawn. To satisfy a separate commitment under the Strawberry Aqueduct and Collection System, the Mitigation Commission, DOI and the Ute Tribe are developing a plan and Draft EIS for protecting, enhancing and developing wetland areas along the Duchesne River. Some concepts being considered could combine the Riverdell property in the plan. If the Riverdell property does not become incorporated into the Lower Duchesne River Wetland Mitigation Project the Riverdell property will be managed separately as compensation for impacts from the DRACR Program.	Mitigation Commission	Ongoing. In December 2001, DOI released a Draft EA describing the proposed action and alternatives to develop water delivery system capability for the property. Issues involving obtaining clear title to the water rights and resolving an easement for the canal have been worked on since that time. This project will be implemented regardless of a decision on the Lower Duchesne River Wetland Mitigation Project, and will help satisfy DRACR mitigation objectives.	No
8	Strawberry Aqueduct and Collection System: Six waterfowl management areas will be established along the Duchesne River to mitigate for waterfowl losses resulting from operation of the Strawberry Aqueduct and Collection System.	A 1965 FWCA report recommended the development of 6 wetland management areas containing 6,640 acres to mitigate for impacts of the Bonneville Unit SACS, and to provide additional wetland/wildlife-related benefits to the Ute Tribe. Plans developed by Reclamation in the 1970s were never implemented. The Mitigation Commission, Department of the Interior and Ute Tribe entered into agreements beginning in 1995 for development of a conceptual plan for the protection, enhancement and restoration of wetland areas along the Duchesne River corridor. Under the agreements, the Tribe developed a feasibility study for a 45-mile corridor of the lower Duchesne River, from Bridgeland to Ouray, Utah. Three alternatives were identified which accomplish the specific objectives of the mitigation commitment. A Draft EIS has been prepared for this project, and was released for public review in November 2003.	Mitigation Commission	Ongoing. This is in the Mitigation Commission Plan, continuing as part of the planning process with DOI and the Ute Tribe.	No
9	Strawberry Aqueduct and Collection System: Until it is resolved whether existing law will require that said entire 44,400 acre-feet of water remain in the Duchesne River until its confluence with the Green River, the District will not redivert above said confluence.	The FWS is preparing an amendment to incorporate new information into the Service's Final Biological Opinion, July 1998 for the Duchesne River Basin and to provide a revised reasonable and prudent alternative and a re-initiation notice. The final biological opinion on the Duchesne River System will be a factor in determining the use of the 44,400 acre-feet of the SACS in-stream flow water. Until it is resolved whether existing law will require the entire 44,400 acre-feet of water remain in the Duchesne River until its confluence with the Green River, the District will not re-divert above the confluence.	District	Pending.	No
10	Strawberry Aqueduct and Collection System: A minimum of 25 cfs will be maintained in Rock Creek at the FS/Indian reservation boundary.	The 1980 Streamflow Agreement and 1990 amendment recognized the 25 cfs commitment from the September 20, 1965 Agreement. The CUP Completion Act (Section 505(d) states the Secretary shall endeavor to maintain continuous flows of 29 cfs during May-October and 23 cfs during November-April at the reservation boundary. These minimum flows are met through combined releases out of Upper Stillwater Dam on Rock Creek and Docs Diversion on South Fork of Rock Creek. South Fork of Rock Creek joins the main channel of Rock Creek about 0.9 miles downstream from Upper Stillwater Dam. The two streams merge approximately 7 miles upstream of the reservation boundary.	District	With accretion flows, the 25 cfs requirement is being achieved and usually exceeded. A U.S. Geological Survey gage at the Reservation boundary is used to confirm the minimum flows are met. Monitoring of the 1980 Streamflow Agreement and 1990 Amendment is conducted by IBAT, District, the Tribe, and the Service.	No

No.	Environmental Commitment	Comments	Responsibility	Status	ULS Requirement
11	Strawberry Aqueduct and Collection System: The operation and maintenance of the recreation, fishery and wildlife features of Midview Reservoir will be transferred to the Tribe, and a minimum fishery pool will be maintained in the reservoir.	This recommendation has been accomplished.	District, Reclamation, Ute Indian Tribe and US BIA	This recommendation has been accomplished.	No
12	Strawberry Aqueduct and Collection System: Fishing lakes aggregating approximately 800 surface acres will be constructed on Indian lands, site locations and cost estimates to be provided on the basis of further studies by the Service, said cost not to exceed $2 million to be funded under the provisions of Section 8 of the Act of April 11, 1956.	Bottle Hollow Reservoir (see Figure 6), with a surface area of approximately 420 acres was completed in 1970, and fulfilled part of this recommendation. The proposed Lower Stillwater reservoir would have provided the remaining 380 acres of surface water fishing opportunity committed to the Tribe. However, the proposed Lower Stillwater was deauthorized by Section 201 of CUPCA. Replacement features were authorized by Section 505 of CUPCA.	DOI	Bottle Hollow Reservoir is constructed. Further recreation enhancements for the Ute Tribe are authorized by Section 505 of CUPCA *in lieu* of construction of Lower Stillwater Reservoir	No
13	Starvation Collection System: The acquisition and development of 1,280 acres of big game winter range.	A total of 1,661 acres of big game winter range were acquired and deeded to Utah Division of Wildlife Resources. Additional lands were acquired in lieu of development. The lands are situated within the Utah Division of Wildlife Resources Red Creek Wildlife Management Area.	Reclamation	Completed.	No
14	Municipal and Industrial System: Transfer to Utah Division of Wildlife Resources 970 acres of Deer Creek lands. Provide funds to improve lands.	This mitigation commitment has been dropped, as a result of the 1990 reformulation of the DFS and the resulting reduced need for mitigation. The additional 161 acres of equivalent wildlife habitat has been fulfilled (see Environmental Commitment No. 1).	Mitigation Commission	Completed. Land has been acquired on the Middle Strawberry River.	No
15	Municipal and Industrial System: Acquire 720 acres of West Hills area.	Lands have been acquired by Reclamation. The FWS recommends transfer of the lands from Reclamation to Utah Division of Wildlife Resources (see Environmental Commitment No. 1).	Mitigation Commission and Reclamation	Completed.	No
16	Municipal and Industrial System: Manage Jordanelle Reservoir lands for wildlife within management boundary area.	Reclamation and Utah Division of Parks and Recreation developed a cooperative agreement on 12/19/90 to manage lands within the management boundary. The agreement states that Utah Division of Parks and Recreation will implement a resource management plan developed by Reclamation.	Mitigation Commission, Reclamation, Utah Division Wildlife Resources, Utah Division of Parks and Recreation	Pending. Mitigation Commission will be following up on this in 2004.	No
17	Municipal and Industrial System: Stabilization of twelve upstream reservoirs on Provo River.	A FEIS on the Upper Provo River Reservoir Stabilization Project was issued by the FS on April 19, 1995. The Mitigation Commission entered into Interagency Agreements with the Forest Service and Reclamation to complete this project.	Mitigation Commission	All twelve lakes in the upper Provo River drainage were stabilized during the 1994-1999 period.	No
18	Municipal and Industrial System: Construct a campground at Washington Lake and construct the Crystal Lake Trailhead.	The 1987 Final Supplement to the Final Environmental Impact Statement for the Municipal and Industrial System required the construction of Washington Lake Campground and the Crystal Lake Trailhead.	Mitigation Commission	Construction began in July of 1997 and was completed in 1999.	No
19	Municipal and Industrial System: Fishery mitigation will consist of … maintenance of minimum flows of 125 cfs between Jordanelle Dam and Deer Creek Reservoir, 100 cfs between Deer Creek Dam and Olmsted Diversion, and 25 cfs during the winter from Olmsted Diversion to Utah Lake.	Compliance is required by Sec. 303(c) of CUPCA: "The yield and operating plans for the Bonneville Unit of the Central Utah Project shall be established or adjusted to provide for the following minimum stream flows, which flows shall be provided continuously and in perpetuity from the date first feasible, as determined by the Commission in consultation with the FWS and the Utah State Division of Wildlife Resources: In the Provo River from the base of Jordanelle Dam to Deer Creek Reservoir a minimum of one hundred and twenty-five cubic feet per second; In the Provo River from the confluence of Deer Creek and the Provo River to the Olmsted Diversion a minimum of one hundred cubic feet per second."	District	Completed and ongoing. Jordanelle Reservoir filled and was declared operation in July 1996. Minimum stream flows have been met since that date.	Yes

No.	Environmental Commitment	Comments	Responsibility	Status	ULS Requirement
20	Municipal and Industrial System: Post-project fishery studies will be conducted below Deer Creek Dam to more precisely examine the impacts of summer habitat loss and winter habitat gain on the overall Brown trout population and assess the feasibility of improving habitat through modification of streamflow regimens.	This commitment originated from the 1987 Final Supplement to the Final Environmental Impact Statement on the M&I System (Reclamation 1987). The study is intended to address the impacts on Brown trout habitat in the Provo River downstream from Deer Creek Dam resulting from implementation and operation of the M&I System. Section 303(d) of CUPCA indicates that "The District shall, with public involvement, prepare and conduct a study and develop a plan to mitigate the effects of peak season flows in the Provo River. Such study and plan will be developed in consultation with the FWS, the Utah Division of Water Rights, the Utah Division of Wildlife Resources, affected water right holders and users, the Mitigation Commission, and the Bureau." Section 303(e) authorized the appropriation of $500,000 to conduct this study and prepare the plan.	Mitigation Commission and District	In early 2002, the Mitigation Commission, in cooperation with the District and DOI, initiated the study. At that time, it was the Joint Lead Agencies' intent that the study and plan would be completed and incorporated into the ULS draft EIS. However, that won't be possible because of the complexity of the study and statutorily required consultation process, which hasn't occurred yet. The Provo River System Stream Flow Study, as envisioned by the Mitigation Commission, will address a broader scope of study than that necessary to meet this environmental commitment. Therefore, in accordance with section 303(d) of CUPCA and this previous environmental commitment, the Joint Lead Agencies commit to complete the Provo River System Stream Flow Study and associated plan as quickly as is reasonably possible.	Yes
21	Municipal and Industrial System: Angler access to 10 miles of Provo River downstream of Jordanelle Dam to Deer Creek Reservoir.	The PRRP ROD was signed by the Mitigation Commission on February 23, 1998 and by the DOI on March 20, 1998. Angler access acquisition along the middle Provo River is being integrated with the PRRP.	Mitigation Commission	Ongoing. This is part of the Mitigation Commission Plan. To date, the Mitigation Commission and Reclamation have purchased about 80 percent of the access needed along the river. Public access has been acquired for about 8.5 miles along the Provo River.	No
22	Municipal and Industrial System: Replacement of Middle Provo River Diversion Dams.	The 1987 Final Supplement to the M&I System Final EIS committed to assure that instream flows released from Jordanelle Dam could be bypassed all the way to Deer Creek Reservoir. Diversion dams in this reach have been incapable of accurately measuring or delivering bypasses for instream flows. Designs to modify or replace diversion structures on the middle Provo River are incorporated into the PRRP, which is being implemented.	Mitigation Commission	Ongoing. Part of the PRRP plans.	No
23	Municipal and Industrial System: Deer Mortality reduction on highways around Jordanelle Reservoir.	The Mitigation Commission continues to coordinate with Utah Division of Wildlife and FWS to determine the need and best methods for reducing deer mortality. The Mitigation Commission is no longer funding studies to evaluate the at-grade deer crossing areas as a viable mitigation measure. Utah Department of Transportation funded a study to evaluate deer exit ramps.	Mitigation Commission	Pending. Mitigation Commission will reconvene to work with FWS, Utah Division of Wildlife Resources and others; must determine next course of action.	No
24	Diamond Fork System: A total capacity of 510 cfs will be included in the Diamond Fork Pipeline for the purpose of removing project water, as well as existing high irrigation flows, from the lower Diamond Fork to mitigate potential project impacts and provide fishery enhancement.	The 510 cfs capacity pipeline has been constructed and the Diamond Fork Tunnel is under construction. When the DFS is completed and placed into operation, this commitment will be satisfied.	CWCD and DOI	Ongoing. Will be completed by the time the ULS EIS is completed. See 1999 DF FS-FEIS ROD and 2000 DF Final EA and FONSI.	No

No.	Environmental Commitment	Comments	Responsibility	Status	ULS Requirement
25	Diamond Fork System: A monitoring program will be established to ensure satisfactory water quality and water temperature in Diamond Fork below Monks Hollow Reservoir. If problems occur with low dissolved oxygen during project operation, corrective measures such as multi-level outlet on Monks Hollow Dam, aerators or destratifiers on Strawberry or Monks Hollow reservoirs, or warming ponds and aerators on Diamond Fork below Monks Hollow Reservoir will be constructed, as required, to guarantee a minimum dissolved oxygen content of 5 mg/L.	The DFS was reconfigured and Monks Hollow Reservoir is no longer part of any project plan. District has been collecting water quality and temperature data since July 1996. A cooperative agreement between the Mitigation Commission and District was signed in 1997 for collecting water quality and temperature data. The Mitigation Commission funded installation of two real-time stream gauging stations complete with Hydrolab water quality sampling units. The Mitigation Commission will work with District and the FWS to recommend incorporating water temperature and water quality modeling into the Utah Lake Drainage Basin Water Delivery Project planning process. Post project water temperature monitoring also would continue.	District and Mitigation Commission	Ongoing. District and Mitigation Commission are monitoring water quality during construction; Mitigation Commission will monitor following construction. ULS must address this issue and come to a conclusion on corrective measures, if they are necessary.	Yes
26	Diamond Fork System: A monitoring program would be established to ensure satisfactory water quality in Diamond Fork. Impacts of the [ULS] on Strawberry Reservoir, Utah Lake, Utah Valley streams, and the Jordan River will be presented in the environmental statement on the ULS. The water quality monitoring program committed to in the 1990 final supplement (Reclamation 1990) and the DOI 1995 Diamond Fork Pipeline ROD will be continued.	Original EC from the 1990 FS-FESI stated: "Features required exclusively for the Recommended Plan and Alternative A should not be constructed until there has been a disclosure of the total impacts they would have on fish and wildlife resources of Strawberry Reservoir, Utah Lake, and streams in Utah and Sevier valleys, and plans for mitigating losses have been agreed upon."	District	Cumulative impacts of Bonneville Unit on Strawberry Reservoir, Utah Lake, Utah Valley streams, and the Jordan River are addressed in the ULS. Sevier Valley area, Millard and Sevier counties are no longer in the District.	Yes
27	Diamond Fork System: The feasibility of incorporating plans for delivering up to 49 cfs during summer and 32 cfs during winter to Sixth Water Creek should be thoroughly explored. [A similar recommendation was included as an option in the 1988 Aquatic Mitigation Plan for the SACS].	Sec. 303(c)(1)(A) of CUPCA specifies that minimum stream flows in Sixth Water Creek downstream of Strawberry Tunnel shall be not less than thirty-two cfs during May through October and not less than twenty-five cfs during November through April. The minimum streamflows specified in CUPCA are less than the minimums originally recommended by IBAT and the FWS. A stream gage was constructed in October 1998 on Sixth Water Creek immediately upstream of the Sixth Water Aqueduct Outlet to monitor minimum stream flows. The DFS is under construction and these flows will be provided in perpetuity upon its completion.	District operates per CUPCA Sec. 303(c)(1)(A)	Completed. Sec. 303 of CUPCA specified the instream flows and modified the commitment. Modifications to Strawberry Tunnel and installation of the Syar Tunnel Guard Gate help achieve this objective.	No
28	Diamond Fork System: If not required by law, the feasibility of maintaining a minimum streamflow of 80 cfs in Diamond Fork for the protection of the stream fishery should be thoroughly explored.	The minimum streamflows specified in CUPCA Section 303(c)(1)(B) state that subsequent to completion of Monks Hollow Dam or other structure that re-diverts water from the Diamond Fork drainage into the DFS of the Bonneville Unit, flows from the bottom of Monks Hollow Dam to the Spanish Fork River shall be not less than eighty cfs during the months of May through September and not less than sixty cfs during the months of October through April. The Diamond Fork stream restoration study and re-analysis of the DFS flows will result in recommendations for flows in Diamond Fork to accomplish fisheries and riparian restoration and the accomplishment of project goals.	Mitigation Commission	Pending. The Mitigation Commission will begin studying the potential for stream restoration and flow recommendations after the DFS begins to operate.	No

No.	Environmental Commitment	Comments	Responsibility	Status	ULS Requirement
29	Diamond Fork System: Significant impacts on aquatic resources from modifications made at the Spanish Fork River diversions will be mitigated. If the diversion structures are modified, fish passage will be built into each structure.	District commenced studies on modifications at the Spanish Fork River diversions in 2001, but has not completed the design studies. Construction of the bypass structures is only included in the ULS No Action Alternative. The ULS alternatives would not require modifications to the Spanish Fork diversions to make deliveries to Utah Lake. The June sucker Recovery Implementation Program has recommended flows be provided to lower Hobble Creek, rather than Spanish Fork River, to establish a second June sucker spawning run.	District	Not a valid EC anymore. The Spanish Fork River Structures project has been suspended.	Yes
30	Diamond Fork System: The Diamond Fork System should be operated so that all sections of the Spanish Fork River receive the flows that are documented in the 1999 FS-FEIS that will benefit aquatic and terrestrial resources.	Since planning for ULS has commenced, June Sucker Recovery Implementation Program has recommended the joint-lead agencies investigate feasibility of providing flows to lower Hobble Creek, rather than lower Spanish Fork River, as number one priority for establishing a second spawning run of June sucker. This has been included in the ULS EIS.	District	The ULS EIS includes how the BU water will be delivered to lower Hobble Creek, Provo River, and Spanish Fork River.	Yes
31	Diamond Fork System: An interagency team consisting of representatives from the joint-lead agencies (District, DOI, and Mitigation Commission), FS, FWS, and Utah Division of Wildlife Resources should be organized to determine flow needs within Sixth Water and Diamond Fork creeks and the Spanish Fork River to benefit aquatic, terrestrial, and riparian resources.	See the comments in Environmental Commitment No. 21. The Mitigation Commission will organize the interagency team after the DFS begins to operate and high irrigation-influenced streamflows are removed from Diamond Fork Creek. Monitoring will include assessment of spawning gravel conditions, and leatherside populations and habitat.	Mitigation Commission	Pending. The Mitigation Commission will organize and convene an interagency team in 2004.	No
32	Diamond Fork System: Water quality monitoring will continue downstream of Strawberry Tunnel, Sixth Water Aqueduct, and the Diamond Fork Tunnel Outlet to determine potential DO concentration impacts and how far downstream low DO levels are found.	The dissolved oxygen concentrations in Diamond Fork Creek and Sixth Water Creek downstream of the three outlets will not be known until the DFS begins to operate. However, measures have been designed or are in place to re-aerate the water before it is discharged and low dissolved oxygen is not expected to be a problem. Monitoring of water quality, including dissolved oxygen, is ongoing in Sixth Water Creek and Diamond Fork Creek. Corrective measures will be taken as necessary to ensure the water quality standards for dissolved oxygen are met. This Environmental Commitment supercedes the dissolved oxygen portion of Environmental Commitment No. 18.	Mitigation Commission and District	Ongoing. District and Mitigation Commission are monitoring water quality during construction; Mitigation Commission will monitor following construction. ULS must address this issue and come to a conclusion on corrective measures, if they are necessary.	Yes
33	Diamond Fork System: If low DO levels are found downstream from tunnel outlets, baffles or oxygen aerators should be installed to bring DO concentrations up to levels that are not detrimental to fish and other aquatic resources.	See the comment in Environmental Commitment No. 25.	District	See the status in Environmental Commitment No. 25.	Yes
34	Diamond Fork System: Conduct a water quality and temperature-monitoring program throughout the Diamond Fork System.	The Mitigation Commission entered into a cooperative agreement with District to implement the program in 1997 and at that time added additional water quality parameters to be monitored. This Environmental Commitment supercedes the temperature portion of Environmental Commitment No. 18.	Mitigation Commission and District	Ongoing. Monitoring continues through present. In 2001, the Mitigation Commission determined through consultation with District, FWS, DOI, and Utah Division of Wildlife Resources that most metals and other parameters could be removed from the monitoring program. Once the DFS is in operation, additional monitoring will resume.	Yes

No.	Environmental Commitment	Comments	Responsibility	Status	ULS Requirement
35	Diamond Fork System: Acquire public access to the lower five miles of Diamond Fork Creek.	This requirement consisted of acquiring private lands. Partial accomplishment by USFS through land exchange; remaining lands acquired by Reclamation. The public access will provide angler access on lower Diamond Fork Creek.	Mitigation Commission	Ongoing. All properties have been acquired; but negotiations to clear minor boundary issues are still ongoing. An Interim Operating Agreement is in effect.	No
36	Diamond Fork System: Provide Diamond Fork recreation facilities compatible with the conservation of natural resources.	The 1988 Definite Plan Report and 1990 Final Supplement to the Final Environmental Impact Statement for the DFS identified construction of recreation facilities to help meet the anticipated recreation demand associated with construction of the DFS and to help meet the needs of a growing population along the Wasatch Front. The recreation facilities identified in the documents included a campground, day-use areas, trails, and angler access. The 1999 Final Supplement to the 1984 FEIS did not further revise the recreation commitments.	Mitigation Commission	Ongoing. Based on a 1998 Final Environmental Assessment (EA) and Decision Notice, the Diamond and Palmyra campgrounds were rebuilt in 2000. The rehabilitated campgrounds provide two-thirds the capacity of the original campgrounds in order to protect riparian vegetation from visitor use and to allow for stream restoration of Diamond Fork Creek. A Draft EA for the group campground facility was released in April, 2003. Other CUP recreation facilities planned in accordance with the Diamond Fork Area Assessment include day-use areas, trailheads, and angler access points.	No
37	Diamond Fork System: The joint-lead agencies will plan for a long-term riparian vegetation monitoring program to determine the effects on species composition, riparian corridor width, and vegetation density from flow modifications within the impact area of influence.	The Mitigation Commission will be including long-term riparian vegetation monitoring along Diamond Fork Creek, part of which will include recording existing conditions prior to operation of the DFS. The District and DOI will work with the Mitigation Commission to prepare the monitoring program (See also Environmental Commitment No. 30).	Mitigation Commission	Pending. The Mitigation Commission will put together a team to collect GIS data and aerial photos of Diamond Fork Creek as part of the monitoring.	No
38	Diamond Fork System: The joint-lead agencies will continue to coordinate with the FWS regarding results of the monitoring program and recommendations to mitigate any documented impacts.	The Mitigation Commission will monitor Diamond Fork Creek and Sixth Water Creek after the DFS begins operation. These data will be shared with the District, DOI and FWS. Documented impacts will be mitigated (See also Environmental Commitment No. 30).	Mitigation Commission	Pending. The Mitigation Commission will coordinate with the FWS.	No
39	Diamond Fork System: The joint-lead agencies will mitigate any losses or detrimental impacts on wetland and riparian habitats that cannot be restored.	The Mitigation Commission will determine the need for mitigation of losses or detrimental impacts on wetland and riparian habitats that cannot be restored, after the DFS begins operating (See also Environmental Commitment No. 30).	Mitigation Commission	Pending. Following completion of the DFS, the Mitigation Commission will determine the need for mitigation.	No
40	Diamond Fork System: The Mitigation Commission will continue to consult with the DOI, District, FWS, FS, Utah Division of Wildlife Resources, and others to plan and implement restoration of Sixth Water and Diamond Fork creeks, and to the extent possible, the Spanish Fork River.	The Mitigation Commission and the Forest Service (FS) entered into an Interagency Agreement in March 1995 to develop a conceptual plan for aquatic and riparian habitat restoration for Diamond Fork Creek that would emphasize natural processes and low maintenance. The planning area extends from Three Forks to the Spanish Fork River. The plan defined a reasonable range of alternative solutions for Diamond Fork Creek restoration considering the potential interactive effects of the pending Utah Lake Drainage Basin System, the Diamond Fork Pipeline, and management objectives for the watershed. The conceptual plan identifies factors that have created undesirable conditions and makes recommendations for management, structural, and hydrologic changes to rehabilitate the system (See also Environmental Commitment No. 30).	Mitigation Commission	Pending. Following completion of the DFS, the Mitigation Commission will consult with the agencies to plan and implement restoration actions as appropriate.	No
41a	Diamond Fork System: Monitoring during the construction period prior to project operation will continue to establish a credible baseline for Ute ladies'-tresses.	District has been conducting ULT studies in Diamond Fork Canyon and Spanish Fork Canyon during construction of the Diamond Fork Project. The Mitigation Commission will continue ULT monitoring for some period of time during operation of the DFS. The Spanish Fork Canyon colonies will be potentially affected by the ULS project; therefore, the commitments listed must be met under the ULS.	District	Ongoing. District has been monitoring ULT and baseline data are being collected. The Mitigation Commission will be responsible for data collection after the DFS begins operation as noted in Environmental Commitment 40b. The Mitigation Commission has been consulting with FWS regarding this change.	Yes

No.	Environmental Commitment	Comments	Responsibility	Status	ULS Requirement
41b	Diamond Fork System: Data collection following project implementation will include measurements of actual stream elevations relative to Ute ladies'-tresses orchid colony locations. If there are significant discrepancies, the model should be modified and a new impact assessment completed. Additionally, the joint-lead agencies should perform aerial mapping at a resolution sufficient to record stream channel geomorphology, vegetation community, and orchid colony locations in several-year intervals to help better understand changes and evaluate their significance in relation to restoration and conservation goals.	The measurements and other data will allow the FWS to verify the impact assessment model and its results. The joint-lead agencies (Mitigation Commission, DOI, and District) plan to perform aerial mapping during completion of the DFS and in several-year intervals following implementation. The Mitigation Commission will take the lead on performing the aerial photography and mapping.	Mitigation Commission	Pending.	No
41c	Diamond Fork System: Changes in vegetative communities in occupied or potentially suitable orchid habitat will be measured along Diamond Fork Creek and Spanish Fork Canyon.	The changes in vegetative communities may be measured using habitat associations, based on recent consultation between the Mitigation Commission and FWS.	Mitigation Commission	Pending. The Mitigation Commission will perform these studies; however, the plan for collecting these data may change based on consultation with the FWS.	No
41d	Diamond Fork System: The natural variation in Ute ladies'-tresses orchid demography, population vigor, and habitat will be characterized under baseline conditions and under actual operations.	After the DFS begins operation, the Mitigation Commission will be responsible for monitoring Ute ladies'-tresses orchid populations under action operations.	Mitigation Commission	Ongoing. Mitigation Commission will perform characterizations under actual operations.	No
41e	Diamond Fork System: The Three Forks colony will be monitored to better understand the process of loss of viability and eventual extirpation of colonies. Monitoring should focus on the rate of loss, identifying which parameters are best to measure to determine if loss is occurring	The Three Forks colony of Ute ladies'-tresses orchid is the most upstream colony documented in the Diamond Fork Creek drainage. Baseline data on this colony have been collected since the SFN EIS was started and continued through completion of the 1999 Diamond Fork System FS-FEIS.	Mitigation Commission	Ongoing. The Mitigation Commission will continue monitoring after operations begin.	No
41f	Diamond Fork System: Conservation measures in addition to altering flows and rescue/transplant should be considered, such as vegetation manipulation, providing supplemental water to colonies, and mechanical reconfiguration of portions of the stream channel or floodplain surfaces, if monitoring data show streamflow hydrology is adversely affecting the Ute ladies'-tresses orchid population.		Mitigation Commission	Pending. The Mitigation Commission will determine these measures after the DFS begins operating.	No
41g	Diamond Fork System: If pollination is determined to be a limiting factor to long-term orchid viability and successful colonization of new habitats, then the joint-lead agencies will consider actions to enhance pollinator habitat or numbers as appropriate.		Mitigation Commission	Pending. The Mitigation Commission will determine the need for the actions during DFS operation.	No

No.	Environmental Commitment	Comments	Responsibility	Status	ULS Requirement
41h	Diamond Fork System: A methodology should be developed that will monitor changes in Ute ladies'-tresses orchid habitat quality, and the methodology should be used to establish habitat quality parameters of the population.	The District has been collecting data on Ute ladies'-tresses orchid that will support the development of the methodology.	Mitigation Commission	Pending. The Mitigation Commission will develop the methodology.	No
41i	Diamond Fork System: Population viability parameters and "red-flag" conditions should be established for the habitat quality parameters.	The District has been collecting data on Ute ladies'-tresses orchid that will support establishing population viability parameters and "red-flag" conditions for the habitat quality parameters.	Mitigation Commission	Pending. The Mitigation Commission will establish after the DFS begins operating.	No
41j	Diamond Fork System: The accuracy of the predicted effects analysis should be measured.	This was not listed as a commitment in the DOI ROD. The District has been collecting data that will support measurement of the accuracy of the predicted effects analysis.	Mitigation Commission	Pending. The Mitigation Commission will measure after the DFS begins operating.	No
41k	Diamond Fork System: Timing for performing the most accurate canyon-wide Ute ladies'-tresses orchid counts should be evaluated.	The District has been collecting data that will support evaluation of timing for performing the most accurate canyon-wide counts of Ute ladies'-tresses orchid.	Mitigation Commission	Pending. The Mitigation Commission will evaluate after the DFS begins operating.	No
41 l	Diamond Fork System: The relationship between river hydrology, depth to soil water, soil moisture, soil characteristics and Ute ladies'-tresses orchid colonies should be correlated.	The District has been collecting data that will support the correlation of these relationships.	Mitigation Commission	Pending. The Mitigation Commission will correlate these relationships after the DFS begins operating.	No
42	Diamond Fork System: The joint-lead agencies will identify, acquire, and permanently provide a block of water for flows in the lower Provo River through critical habitat, in perpetuity, for June sucker.	The District, DOI and Mitigation Commission have actively worked to acquire water for the June sucker and continue to pursue more water through Sections 207, 303, and other existing authorities involving water conservation conveyance efficiency, and outright purchase of water. Water saved or acquired may become project water and may be applied to meet this and other environmental commitments.	District and DOI	Ongoing. The District, DOI, and Mitigation Commission have been actively acquiring water through the Sections 207, 303, and other existing authorities, now in the amount of 3,300 ac-ft permanent water rights, with additional temporary water in the amount of 10,000 ac-ft available in 5-year increments.	Yes
43	Diamond Fork System: District, in cooperation with the other Provo River water users, the FWS, and other members of the Provo River Flows Workgroup, will agree on operational scenarios that mimic dry, moderate and wet years. The District, with the support of the joint-lead agencies and Provo River water users, will apply operational scenarios to the annual Provo River operation to benefit June sucker.	District has developed operational scenarios that mimic dry, moderate and wet year hydrology and has applied them annually since 1999 to release of water in the Provo River to benefit June sucker. These operational scenarios are working well and the District has accomplished its goal of providing operations in the Provo River to benefit June sucker.	District	Completed. This commitment has been met, and the District will continue to manage and operate flows under the three scenarios.	Yes
44	Diamond Fork System: The joint-lead agencies, in cooperation with the State of Utah and the FWS, will work toward establishment of a refugium in Red Butte Reservoir for June sucker.	District has been working with DOI and the Mitigation Commission, in cooperation with the State of Utah and FWS, to establish a refugium for June sucker in Red Butte Reservoir. The NEPA compliance document is being prepared and necessary modifications are being made to the reservoir control structures.	District	Ongoing. This commitment will be completed in late 2004 or 2005.	No
45	Diamond Fork System: Any future development of the Bonneville Unit of CUP will be contingent on the Recovery Implementation Program making "sufficient progress" towards recovery of June sucker.	District, DOI and the Mitigation Commission have been active participants in the June sucker Recovery Implementation Program (JSRIP), and 29 separate activities or studies are underway or planned as part of the recovery of June sucker.	District, DOI, and Mitigation Commission	Ongoing. The RIP has been developed and 29 activities are being performed in 2003. "Sufficient progress" will be determined in writing by FWS 1 year after the RIP is implemented (2002).	Yes

No.	Environmental Commitment	Comments	Responsibility	Status	ULS Requirement
46	Diamond Fork System: The ROD commits and obligates the Joint-Lead Agencies to prepare another EIS on the Bonneville Unit, Central Utah Project, associated with the Utah Lake System in compliance with Interior's FRN (FR Doc. 98-27484) dated October 14, 1998. That will not only address the impacts associated with any additional Utah Lake System facilities, but will also incorporate and address all remaining and incomplete commitments contained in the various CUP NEPA compliance documents and previous RODs.	The District, DOI and the Mitigation Commission have initiated planning and NEPA compliance activities on the Utah Lake System project.	District, DOI, and Mitigation Commission	Pending.	Yes
47	I&D System/Utah Lake System: That a minimum pool elevation of 4,480 feet be maintained in Utah Lake, representing a maximum drawdown of about 9.3 feet below compromise level.	The Utah State Engineer's Office issued the Water Distribution Plan the Utah Lake Drainage Basin on October 22, 1992. This interim plan recommended the inactive storage level to be 8.7 feet below compromise. The FWS believes that the 1988 Definite Plan Report (DPR) commitments will be satisfied if the inactive storage level is established at 8.7 feet below compromise as per the Water Distribution Plan for Utah Lake. The FWS will review the water level needs for the endangered June sucker during consultations for either the Diamond Fork Project or the Utah Lake Drainage Basin Water Delivery System project.	NA	Not a valid EC anymore. The State Engineer's Water Distribution Plan sets the level of Utah Lake.	NA
48	I&D System/Utah Lake System: That effort be made to secure approximately 24,250 acre-feet of water annually for management of the Goshen Bay Wildlife Management Area.	This commitment was associated with a previous planning effort for components of the I&D System of the Bonneville Unit, which have since been discarded and/or de-authorized. Preliminary planning for the Utah Lake Wetland Preserve (ULWP) suggests that about 13,000 acre-feet of water might be needed for the ULWP under the "maximum possible wetland development" scenario if adopted for the development and management of the ULWP.	Mitigation Commission	This is not a Bonneville Unit EC, but is ongoing. The original quantity of water is not relevant anymore, superceded by CUPCA.	NA
49	I&D System/Utah Lake System: That 14,500 acres of lands with attached water rights in the vicinity of Goshen Bay be acquired and developed for management by the Utah Division of Wildlife Resources. Management would be directed primarily towards mitigation of waterfowl and pheasant habitats.	This recommendation was associated with a previous planning effort for components of the I&D System of the Bonneville Unit, which have since been discarded and/or de-authorized. CUPCA authorized the establishment of the ULWP. CUPCA identifies about 22,000 acres to be acquired by the Mitigation Commission on the southern end of Utah Lake in the Goshen Bay and Benjamin Slough areas to establish the ULWP. The ULWP will be managed by the Utah Division of Wildlife Resources for protection of migratory birds, wildlife habitat, and wetland values in accordance with CUPCA and the substantive requirements of the National Wildlife Refuge System Administration Act of 1966.	Mitigation Commission	This is not a Bonneville Unit EC, but is ongoing. The Mitigation Commission in partnership with Utah Division of Wildlife Resources and Reclamation has acquired about 5,040 acres to date for the ULWP. The recommend acreage from the previous plan is no longer applicable.	NA
50	I&D System/Utah Lake System: That plans for about 6 miles of open canal sections of the Wasatch Aqueduct and 1.5 miles of the Mona-Nephi Canal be modified to permit crossing by big game animals.	The need for these actions will be evaluated in light of new plans. If no further Bonneville Unit developments are expected (i.e. no Utah Lake Drainage Basin Water Delivery System project), the need for these actions will also be evaluated and appropriate actions implemented.	NA	Not a valid EC anymore. The SFN considered changes to the Wasatch Aqueduct and Mona-Nephi Canal; since the SFN was discontinued, this commitment is no longer applicable.	NA

No.	Environmental Commitment	Comments	Responsibility	Status	ULS Requirement
51	Utah Lake System: Complete all mitigation commitments for fish, wildlife and related recreation associated with the ULS project or other CUP facilities.	The Utah Lake Drainage Basin System is in the planning stages. Mitigation commitments will be identified in a final environmental impact statement and record of decision. The Mitigation Commission will use some of the funds available for this program to implement June sucker recovery actions in accordance with the June sucker Recovery Implementation Program.	Mitigation Commission	Pending.	Yes
52	Wasatch County Water Efficiency Project and Daniel Replacement Project: Future land uses in easement Right of Ways will exclude use by cattle and any other uses that impact water quality.	All easements have been acquired for the WCWEP project, and all uses of water are protected from livestock and any other uses that could impact water quality.	District	Completed.	No
53	Provo River Restoration Project: Develop a comprehensive monitoring and reporting program in cooperation with the U.S. Army Corps of Engineers, Utah Division of Wildlife Resources, FWS, recreation groups, and county officials to evaluate and provide information and management guidance on the following: A. Success of revegetation and erosion control measures. B. Control of noxious weeds and undesirable plants. C. Aquatic and terrestrial habitat mitigation. D. Aquatic and terrestrial species responses to the project. E. Threatened, endangered, and candidate species status and trends.	The Mitigation Commission has been monitoring and reporting on each item in cooperation with the agencies and entities listed at left. The project is meeting or exceeding its goals for revegetation, erosion control, control of noxious weeds and undesirable plants, aquatic and terrestrial habitat mitigation, T&E species habitat. The aquatic and terrestrial species responses to the project are being monitored.	Mitigation Commission	Ongoing. Baseline data and post-project data have been collected since 1997. Annual progress meetings are held. The Mitigation Commission is monitoring each item as listed.	No

Source Documents:

2001 Mitigation and Conservation Plan. Utah Reclamation Mitigation and Conservation Commission.

Amendment to Agreement. September 11, 1990. Amends the 1980 Instream Flow Agreement.

Biological Opinion on the Final Supplement to the Final Environmental Impact Statement, Diamond Fork System, Bonneville Unit, Central Utah Project. July 1999. U.S. Department of the Interior, Fish and Wildlife Service, Utah Field Office. Salt Lake City, Utah.

Biological Opinion on the Operation of the Provo River Project, Utah. September 1994. U.S. Department of the Interior, Fish and Wildlife Service, Utah Field Office. Salt Lake City, Utah.

Draft Annual Work Plan 2001 Calendar Year for the Proposed June Sucker Recovery Implementation Program. June 2001. June Sucker Recovery Implementation Program Technical Committee and Interested Parties.

Final Environmental Assessment for the Diamond Fork System Proposed Action Modifications. June 2000. Central Utah Water Conservancy District, Orem, Utah.

Final Environmental Statement, Municipal and Industrial System, Bonneville Unit, Central Utah Project. October 1979. U.S. Bureau of Reclamation, Upper Colorado Region, Salt Lake City, Utah.

Final Supplement to the Final Environmental Impact Statement, Diamond Fork System, Bonneville Unit, Central Utah Project. July 1999. Central Utah Water Conservancy District, Orem, Utah.

Final Supplement to the Final Environmental Impact Statement, Diamond Fork System, Bonneville Unit, Central Utah Project. February 1990. U.S. Bureau of Reclamation, Upper Colorado Region, Salt Lake City, Utah.

Final Supplement to the Final Environmental Statement, Municipal and Industrial System, Bonneville Unit, Central Utah Project. March 1987. U.S. Bureau of Reclamation, Upper Colorado Region, Salt Lake City, Utah.

Record of Decision for the Diamond Fork System. September 29, 1999. United States Department of the Interior, Central Utah Project Completion Act Office.

Record of Decision for the Diamond Fork System. November 19, 1999. Utah Reclamation Mitigation and Conservation Commission.

Status of Fish and Wildlife Mitigation Recommendations for the Central Utah Project, 2000 Update. United States Department of the Interior, Fish and Wildlife Service, Utah Field Office. Salt Lake City, Utah.

Public Law 102-575, Reclamation Projects Authorization and Adjustment Act of 1992 (CUPCA). October 30, 1992. 102^{nd} Congress of the U.S.

ULS Environmental Commitments

The Central Utah Water Conservancy District (District) will comply with the State of Utah's water conservation goals of reducing per capita water use within the District's Bonneville Unit service area by 12.5 percent by year 2020 and by 25 percent by year 2050. (District)

Beginning in 2005, the District will prepare an annual report for the Utah Division of Water Resources and U.S. Department of the Interior (DOI) on the average annual per capita water use within the District's Bonneville Unit service area for each of the District's petitioners of ULS water. (District)

The District, working with the DOI, the District's petitioners, and owners/operations of wastewater treatment plants, shall by the year 2030 recycle 18,000 acre-feet of return flows from the Bonneville Unit Project Water. (District)

Commencing with water year 2016 and continuing until the water year 2033 the District shall demonstrate its annual progress towards recycling 18,000 acre-feet and shall continue to maintain recycling the 18,000 acre-feet through water year 2050. (District)

Provide 12,165 acre-feet of water to be regulated annually from Deer Creek Reservoir to the lower Provo River for June sucker spawning and rearing flows. (DOI and District)

The Utah Reclamation Mitigation and Conservation Commission (Mitigation Commission) and the District will continue to acquire water shares from irrigation companies to provide flows in the lower Provo River to meet the 75 cfs target flow. (Mitigation Commission and District)

Provide 3,300 acre-feet of irrigation company shares of water to flow unregulated toward the 75 cfs target flow in the lower Provo River. (Mitigation Commission and District)

An annual average of 16,000 acre-feet of Bonneville Unit water would be delivered to the lower Provo River through the Spanish Fork-Provo Reservoir Canal Pipeline, when water is needed in Utah Lake for exchange to Jordanelle Reservoir, and when the lower Provo River is below the 75 cfs target flow. (District)

An annual average of 12,037 acre-feet of water, of which 4,000 acre-feet will be available annually, would be regulated out of Strawberry Reservoir through the Mapleton-Springville Lateral Pipeline to Hobble Creek to Utah Lake for June sucker spawning and rearing in Hobble Creek. (DOI and District)

The Mitigation Commission will provide 10 acres of the 85 acre Mona Springs Wetland Unit which was acquired for protection of the wetlands complex for mitigation of 1.03 acres of non-jurisdictional permanent wetland loss and 0.27 acres of temporary wetland impacts. (Mitigation Commission)

The District is fully committed to participating with the Utah Division of Water Quality in the state's Total Maximum Daily Load (TMDL) study and has joined the Stakeholders Advisory Committee established by the State to guide the TMDL study. (District)

The Joint-Lead Agencies, in cooperation with the June Sucker Recovery Implementation Program (JSRIP) and U.S. Fish and Wildlife Service (FWS), have initiated a study to determine the feasibility of providing fish passage or removing the Fort Field Diversion Dam on the lower Provo River for June sucker spawning and rearing. (Mitigation Commission)

A Ute ladies'-tresses orchid monitoring program should be carried forward for a number of years (to be determined jointly by the District, Mitigation Commission and FWS) similar to the pre-operation study in Diamond Fork. If the changes to the Ute ladies'-tresses orchid population in Spanish Fork Canyon exceed the variation expected from pre-operation analysis and the critical values established, management guidelines presented in the 1999 Diamond Fork Biological Opinion may be implemented to compensate for impacts. (Mitigation Commission)

If post-operation monitoring results in measured parameters exceeding pre-set critical values for Ute ladies'-tresses orchid populations in Spanish Fork Canyon, the Diamond Fork System operation has the flexibility to supplement flows in Spanish Fork River. Other measures, such as a rescue/transplant program, could be initiated. (Mitigation Commission)

To offset potential impacts on leatherside chub, the Joint-Lead Agencies will support the Utah Division of Wildlife Resources in evaluating population and habitat status, or determining threats and/or identifying conservation actions that could protect and where appropriate enhance leatherside chub habitat. (Mitigation Commission)

The District and DOI will re-consult with the Native American Tribes if there are significant changes in ULS Proposed Action facility locations. (District and DOI)

Utah Lake Drainage Basin
Water Delivery System
Bonneville Unit, Central Utah Project

Final
Environmental Impact Statement

Appendix B
Noxious Weed Control Plan

Appendix B
Noxious Weed Control Plan

B.1 Introduction

Construction of the Utah Lake Drainage Basin Water Delivery System (ULS) project would disturb a number of acres and provide the opportunity for noxious weed invasion. This appendix identifies noxious weeds and provides a plan to control them in areas disturbed by construction of the Proposed Action and other alternatives. The plan is required by the State of Utah under Section 4-17-3 of Utah Noxious Weed Act (updated July 2003).

B.2 Utah Noxious Weed Lists

Table 1 identifies noxious weeds listed by the State of Utah or by counties; "weeds of concern" listed by the Uinta National Forest, and new and invading species listed by the U.S. Bureau of Land Management in the ULS impact area of influence.

Table B-1
Noxious Weeds, Weeds of Concern, and New and Invading Species in ULS Impact Area of Influence

Page 1 of 2

Common Name	Scientific Name
Utah State and County-Listed Noxious Weed Species	
Quackgrass	*Elytrigia repens* (formerly *Agropyron repens*)
Bermudagrass	*Cynodon dactylon*
Perennial Sorghums, including Johnsongrass	*Sorghum almum, S. halepense*
Canada thistle	*Cirsium arvense*
Scotch thistle	*Onopordum acanthium*
Musk thistle	*Carduus nutans*
Spotted knapweed	*Centaurea maculosa*
Squarrose knapweed	*Centaurea vigata* Lam.
Diffuse knapweed	*Centaurea diffusa*
Russian knapweed	*Centaurea repens*
Field bindweed (wild morning glory)	*Convolvulus arvensis*
Dyers woad	*Isatis tinctoria*
Perennial pepperweed	*Lepidium latifolium*
Yellow starthistle	*Centaurea solstitialis*
Leafy spurge	*Euphorbia esula*
Purple loosestrife	*Lythrum salicaria*
Hoary cress	*Cardaria draba*
Medusahead	*Taeniatherum caput-medusae*
Houndstongue	*Cynoglossum officinale*
Dalmatian toadflax	*Linaria genistifolia*
Yellow toadflax	*Linaria vulgaris*

Table B-1
Noxious Weeds, Weeds of Concern, New and Invading Species in ULS Impact Area of Influence

Page 2 of 2

Common Name	Scientific Name
Uinta National Forest Weeds of Concern	
Black henbane	*Hyoscyamus niger*
Blue spurge	*Euphorbia myrsinites*
Common burdock	*Arctium minus*
Cheatgrass	*Bromus tectorum*
Russian olive	*Elaeagnus augustifolia*
Tamarisk	*Tamarix ramosissima*
Jointed goatgrass	*Aegilops cylindrica*
Poison hemlock	*Conium maculatum*
Wooly mullein	*Verbascum bombyciferum*
Other New and Invading Noxious Weed Species	
Camel thorn	*Alhagi camelorum*
Goats-rue	*Galega officinalis*
Purple starthistle	*Centaurea calcitrapa*
Silver nightshade	*Solanum elaeagnifloium*
St. Johnswort	*Hypericum perforatum*
Velvetleaf	*Abutilon theophrasti*
Water hemlock	*Cicuta douglasii*
Wild proso millet	*Panicum miliaceum*
Yellow nutsedge	*Cyperus esculentus*
Yellow toadflax	*Linaria vulgaris*

Sources:
Noxious Weed Guide for Utah (2003), Cache County Weed Department. Logan, Utah (includes county lists).
Land and Resource Management Plan Revision (2003), Uinta National Forest.
Utah Administrative Code R68-9-1 (2003).
Bureau of Land Management, Utah Weed Program (2003).

B.3 Noxious Weed Control Measures

The following measures would be taken to control the invasion and establishment of noxious weeds during construction and revegetation of the Proposed Action and other alternatives.

- Control weed growth on topsoil and other earth stockpiles
- Inspect topsoil and aggregate sources to be imported and make sure there are no noxious weeds
- Prohibit the transport of infested materials to project work sites
- Wash heavy equipment prior to transport to the site
- Treat weeds in right-of-way areas during construction activities
- Monitor for and treat disturbed revegetated areas for up to 5 years after project completion

- Include weed prevention and control activities as part of an operation and maintenance plan

This program would include the following key activities:

B.3.1 Seeding

Establish a cover of desirable plant species as quickly as possible after construction. This may include interim seeding of topsoil stockpiles and areas that would remain barren for lengthy periods. Table 2 lists plant species that could be considered for upland transplanting and seeding in disturbed areas. Table 3 lists species for transplanting and seeding in disturbed riparian and wetland areas (Horton 1989 and Clary et al 1992). Some species may need to be substituted depending on the availability of locally adapted stock seed supplies.

Table B-2
Species for Transplanting and Seeding Upland Areas
Disturbed by Construction Activities

Page 1 of 2

Common Name	Scientific Name
	Woody Shrubs
Utah serviceberry	*Amelanchier utahensis*
Mountain big sagebrush	*Artemisia tridentata vaseyana*
Curl-leaf mountain mahogany	*Cercocarpus ledifloius*
Birch-leaf mountain mahogany	*Cercocarpus montanus*
Gray Rabbitbrush	*Chrysothamnus nauseous hololrucus*
Utah Juniper	*Juniperus osteosperma*
Bitterbrush	*Purshia tridentata*
Gambel oak	*Quercus gambelli*
Skunkbrush sumac	*Rhus trilobata*
	Grasses and Grasslikes
Slender wheatgrass	*Elymus trachycaulus* (formerly *Agropyron trachycaulum)*
Intermediate wheatgrass	*Elytrigia intermedia (*formerly *Agropyron intermedium)*
Pubescent wheatgrass	*Elytrigia intermedia* spp. *trichophorum (*formerly *Agropyron trichophorum)*
Bluebunch wheatgrass	*Elymus spicatus (goldar) (*formerly *Agropyron spicatum)*
Western wheatgrass	*Elymus smithii (*formerly *Agropyron smithii)*
Thickspike wheatgrass	*Elymus lanceolatus (*formerly *Agropyron dasystachyrum)*
Streambank wheatgrass	*Elymus lanceolatus riparium (*formerly *Agropyron dasystachyrum riparium)*
Sandberg's bluegrass	*Poa secunda*
Mountain brome	*Bromus marginatus*
Great Basin wildrye	*Elymus cinereus*
Squirreltail	*Elymus elymoides*
Sheep fescue	*Festuca ovina*
Hard fescue	*Festuca ovina var. duriuscula*
Big bluegrass	*Poa ampla*
Indian ricegrass	*Oryzopsis hymenoides*

Table B-2
Species for Transplanting and Seeding Upland Areas
Disturbed by Construction Activities

Page 2 of 2

Common Name	Scientific Name (Synonyms)
	Forbs
Pacific aster	*Aster chilensis var. ascendens*
Blueleaf aster	*Aster glaucodes var. glaucodes*
Louisiana wormwood	*Artemisia ludoviciana (summit)*
White yarrow	*Achillea millefolium*
Utah milkvetch	*Astragalus utahensis*
Arrowleaf balsamroot	*Balsamorhiza sagittata*
Sulfur flower	*Eriogonum umbellatum*
Lewis flax	*Linum perenne lewisii*
Palmer's penstemon	*Penstemon palmeri*
Rydberg's penstemon	*Penstemon rydbergii*
American vetch	*Vicia americana*

Note: Central Utah Water Conservancy District would consult with USDA Forest Service Provo Shrub Sciences Lab before developing specific revegetation seed mixtures.

Table B-3
Species for Transplanting and Seeding Riparian and Wetland Areas
Disturbed by Construction Activities

Page 1 of 2

Common Name	Scientific Name
	Riparian Trees
Box elder	*Acer negundo*
Mountain alder	*Alnus incana*
River birch	*Betula occidentalis*
Douglas hawthorn	*Crataegus douglasii*
Narrowleaf cottonwood	*Populus angustifolia*
	Woody Shrubs
Whiplash willow	*Salix lasiandra*
Yellow willow	*Salix lutea*
Booth's willow	*Salix boothii*
Coyote willow	*Salix exigua*
Wood's rose	*Rosa woodsii*
Squawbush	*Rhus aromatica*
Golden currant	*Ribies aureum*
Red-osier dogwood	*Cornus sericea*
	Grasses and Grasslikes
Redtop	*Agrostis stolonifera*
Mountain Brome	*Bromus marginatus*
Bluejoint Reedgrass	*Calamagrostis canadensis*

Table B-3
Species for Transplanting and Seeding Riparian and Wetland Areas
Disturbed by Construction Activities

Page 2 of 2

Common Name	Scientific Name (Synonyms)
Popcorn Sedge	*Carex microptera*
Nebraska sedge	*Carex nebraskensis*
Beaked sedge	*Carex rostrata*
Tufted Hairgrass	*Deschampsia caespitosa*
Creeping Spikerush	*Eleocharis palustris*
Great Basin wildrye	*Elymus cinereus*
Blue wildrye	*Elymus glaucus*
	Grasses and Grasslikes
Fowl Mannagrass	*Glyceria striata*
Baltic rush (wiregrass)	*Juncus articus*
Torrey's Rush	*Juncus torreyi*
Small Fruit Bulrush	*Scirpus microcarpus*

Note: District would consult with USDA Forest Service Provo Shrub Sciences Lab before developing specific revegetation seed mixtures.

B.3.2 Weed Surveys

For three years after initial seedings, conduct monthly weed surveys during the growing season in all areas disturbed by construction. Any weeds would be chemically treated or removed (mechanically or by hand) before they develop seeds or spread rhizomatous roots and establish large colonies that are difficult to eradicate. Fall and spring weed surveys are especially important to identify and locate perennial and biennial weeds in their early stages of development.

B.3.3 Herbicide Control

Apply herbicides such as 2-4-D, Roundup™, Weedmaster™ and Banvel™ according to the manufacturers' recommendations and federal regulations. Herbicides should not be used in close proximity to drinking water source protection areas.

Fall herbicide applications can effectively control perennial weeds if most stem and leaf tissue has not been killed by frost. Field bindweed, leafy spurge and Canada thistle should have 12 inches or more of leaf area to absorb the herbicide. Good leafy spurge control can be expected through mid-October even after several light frosts if the leaves are green or red but still firmly attached to the stem.

B.3.4 Federal Herbicide Application and Record-Keeping Requirements

All Federally Restricted-Use Herbicides must be applied by a certified commercial or private applicator who must keep a record of all such applications for two years from the date of the herbicide application (USDA 1993). The following information must be recorded within 30 days following the herbicide application:

- Brand or product name of restricted-use herbicide and its EPA registration number

- Total amount of herbicide applied
- Size and location of area treated
- Crop, commodity, stored product or site to which the herbicide was applied
- Month, day and year of application
- Certified applicator's name and certification

Utah Lake Drainage Basin Water Delivery System
Bonneville Unit, Central Utah Project

Final
Environmental Impact Statement

Appendix C
404(b)(1) Analysis and
401 Water Quality Certification

Appendix C
Utah Lake System EIS 404(b)(1) Analysis for 404 (r)

C.1 Introduction

This appendix presents the 404(b)(1) Analysis and the State of Utah's 401 Water Quality Certification letter prepared for the Utah Lake Drainage Basin Water Delivery System (ULS). This analysis was performed by the Central Utah Water Conservancy District (District) in compliance with Title 40 Code of Federal Regulations (CFR) 230 – Section 404(b)(1) Guidelines for Specification of Disposal Sites for Dredged or Fill Material.

Waters of the U.S. are protected by the federal government through Section 404 of the Clean Water Act (CWA) (sections a and e) which is administered by the U.S. Army Corps of Engineers (COE) with oversight by the U.S. Environmental Protection Agency (EPA). The CWA applies to dredged or fill material placed in waters of the United States, which Title 40 CFR 230.3 defines as all waters which are currently used, or were used in the past, or may be susceptible to use in interstate or foreign commerce, including all waters which are subject to the ebb and flow of the tide, all interstate waters including interstate wetlands and all other waters such as interstate lakes, rivers, streams (including intermittent streams), mudflats, sandflats, wetlands, sloughs, prairie potholes, wet meadows, playa lakes or natural ponds.

C.1.1 Purpose of this 404(b)(1) Analysis

This analysis under Section 404(b)(1) of the Clean Water Act has been prepared to analyze and describe the potential impacts from proposed discharges of fill material into waters of the United States as a result of the construction and operation of the proposed Utah Lake System (ULS) project in Utah. This 404(b)(1) Analysis is prepared in support of the requirements of Section 404 of the CWA (PL 92-500, as amended), and the Environmental Protection Agency Guidelines (40 CFR Part 230 *et seq*). Specifically, the 404(b)(1) Analysis is prepared to support the Joint-Lead Agencies' (U.S. Department of the Interior, Central Utah Water Conservancy District, and Utah Reclamation Mitigation and Conservation Commission) intention to seek Clean Water Act compliance through Section 404 (r) provisions. Section 404 (r) establishes that that a project is not prohibited or subject to regulation under Section 404 if information on the effects of the project, including consideration of the 404(b)(1) Guidelines is included in the EIS for the project, which means that certain Federal projects are exempt from the requirements to obtain a Section 404 permit for construction activities resulting in a discharge of dredged or fill material into waters of the United States. It is necessary for the EIS to be submitted to Congress before any discharge for the project occurs, and prior to either Congressional authorization or appropriation for the project.

C.1.2 404(b)(1) Guidelines

The 404(b)(1) Guidelines, contained in Title 40 CFR Part 230 et seq., are the criteria used in evaluating discharges of fill (or discharges of dredged materials) in waters of the United States under Section 404 of the CWA Act.

The Guidelines were developed by the EPA in conjunction with the Secretary of the Army acting through the Chief of Engineers and have the full force and effect of law. The Guidelines are consistent with policies expressed in the CWA and are intended to implement those policies. The Guidelines are weighted toward restoring and maintaining the chemical, physical, and biological integrity of waters of the United States by controlling discharges. Basic to the Guidelines is an understanding that fill (or dredged) material should not be discharged into such waters unless it is demonstrated that such discharges would not have unacceptable adverse impacts either individually or in combination with existing and/or probable impacts of other activities affecting the environment. A Section 404(b)(1) Analysis is intended to provide demonstration of the compliance, or the lack thereof, with the Guidelines.

The Guidelines state that there must be no other practicable alternative which is less damaging to the aquatic environment, unless the least damaging alternative would have other significant adverse environmental consequences. This is a technical analysis based on many factors that are evaluated in light of the basic purpose for the project under review.

A number of critical items must be evaluated for each project. These include the project basic purpose, practicable alternatives, cumulative effects, and impact mitigation, as well as the factual determinations. Key issues must be decided in arriving at a determination of compliance or non-compliance. The project must not cause or contribute to significant degradation of waters of the United States, and all appropriate and practicable measures for avoiding or minimizing potential adverse impacts of the discharge on the aquatic ecosystem must be taken.

Section 230.10(b) requires that the project comply with State water quality standards, the federal Endangered Species Act (ESA), and other pertinent statutory provisions. Section 230.11 of the Guidelines sets forth the factual determinations used in deciding compliance. These determinations are:

- Physical substrate
- Water circulation, fluctuation, and salinity
- Suspended particulate/turbidity
- Contaminant
- Aquatic ecosystem and organism
- Proposed disposal site
- Cumulative effects on the aquatic ecosystem
- Secondary effects on the aquatic ecosystem.

Section 230.12 requires a finding of compliance or non-compliance with the restrictions on discharge.

Subparts C through F of the Guidelines evaluate the potential impacts of the fill activity on physical and chemical characteristics of the aquatic ecosystem, special aquatic sites, and human use characteristics respectively. Subpart G of the Guidelines set forth evaluation and testing procedures to provide information necessary to reach the determinations in Subpart B. Subpart H of the Guidelines lists actions to minimize adverse effects of the discharge.

C.1.3 Procedures Followed In The Evaluation (Based on 40 CFR 230.5)

C.1.3.1 Identification of Waters of the U.S. Including All Wetlands (Jurisdictional and Non-jurisdictional)

The analysis of impacts on aquatic resources involved identifying, defining and documenting existing waters and wetlands by plant community type, extent, and function, then determining the impact of the Proposed Action and other alternatives on each aquatic type, extent and function. All wetlands were addressed regardless if they were jurisdictional or non-jurisdictional. Direct and indirect impacts were evaluated, quantified to the extent possible and visually presented on maps. The analysis of impacts considered the standard operating procedures and project design features that the District will carry out or implement as part of the project.

The 2003 baseline wetland inventory was based on National Wetlands Inventory (NWI) geographic information system (GIS) maps and the results of fieldwork conducted by in May 2002. An additional wetland reconnaissance was conducted in May and June 2003 to identify and delineate existing wetlands, characterize wetland hydrology and hydrogeological settings, and determine wetland functions within the impact area of influence. Wetlands in the ULS impact area identified in the NWI database for Utah were visually surveyed in the field to confirm hydrology and vegetation. Soil pits were not excavated because the District would mitigate for all wetland impacts whether jurisdictional or non-jurisdictional. Wetlands potentially impacted by construction were recorded using a Geographic Positioning System (GPS). This baseline information was displayed on a computer-generated GIS base map for analysis. This baseline was used to estimate the impacts that would occur from construction of the proposed ULS alternatives. Additionally, it was used to determine any impacts that may result from stream and river flow alterations associated with ULS operations.

C.1.4 Items from 40 CFR 230 Not Included in this Analysis Because They Are Not Applicable

With regard to the ULS project, impacts from placement of dredged or fill materials do not apply to tidal-affected waters, sandflats, prairie potholes, or playa lakes. In addition, for the following tables, specific topics were not found to be applicable to the ULS project:

- Table 3 Section C.3.2.2 and C.3.2.3 under Special Aquatic Sites. Discussion of mudflats and vegetative shallows is not applicable for any alternative.
- Table 11 Section C.9.2 Gravel, sand, other naturally occurring inert materials, excavated earth used for trench backfill, and concrete are not applicable for any of the alternatives because contact with any contaminated material is not anticipated.

C.2 Alternatives Analysis

C.2.1 Project Purpose

The determination of the basic project purpose is required to conduct an adequate 404(b)(1) analysis of the least damaging practicable alternative. The project purpose drives the definition and analysis of practicable alternatives.

The ULS basic project purpose is:

To provide M&I water to the Wasatch Front area, which is in addition to that committed to in the 1979 M&I Final Environmental Impact Statement.

C.2.2 Description of Practicable Alternatives

Practicable alternatives include the Spanish Fork Canyon-Provo Reservoir Canal Alternative (Proposed Action), the Bonneville Unit Water Alternative, Strawberry Reservoir-Daniels Summit Alternative, and Strawberry Reservoir-Deer Creek Reservoir Alternative. In addition, the No Action Alternative is considered a practicable alternative. Table 1 shows the allocation of ULS M&I water to southern Utah County and Salt Lake County for the practicable alternatives.

Table 1
Allocation of Utah Lake System M&I Water by Practicable Alternatives
(acre-feet)

Allocation	Proposed Action	Bonneville Unit Water Alternative	Strawberry Reservoir-Daniels Summit Alternative	Strawberry Reservoir-Deer Creek Reservoir Alternative	No Action Alternative
Southern Utah County	30,000	15,800	30,000	30,000	0
Conserved water from southern Utah County	3,000	3,000	3,000	3,000	0
Net to southern Utah County	27,000	12,800	27,000	27,000	0
Salt Lake County	30,000	0	30,000	30,000	0
Total	**60,000**	**15,800**	**60,000**	**60,000**	**0**

The following sections present a summary of the practicable alternatives.

C.2.2.1 Spanish Fork Canyon – Provo Reservoir Canal Alternative (Proposed Action)

Table 2 presents the Proposed Action features, which would deliver 30,000 acre-feet of municipal and industrial (M&I) secondary water to southern Utah County and 30,000 acre-feet of M&I water to Salt Lake County. It would involve construction of five new pipelines: 1) from the mouth of Diamond Fork Canyon to the mouth of Spanish Fork Canyon; 2) from the mouth of Spanish Fork Canyon to Santaquin in southern Utah County; 3) from Santaquin to Mona Reservoir; 4) from the mouth of Spanish Fork Canyon to Hobble Creek along the Mapleton-Springville Lateral alignment; and 5) from the mouth of Spanish Fork Canyon to the Provo Reservoir Canal and Jordan Valley Aqueduct. Under this alternative, the Department of the Interior (DOI) would acquire up to 57,000 acre-feet of the District's secondary water rights in Utah Lake as part of the water supply. Two power generating facilities would be constructed in the Diamond Fork System under this alternative. The construction cost of the Proposed Action would be $458,800,000. For a complete description of this alternative, see Chapter 1 of the EIS.

The following summarizes the Proposed Action operations. For details, see EIS Chapter 1, Section 1.4.10.2.

- 30,000 acre-feet of ULS M&I water would be conveyed through the Spanish Fork – Provo Reservoir Canal Pipeline to the Provo Reservoir Canal (or enclosure) and the Jordan Aqueduct to Salt Lake County water treatment plants as a culinary supply.

- An annual average of 16,273 acre-feet of Bonneville Unit water from Strawberry Reservoir would be released for in-stream flows in Sixth Water Creek and Diamond Fork Creek and flow down the Spanish Fork River to Utah Lake mainly during the winter months, as previously described in the 1990 Diamond Fork System Final Supplement to the Final Environmental Impact Statement (Reclamation 1990). This water is included in the annual average of 40,310 acre-feet that would be exchanged from Utah Lake to Jordanelle Reservoir.

- As the ULS facilities are completed, but not later than 2030, 30,000 acre-feet of ULS M&I water would be delivered through the Spanish Fork–Santaquin Pipeline in southern Utah County under a contract with SUVMWA. Of this amount, an estimated 3,000 acre-feet would be conserved under Section 207 projects, assigned to DOI, conveyed through the Mapleton–Springville Lateral Pipeline, and is included in the 12,037 acre-feet delivered to Hobble Creek for June sucker spawning and rearing flows and other in-stream flows as provided by deliveries from Strawberry Reservoir to Utah Lake. This 12,037 acre-feet of water would then be exchanged from Utah Lake to Jordanelle Reservoir.

- Up to 10,200 acre-feet of SVP water shares acquired by SUVMWA cities would be conveyed to these cities in southern Utah County through the new ULS pipelines on a space-available basis. This water is part of the overall 61,000 acre-feet of SVP water stored in Strawberry Reservoir. An additional 8,680 acre-feet of SVP water would be delivered to the Mapleton and Springville irrigation companies through the Mapleton-Springville Lateral Pipeline. The balance of the SVP water supply would be released through the Strawberry Tunnel and Syar Tunnel to the Diamond Fork System and released to the Spanish Fork River.

- Of the 1,590 acre-feet of M&I water already under contract to SUVMWA, 590 acre-feet would be used by SUVMWA member cities as secondary M&I water. This water would be delivered through the Spanish Fork Canyon Pipeline and Spanish Fork–Santaquin Pipeline to the SUVMWA member cities. The remaining 1,000 acre-feet has been assigned to DOI and is part of the 12,037 acre-feet released to Hobble Creek (see Section 1.4.9.4.2).

- An annual average of 16,000 acre-feet of Bonneville Unit water would be delivered to the lower Provo River to assist in meeting the in-stream flow objectives and would be subsequently exchanged from Utah Lake to Jordanelle Reservoir. This water would be conveyed through the Spanish Fork–Provo Reservoir Canal Pipeline and discharged to the Provo River at the pipeline crossing when needed to make the Utah Lake–Jordanelle Reservoir exchange and when flows in the Provo River are less than 75 cfs (Figure 1-20). A minimum 75 cfs flow normally occurs in the river between the Olmsted and Murdock diversions during the summer months when releases are made from Deer Creek Reservoir for conveyance through the Provo Reservoir Canal.

  CUPCA Section 303(c)(4) states that "Upon the acquisition of the water rights in the Provo Drainage identified in section 302, in the Provo River from the Olmsted Diversion to Utah Lake, a minimum of seventy-five cubic feet per second" shall be provided from the yield and operating plans for the Bonneville Unit of the CUP. The Act states the purchases would be limited to willing sellers below Heber Valley. Toward this goal, CUPCA has authorized funds for acquiring up to 25,000 acre-feet of water rights in the Utah Lake Drainage Basin. The District has acquired with Mitigation Commission funds irrigation company water shares representing about 3,300 acre-feet, which would allow such water to flow undiverted to Utah Lake, thereby increasing the summertime flow in the lower Provo River.

- As allowed under the Jordanelle-Deer Creek Operating Agreement, an annual 12,165 acre-feet of water would be provided as flows for June sucker spawning and rearing in the lower Provo River to meet JSRIP goals annually. This water would be comprised of the conserved water as shown in Table 1-13.

- Approximately 12,037 acre-feet of water would be available through the Mapleton-Springville Lateral Pipeline to Hobble Creek for June sucker spawning and rearing flows (April through July) and to provide other fish and wildlife benefits throughout the year. This water would be part of 40,310 acre-feet of Utah Lake inflow from Strawberry Reservoir and would be subsequently exchanged from Utah Lake to Jordanelle Reservoir. Of the 12,037 acre-feet, 4,000 acre-feet would be provided in every year because this is the amount of water saved each year through Section 207. An average of 8,037 acre-feet only would be provided when water is being delivered from Strawberry Reservoir to Utah Lake for exchange up to Jordanelle Reservoir. Hobble Creek supplemental water would not be delivered during high runoff years when Utah Lake is above compromise level. The high runoff years correspond with years when natural runoff would be sufficient to attract June sucker spawning.

C.2.2.2 Bonneville Unit Water Alternative

Table 2 presents the features of this alternative, which would deliver 15,800 acre-feet of M&I secondary water to southern Utah County. It would involve construction of three new pipelines as described for the Proposed Action: 1) from the mouth of Diamond Fork Canyon to the mouth of Spanish Fork Canyon; 2) from the mouth of Spanish Fork Canyon to Santaquin in southern Utah County; and 3) from the mouth of Spanish Fork Canyon to Hobble Creek along the Mapleton – Springville Lateral alignment. The Spanish Fork Canyon Pipeline would be a Federally-funded feature; the other two pipelines would be constructed using local funding under the Central Utah Project Completion Act (CUPCA) Section 207 Water Conservation Program. Under this alternative, two power generating facilities would be constructed in the Diamond Fork System; the DOI would acquire approximately 15,000 acre-feet of District secondary water rights in Utah Lake; and no M&I water would be conveyed to Salt Lake County. The construction cost of the Bonneville Unit Water Alternative would be $184,000,000. For a complete description of this alternative, see Chapter 1 of the EIS.

The following summarizes the operation of the Bonneville Unit Water Alternative. For details, see EIS Chapter 1, Section 1.5.10.2.

- As the ULS facilities are completed, 15,800 acre-feet of ULS M&I water would be delivered through the Spanish Fork–Santaquin Pipeline in southern Utah County under a contract with SUVMWA. Of the 15,800 acre-feet, it is anticipated that 3,000 acre-feet would be conserved under 207 projects and returned to DOI for in-stream flows, and would be included in the 23,510 acre-feet conveyed through the Mapleton-Springville Lateral pipeline.

- An annual average of 16,273 acre-feet of Bonneville Unit water from Strawberry Reservoir would be released for in-stream flows in Sixth Water Creek and Diamond Fork Creek and flow down the Spanish Fork River to Utah Lake on a year-round basis. This water would be exchanged from Utah Lake to Jordanelle Reservoir.

- Up to 10,200 acre-feet of SVP water shares owned by SUVMWA cities would be conveyed to member cities by SUVMUA in southern Utah County through the new ULS pipelines. This water is part of the overall 61,000 acre-feet of SVP water stored in Strawberry Reservoir. The balance of the SVP water would be released through the Strawberry Tunnel and Syar Tunnel to the Diamond Fork System for conveyance to the Spanish Fork River (except for SVP water in the Mapleton-Springville Lateral).

- Of the 1,590 acre-feet already under contract to SUVMWA, 590 acre-feet would be used by SUVMWA member cities as secondary M&I water. This water would be delivered through the ULS pipelines to the SUVMWA member cities. The remaining 1,000 acre-feet has been assigned to DOI and would be part of the 23,510 acre-feet released to Hobble Creek.

- About 84,510 acre-feet of Bonneville Unit water would be conveyed to Utah Lake primarily from October through April (winter months) when the radial gates are up at the five diversion dams on the Spanish Fork River, thus completing the M&I exchange between Strawberry Reservoir and Jordanelle Reservoir. Of this 84,510 acre-feet, about 65,000 acre-feet would be conveyed to Utah Lake via the Spanish Fork River and 19,510 acre-feet would be conveyed to Utah Lake via Hobble Creek.

- Under the Jordanelle-Deer Creek Operating Agreement, an annual 12,165 acre-feet of water would be provided as flows for June sucker spawning and rearing in the lower Provo River to meet JSRIP goals annually. This water would be comprised of the conserved water as shown in Table 1-13 in Section 1.4.10.2.1.

- An annual average of 23,510 acre-feet of water would be conveyed through the Mapleton-Springville Lateral pipeline to Hobble Creek for June sucker spawning and rearing flows to meet JSRIP goals and to provide other fish and wildlife benefits throughout the year. This water would be subsequently exchanged from Utah Lake to Jordanelle Reservoir. Of the 23,510 acre-feet, 4,000 acre-feet would be provided in every year that it is needed. About 3,000 acre-feet of this amount is ULS M&I water that would be available for release in the spring and 1,000 acre-feet is conserved Bonneville Unit M&I water that would occur during the summer season. The remaining annual average 19,510 acre-feet only would be brought when water is being delivered from Strawberry Reservoir to Utah Lake for exchange up to Jordanelle Reservoir. Hobble Creek supplemental water would not be delivered during high runoff years when Utah Lake is above compromise level. The high runoff years correspond with years when natural runoff would be sufficient to attract June sucker spawning. An additional 8,680 a.f. of SVP water would be delivered through the Mapleton-Springville lateral to the Springville and Mapleton Irrigation Companies.

C.2.2.3 Strawberry Reservoir–Daniels Summit Alternative

Table 2 presents the features of this alternative, which would deliver 30,000 acre-feet of municipal and industrial (M&I) secondary water to southern Utah County and 30,000 acre-feet of M&I water to Salt Lake County. It would involve construction of five new pipelines, including four the same as described for the Proposed Action in Section C.2.2.1: 1) from the mouth of Diamond Fork Canyon to the mouth of Spanish Fork Canyon along U.S. Highway 6; 2) from the mouth of Spanish Fork Canyon to Santaquin in southern Utah County; 3) from Santaquin to Mona Reservoir; and 4) from the mouth of Spanish Fork Canyon to Hobble Creek along the Mapleton-Springville Lateral canal alignment. The fifth new pipeline would convey water through a 12.5-mile-long steel pipeline from a new pump station at Strawberry Reservoir near the Syar Tunnel inlet to Daniels Summit. Up to 120 cfs would be discharged into Daniels Creek throughout the year and flow down Daniels Canyon to the Heber Valley, continuing on to Deer Creek Reservoir. Daniels Creek crosses under U.S. Highway 40 twelve times in the 20 miles from Daniels Summit to Deer Creek Reservoir. Daniels Creek crosses under U.S. Highway 189 once in Heber Valley. Approximately 2 cfs per mile would seep into the creek bed along the lower 7.5 miles of Daniels Creek, returning to Deer Creek Reservoir as groundwater inflow. Under this alternative, the DOI would acquire up to 57,000 acre-feet of the District's secondary water rights in Utah Lake as part of the water supply. Two hydroelectric generating facilities would be constructed in the Diamond Fork System. The construction cost of the Strawberry Reservoir-Daniels Pass Alternative would be $499,300,000.

The Strawberry Reservoir-Daniels Summit Alternative would have the same operational flows as described for the Proposed Action in Section C.2.2.1, except for the following:

- 30,000 acre feet of ULS M&I water would flow through Deer Creek Reservoir and down the Provo River to the Olmsted and Murdock diversions for conveyance through the Jordan Aqueduct and Provo Reservoir Canal (or enclosure) to Salt Lake County water treatment plants as a culinary supply

- An annual average of 16,000 acre-feet of water to assist in meeting the in-stream flow objectives in the lower Provo River would flow through Deer Creek Reservoir and down the Provo River to Utah Lake

C.2.2.4 Strawberry Reservoir-Deer Creek Reservoir Alternative

The Strawberry Reservoir-Deer Creek Reservoir Alternative would deliver 30,000 acre-feet of secondary M&I water to southern Utah County and 30,000 acre-feet of M&I water to Salt Lake County. It would involve construction of five new pipelines, including four the same as described for the Proposed Action in Section C.2.2.1: 1) from the mouth of Diamond Fork Canyon to the mouth of Spanish Fork Canyon along U.S. Highway 6; 2) from the mouth of Spanish Fork Canyon to Santaquin in southern Utah County; 3) from Santaquin to Mona Reservoir; and 4) from the mouth of Spanish Fork Canyon to Hobble Creek along the Mapleton-Springville Lateral canal alignment. The fifth new pipeline would convey water through a 32-mile long steel pipeline from Strawberry Reservoir over Daniels Summit to the Provo River upstream of Deer Creek Reservoir. A new pump station would pump water from the Syar Tunnel near Strawberry Reservoir to Daniels Summit. Under this alternative, the DOI would acquire up to 57,000 acre-feet of the District's secondary water rights in Utah Lake as part of the water supply. Three hydroelectric generating facilities would be constructed along the Strawberry Reservoir–Deer Creek Reservoir Pipeline, in addition to two hydroelectric generating facilities constructed in the Diamond Fork System. The construction cost of the Strawberry Reservoir- Deer Creek Reservoir Alternative would be $604,700,000.

The Strawberry Reservoir-Deer Creek Reservoir Alternative would have the same operational flows as described for the Proposed Action in Section C.2.2.1, except for the following:

- 30,000 acre feet of ULS M&I water would flow through Deer Creek Reservoir and down the Provo River to the Olmsted and Murdock diversions for conveyance through the Jordan Aqueduct and Provo Reservoir Canal (or enclosure) to Salt Lake County water treatment plants as a culinary supply
- An annual average of 16,000 acre-feet of water to assist in meeting the in-stream flow objectives in the lower Provo River would flow through Deer Creek Reservoir and down the Provo River to Utah Lake

C.2.2.5 No Action Alternative

No new water conveyance features would be constructed under the No Action Alternative. The 86,100 acre-feet of Bonneville Unit water for M&I exchange from Utah Lake to Jordanelle Reservoir would be conveyed from Strawberry Reservoir through the existing Diamond Fork System and discharged into the Spanish Fork River at the mouth of Diamond Fork Canyon. The No Action Alternative would have no construction costs.

The following summarizes the No Action Alternative operation. For details, see EIS Chapter 1, Section 1.6.4.2.

- Approximately 16,273 acre-feet of Bonneville Unit water from Strawberry Reservoir would be released for in-stream flows in Sixth Water Creek and Diamond Fork Creek and flow down the Spanish Fork River to Utah Lake during the non-irrigation season. This water would be exchanged from Utah Lake to Jordanelle Reservoir.
- 590 acre-feet of the total 1,590 acre-feet of existing Bonneville Unit M&I System water already contracted would be used by SUVMWA member cities as M&I water. This water would be made available to SUVMWA member cities by existing wells and through exchanged to Utah Lake. The remaining 1,000 acre-feet already returned to the DOI under the Spanish Fork City Section 207 project would flow down the Spanish Fork River to Utah Lake.

- 86,100 acre-feet of Bonneville Unit water would be conveyed through the Spanish Fork River to Utah Lake on a year-round basis, thus completing the M&I exchange between Strawberry Reservoir and Jordanelle Reservoir.

- Under the Jordanelle-Deer Creek Operating Agreement, an annual 12,165 acre-feet of water would be provided as flows for June sucker spawning and rearing in the lower Provo River to meet JSRIP goals annually. This water would be comprised of the conserved water as shown in Table 1-13 in Section 1.4.10.2.1.

C.2.3 Alternatives Considered and Determined to be Not Practicable

The 404(b)(1) Guidelines at 40 CFR 230.10(a)(2) state that "An alternative is practicable if it is available and capable of being done after taking into consideration cost, existing technology and logistics in light of overall project purposes." Cost as used in this analysis is defined as the construction cost. Existing technology as used in this analysis is defined as an existing scientific method for achieving a practical purpose. Logistics as used in this analysis is defined as the degree of difficulty in handling of details of an operation. These three criteria were applied to each of the alternatives to determine if they were practicable. The following alternatives were considered and determined to be not practicable. A summary of why each alternative was determined to be not practicable is presented in the following sections.

C.2.3.1 Spanish Fork–Bluffdale Alternative

Under this alternative, ULS water would be conveyed through a steel pipeline for about 15 miles from Moark Junction to Lincoln Point, through a ductile iron pipeline for about 5.7 miles across Utah Lake to its west shore at "The Knolls" area south of Pelican Point, and through a steel pipeline for about 22.5 miles along State Route 68 to the Jordan Valley Water Treatment Plant. The construction cost of the Spanish Fork–Bluffdale Alternative would be $658,900,000.

The Spanish Fork–Bluffdale Alternative was considered but determined to be not practicable because of the following criteria:

Cost: This alternative would have a construction cost of $658,900,000, about $200,100,000 more than the Proposed Action. It would require parallel ductile iron pipes crossing the bed of Utah Lake at about $2,800 per foot, an additional 22 miles of large diameter pipeline, and an additional pump station to overcome head requirements at the high point near Camp Williams.

Existing Technology: The dual ductile iron pipes crossing the bed of Utah Lake would require unproven flexible joints and an unknown pipe restraint system to resist the operating pressure forces and ground acceleration where the pipeline would cross four major faults in the Utah Lake Fault Zone. These unknown methods result in unproven technology for an M&I water pipeline system when combined with the unstable foundation materials in the lake bed.

Logistics: Pipeline construction across the bottom of Utah Lake would have a high degree of difficulty because of unsuitable foundation conditions. The lake bottom sediments are unstable, comprised of homogeneous silt with low plasticity, as deep as 76 feet near the middle of the lake and thinning to about 19 feet near its boundaries. Additionally, sediment and turbidity control during pipeline construction across the lake would have a high degree of difficulty. Construction of an additional 22 miles of pipeline along a heavily used 2-lane highway would have a high degree of difficulty because of major construction activity within the narrow corridor. Operation and maintenance of the dual pipelines across the lake would have a high degree of difficulty because the pipes would be submerged in unstable foundation materials and involve isolation with cofferdams to repair or replace pipeline segments.

The Spanish Fork–Bluffdale Alternative was determined to be not practicable because it would have a significantly higher construction cost than comparable alternatives, it would require unproven and unknown technology for steel pipelines crossing Utah Lake, and it would have a high degree of difficulty for construction, operation and maintenance of the pipeline in light of overall project purposes.

C.2.3.2 Bonneville Shoreline Trail Alternative

This alternative would be an alternate route for the Spanish Fork–Provo Reservoir Canal Pipeline described in Chapter 1, Section 1.4.2.7 of the EIS. Under this alternative, ULS water would be conveyed through a steel pipeline buried in the Bonneville Shoreline Trail alignment for about 19.0 miles from near Moark Junction to Foothill Boulevard in Provo, and then would follow the same alignment as the Spanish Fork–Provo Reservoir Canal Pipeline across the Provo River, up to the Provo Reservoir Canal, and up to the connection with the Jordan Aqueduct. The construction cost of the Bonneville Shoreline Trail Alternative would be $520,700,000.

The Bonneville Shoreline Trail Pipeline Alternative was considered but determined to be not practicable because of the following criteria:

Costs: This alternative would have a construction cost of $520,700,000, about $61,900,000 more than the Proposed Action. The pipeline would be 8,000 feet longer than the Proposed Action, would cross multiple active faults including the Wasatch Fault requiring costly special construction techniques, and construction in very steep terrain would increase costs compared to the Proposed Action.

Existing Technology: The pipeline would follow the Wasatch Fault and cross other faults multiple times throughout its alignment, requiring an undefined system to restrain pipe segments in areas of potential displacement. The unknown methods for pipeline construction would substantially reduce the reliability of this alternative.

Logistics: Pipeline construction on the steep mountainside would have a high degree of difficulty because of access road construction, erosion control, multiple steep drainage crossings, and handling of pipe, excavated materials and backfill materials multiple times in limited laydown areas. Operation and maintenance of the pipeline along the Bonneville Shoreline Trail alignment would have a high degree of difficulty because of access along the steep mountainside and the existing recreational trail, potential ruptures from earthquakes, and repair and replacement of pipeline segments.

The Bonneville Shoreline Trail Pipeline Alternative was determined to be not practicable because it would have a significantly higher construction cost than comparable alternatives, it would require unproven and unknown technology for pipelines along the Wasatch Fault and crossing other faults, and it would have a high degree of difficulty for construction, operation and maintenance of the pipeline in light of overall project purposes.

C.2.3.3 Provo Canyon–American Fork Tunnel Alternative

This alternative would be in addition to the Strawberry Reservoir–Deer Creek Reservoir Alternative described in Section C.2.3.7. Under this alternative, ULS water conveyed from Strawberry Reservoir to Deer Creek Reservoir would flow through a short pipeline out of Deer Creek Reservoir connected to an 11.8-mile-long tunnel under Mount Timpanogos to the mouth of American Fork Canyon. A 4.1-mile-long steel pipeline would convey the ULS water from the tunnel outlet through Highland City to the Provo Reservoir Canal and Jordan Aqueduct. The construction cost of the Provo Canyon–American Fork Tunnel Alternative would be $1,210,400,000.

The Provo Canyon–American Fork Tunnel Alternative was considered but determined to be not practicable because of the following criteria:

Cost: This alternative would have a construction cost of $1,210,400,000 (including the Strawberry Reservoir-Deer Creek Reservoir Alternative), about $751,600,000 more than the Proposed Action. The extraordinarily high costs of this alternative include the costs of the Strawberry Reservoir-Deer Creek Reservoir Alternative and the costs associated with an 11.8-mile tunnel under Mount Timpanogos.

Existing Technology: The tunnel would cross multiple major faults, including the Wasatch Fault, and there would be unknown displacement of the tunnel along faults that would not be accounted for in the design for M&I water conveyance. The unknown displacement in the tunnel from seismic activity would substantially reduce the reliability of this alternative.

Logistics: Construction of an 11.8-mile long tunnel through Mount Timpanogos would have a high degree of difficulty because of major dewatering and water disposal, managing hot spring flows within the tunnel, avoiding interruption of groundwater associated with the Timpanogos Cave National Monument, and disposal of high volumes of tunnel spoil. This alternative would have a high degree of difficulty because of the additional details of constructing and operating the Strawberry Reservoir-Deer Creek Reservoir Alternative with Provo Canyon-American Fork Tunnel.

The Provo Canyon–American Fork Tunnel Alternative was determined to be not practicable because it would have an extraordinarily higher construction cost than comparable alternatives, it would require unknown technology for the tunnel through the Wasatch Fault and other major faults, and it would have a high degree of difficulty for construction, operation and maintenance of the tunnel in light of overall project purposes.

C.2.3.4 Utah Lake Perimeter Alternative

This alternative would include a 63-mile-long steel pipeline from the mouth of Spanish Fork Canyon, southeast toward Payson, west across the southern flank of West Mountain through the Goshen Gap, west through the Goshen Valley, and then north along State Route 68 to the Jordan Valley Water Treatment Plant in Bluffdale. The construction cost of the Utah Lake Perimeter Alternative would be $619,700,000.

The Utah Lake Perimeter Alternative was determined to be not practicable because of the following criteria:

Cost: This alternative would have a construction cost of $619,700,000, about $160,900,000 more than the Proposed Action. The pipeline would be 33 miles longer than the Proposed Action to deliver M&I water to Salt Lake County. The alternative would require an additional pump station to overcome head requirements at the high point near Camp Williams.

Logistics: Construction of an additional 33 miles of pipeline along a portions of heavily used 2-lane highways would have a high degree of difficulty because of major construction activity within the narrow corridor.

Construction dewatering and water disposal through the Goshen Valley would have a high degree of difficulty because of construction along the narrow Highway 6 right-of-way through wetlands.

The Utah Lake Perimeter Alternative was determined to be not practicable because it would have a higher construction cost than comparable alternatives, and it would have a high degree of difficulty for pipeline construction dewatering and water disposal in light of overall project purposes.

C.2.3.5 Provo City–Orem City Pipeline Alternative

This alternative would be an alternate route for the Spanish Fork–Provo Reservoir Canal Pipeline described in Chapter 1, Section 1.4.2.7 of the EIS. Under this alternative, ULS water would be conveyed through a 23.7-mile long steel pipeline, buried in the central city streets of Provo and Orem up to the Provo Reservoir Canal (or enclosure), and up to the connection with the Jordan Aqueduct. The construction cost of the Provo City–Orem City Alternative would be $591,200,000.

The Bonneville Shoreline Trail Pipeline Alternative was considered but determined to be not practicable because of the following criteria:

Cost: This alternative would have a construction cost of $591,200,000, about $132,400,000 more than the Proposed Action. The pipeline would be about the same length as the Proposed Action Spanish Fork-Provo Reservoir Canal Pipeline but would cost more because of increased right-of-way purchase and lease costs, special construction practices (microtunneling and bore/jack construction) through much of Provo and Orem, and utility relocation costs.

Existing Technology: The pipeline would cross through an area in Provo City known to have liquefied sands, requiring undefined design and construction techniques to develop suitable pipeline foundation and bedding conditions.

Logistics: Construction of the large diameter steel pipeline through Provo City and Orem City streets would have a high degree of difficulty because of major utilities interference and disruptions, heavy traffic conflicts and re-routing, dewatering and water disposal, and interruption of hospital and school access. Approval for construction of this alternative would have a high degree of difficulty because Provo City officially opposed this pipeline alignment and would not issue right-of-way permits.

The Provo City-Orem City Pipeline Alternative was determined to be not practicable because it would have a higher construction cost than comparable alternatives, it would require undefined design and construction techniques in liquefied sand zones, and it would have a high degree of difficulty for major utilities conflicts, traffic re-routing, pipeline construction dewatering and water disposal, and interruption of hospital and school access in light of overall project purposes.

C.2.3.6 Upper Strawberry River Basin Pipeline Alternative

This alternative would include two pipeline segments in the upper Strawberry River basin: 1) a 2.9-mile long steel pipeline overland from the proposed Strawberry Pump Station to Forest Route 131 about ½-mile north of the Strawberry Bay Road intersection; and 2) a 5.1-mile-long steel pipeline in the from Forest Route 131, about 2000 feet south of the Clyde Creek Road intersection, extending northwest along the west side of Doe Knoll, to U.S. Highway 40 about 2000 feet west of the Strawberry River crossing. The 60-inch diameter pipelines would cross 17 streams, each with a blowoff drain, and require a permanent access road for maintenance and operations. The pipeline would be an alternative alignment to the Strawberry Reservoir–Deer Creek Reservoir Pipeline that would follow Forest Route 131 and U.S. Highway 40 under the Strawberry Reservoir–Deer Creek Reservoir Alternative. The construction cost of the Upper Strawberry River Basin Pipeline Alternative would be $505,700,000.

The Upper Strawberry River Basin Pipeline Alternative was considered but determined to be not practicable because of the following criteria:

Cost: This alternative would have a construction cost of $505,700,000, about $46,900,000 more than the Proposed Action.

Logistics: Construction of the large-diameter pipeline through both overland alignments would have a high degree of difficulty because significant groundwater would be encountered requiring dewatering and water disposal.

The Upper Strawberry River Basin Pipeline Alternative was determined to be not practicable because it would have a higher construction cost than comparable alternatives, and it would have a high degree of difficulty for pipeline construction dewatering and water disposal in light of overall project purposes.

C.2.4 Aquatic Ecosystems That Could be Adversely Impacted

C.2.4.1 Reservoirs

Reservoirs and lakes that could be adversely impacted by the practicable alternatives being considered are limited to Utah Lake and Deer Creek Reservoir.

C.2.4.2 Streams and Rivers

Streams and rivers that could be adversely impacted by the Proposed Action and other alternatives being considered include the Provo River from Deer Creek Reservoir to Utah Lake, Hobble Creek from Springville and Mapleton to Utah Lake, Spanish Fork River from its confluence with Diamond Fork Creek to Utah Lake, and Daniels Creek from Daniels Pass to Deer Creek Reservoir.

C.2.4.3 Wetlands and Riparian Areas

Wetlands and riparian areas that could be adversely impacted by the Proposed Action and other alternatives being considered include jurisdictional wetlands in the upper Strawberry River basin, jurisdictional wetlands and riparian areas along Daniels Creek from Daniels Pass to Heber Valley, jurisdictional wetlands and riparian areas along the Provo River from Deer Creek Reservoir to the Murdock Diversion, jurisdictional wetlands and open water in Spanish Fork Canyon, non-jurisdictional riparian areas along the Mapleton-Springville Lateral, and non-jurisdictional riparian areas along the Salem-South Field Canal and Salem Canal.

C.2.5 Practicable Alternatives Considered That Would Have Significant Adverse Impacts on Aquatic Ecosystems

The 404(b)(1) Guidelines at 40 CFR 230.10(a) state that "...no discharge of dredged or fill material shall be permitted if there is a practicable alternative to the proposed discharge which would have less adverse impact on the aquatic ecosystem, so long as the alternative does not have other significant adverse environmental consequences." The section considers practicable alternatives that would have adverse impacts on aquatic ecosystems to the extent that they can be eliminated from further consideration because there would be practicable alternatives with less adverse impact on the aquatic ecosystem.

C.2.5.1 Strawberry Reservoir–Daniels Summit Alternative

The Strawberry Reservoir-Daniels Summit Alternative would discharge up to 120 cfs of ULS water into the headwaters of Daniels Creek at Daniels Summit. The ULS flows in Daniels Creek would continue throughout the year and would flow down and through Deer Creek Reservoir into the Provo River. The Strawberry Reservoir-Daniels Summit Pipeline would be constructed along existing roads in the upper Strawberry River basin.

Daniels Creek has approximately 98 acres of wetland and riparian area from its headwaters near Daniels Summit to its outlet at Deer Creek Reservoir. Numerous beaver dams, both active and abandoned, occur in Daniels Canyon along the creek, impounding water that has developed into palustrine emergent marsh, palustrine emergent wet meadow, palustrine scrub shrub and palustrine riparian forest wetlands. Free-flowing reaches of Daniels Creek have palustrine emergent wet meadow, palustrine scrub shrub and palustrine riparian forest wetlands. Peak runoff flows in Daniels Creek with the Daniel Irrigation Company flows that occurred from the early 1900s through 2000 ranged up to 100 cfs for 2 weeks, which resulted in severe bank erosion along numerous stream reaches. Base flows in Daniels Creek average about 10 cfs. The Strawberry Reservoir-Daniels Summit Alternative would discharge average flows of 70 cfs and result in sustained flows over 100 cfs during five months of each year. The steep gradient of Daniels Creek in Daniels Canyon would significantly increase stream velocities resulting in severe bank erosion, breaching beaver dams, cutting new channels through wetlands and riparian areas, and depositing sediments in existing wetlands and riparian areas. The wetland and riparian area impacts from the ULS water discharge into Daniels Creek would exceed 65 acres and could adversely affect up to 90 acres of wetlands and riparian areas adjacent to Daniels Creek in Daniels Canyon. The increased sediment would have adverse impacts on beaver (and other wildlife associated with the beaver ponds) and aquatic resources (fish and macroinvertebrates) that live in the stream. Stream water quality would be degraded by increased bed load, suspended sediment, and turbidity. The adverse impacts on stream water quality would adversely affect resident aquatic resources in Daniels Creek.

In addition to adverse impacts on wetlands, stream water quality, wildlife, and aquatic resources in Daniels Creek, this alternative would cause adverse aquatic ecosystem impacts similar to those that have occurred on Sixth Water Creek during the past century and are contrary to the fish and wildlife enhancement and mitigation provisions of CUPCA and its amendments.

The Daniels Creek discharge into Deer Creek Reservoir averages less than 1 cfs, comprised of irrigation return flow from the Lower Charleston Canal. The fluctuating stage of Deer Creek Reservoir results in minor downcutting of the Daniels Creek discharge into the exposed reservoir bed at stages less than full pool. Under the Strawberry Reservoir-Daniels Summit Alternative, significant downcutting would occur in the reservoir bed at stages less than full pool, resulting in sediment mobilization and increased turbidity, adversely affecting Deer Creek Reservoir water quality.

Construction of the Strawberry Reservoir-Daniels Summit Pipeline would have temporary adverse impacts on a total of 29.4 acres of palustrine emergent marsh, palustrine emergent wet meadow, and palustrine scrub shrub wetlands. Permanent impacts on wetlands in the upper Strawberry River basin from pipeline blowoffs and other required structures would total 0.2 acre.

The Strawberry Reservoir water contains phosphorus and conveyance of this water into Deer Creek Reservoir would adversely affect water quality, primarily by increasing the total phosphorus load. The total phosphorus load of water conveyed from Strawberry Reservoir into Deer Creek Reservoir would exceed the total maximum daily load (TMDL) established for the reservoir and would not be in compliance with the updated and approved Deer Creek Reservoir Water Quality Management Plan. The increased total phosphorus load could result in adverse water quality conditions such as low dissolved oxygen concentrations in the reservoir, which would adversely affect aquatic resources. These adverse impacts on water quality and aquatic resources in Deer Creek Reservoir could not be reasonably mitigated.

Operation of the Strawberry Reservoir-Daniels Summit Alternative would increase stream flows on the Provo River below Deer Creek Reservoir by an annual average of 70 cfs and up to 120 cfs. These stream flow increases would be in addition to the already high stream flows that occur on the Provo River and would have minor adverse effects on aquatic resources, wetlands and riparian areas, water quality, and other elements of the aquatic ecosystem in the Provo River.

The adverse impacts of the Strawberry Reservoir-Daniels Summit Alternative on aquatic ecosystems significantly exceed those of the Proposed Action and Bonneville Unit Water Alternative. Therefore, the Strawberry Reservoir-Daniels Summit Alternative has been eliminated from further consideration because there are other practicable alternatives that would have less adverse impact on the aquatic ecosystem.

C.2.5.2 Strawberry Reservoir-Deer Creek Reservoir Alternative

The Strawberry Reservoir-Deer Creek Reservoir Alternative would discharge up to 120 cfs of ULS water into the Provo River upstream of Deer Creek Reservoir. The ULS flows into the Provo River would continue throughout the year and would flow through Deer Creek Reservoir into the Provo River below the reservoir. The Strawberry Reservoir-Deer Creek Reservoir Pipeline would be constructed along existing roads in the upper Strawberry River basin and Highway 40 in Daniels Canyon.

Construction of the Strawberry Reservoir-Deer Creek Reservoir Pipeline would have adverse impacts on a total of 32.6 acres of wetlands, including 6.6 acres of palustrine emergent marsh, 12.2 acres of palustrine emergent wet meadow, 6.9 acres of palustrine scrub shrub, and 6.9 acres of palustrine riparian forest. Permanent impacts on wetlands in the upper Strawberry River basin from pipeline blowoffs and other required structures would total 0.2 acre.

The Strawberry Reservoir water contains phosphorus and conveyance of this water into Deer Creek Reservoir would adversely affect water quality, primarily by increasing the total phosphorus load. The total phosphorus load of water conveyed from Strawberry Reservoir into Deer Creek Reservoir would exceed the total maximum daily load (TMDL) established for the reservoir and would not be in compliance with the updated and approved Deer Creek Reservoir Water Quality Management Plan. The increased total phosphorus load could result in adverse water quality conditions such as low dissolved oxygen concentrations in the reservoir, which would adversely affect aquatic resources. These adverse impacts on water quality and aquatic resources in Deer Creek Reservoir could not be reasonably mitigated.

Operation of the Strawberry Reservoir-Deer Creek Reservoir Alternative would increase stream flows on the Provo River below Deer Creek Reservoir by an annual average of 70 cfs and range up to 120 cfs. These stream flow increases would be in addition to the already high stream flows that occur on the Provo River and would have minor adverse effects on aquatic resources, wetlands and riparian areas, water quality, and other elements of the aquatic ecosystem in the Provo River.

The adverse impacts of the Strawberry Reservoir-Deer Creek Reservoir Alternative on aquatic ecosystems significantly exceed those of the Proposed Action and Bonneville Unit Water Alternative. Therefore, the Strawberry Reservoir-Deer Creek Reservoir Alternative has been eliminated from further consideration because there are other practicable alternatives that would have less adverse impact on the aquatic ecosystem.

C.3 Alternative Evaluation for Discharge of Dredged or Fill Material (40 CFR 230.10(a)

C.3.1 Comparison of Potential Adverse Impacts on Aquatic Ecosystem

Table 3 provides a comparison of potential adverse impacts on aquatic ecosystems associated with the practicable alternatives. This table addresses potential adverse aquatic ecosystem impacts associated with water quality, aquatic resources, wetland resources, threatened and endangered aquatic species, and sensitive aquatic species.

C.3.2 Practicable Alternatives to Discharge of Dredged or Fill Material in Special Aquatic Sites (40CFR230.10(a)(3)

Table 4 presents a summary of practicable alternatives to discharge of dredged or fill material in special aquatic sites. Table 4 addresses practicable alternatives with respect to impacts on wetlands, mudflats, vegetated shallows, and riffle and pool complexes.

C.3.3 Practicable Alternatives That Would Have Less Adverse Impact on Aquatic Ecosystems (40CFR230.10(a)(2)

A comparison of the practicable alternatives is shown in Table 5. The two action alternatives and the No Action Alternative are compared with regard to cost considerations, existing technologies, and logistics in light of overall project purposes.

C.4 Alternative Evaluation for Violations Caused by Discharge of Dredged or Fill Material (40 CFR 230.10(b)

Table 6 compares alternative evaluations for violations caused by discharge of dredged or fill material. Included in Table 6 is a comparison of potential violations of applicable state water quality standards, violations of applicable toxic effluent standards or prohibitions under Section 307 of the Clean Water Act, and threats to the continued existence of threatened or endangered species (as defined under the Endangered Species Act), or that results in possible destruction or adverse modification of critical habitat.

C.5 Potential Impacts on Physical and Chemical Components of the Aquatic Ecosystem (40 CFR 230.10(c) Subpart C)

Table 7 provides a summary of potential impacts from the practicable alternatives and No Action Alternative on physical and chemical components of the aquatic ecosystem. It includes a comparison of impacts on substrate, suspended particulates and turbidity, water, current patterns and water circulation, and normal water fluctuations.

C.6 Potential Impacts on Biological Characteristics of the Aquatic Ecosystem (40 CFR 230.10(c) Subpart D)

The potential impacts on biological characteristics of the aquatic ecosystem are presented for each of the practicable alternatives in Table 8. The potential impacts on threatened and endangered species, fish, crustaceans, mollusks, and other aquatic organisms in the food web, and other wildlife are presented.

C.7 Potential Impacts on Special Aquatic Sites (40 CFR 230.10(c) Subpart E)

Potential impacts associated with the practicable alternatives are presented in Table 9 regarding special aquatic sites including wetlands, mudflats, vegetated shallows, and riffle and pool complexes.

Wetlands that would be permanently lost by construction of the practicable alternatives are comprised of narrow riparian strips along the Mapleton–Springville Lateral and at pipeline drain or discharge sites. The Mapleton–Springville Lateral wetlands are non-jurisdictional and of minimal functional value. They exist only because of seepage from the unlined canal and the riparian vegetation is periodically removed by canal maintenance activity. Riparian areas impacted at pipeline drains or discharges are close to road shoulders and have very low functional value.

C.8 Potential Effects on Human Use Characteristics (40 CFR 230.10(c) Subpart F)

Table 10 provides a comparison of the potential effects on human use characteristics for the practicable alternatives. It includes the effects on municipal and private water supplies, recreational fisheries, other water-related recreation, and aesthetics.

C.9 General Evaluation of Dredged or Fill Materials (40 CFR 230.60 Subpart G)

C.9.1 Description of Dredged or Fill Materials

A description of dredged or fill materials that are anticipated for use in the practicable alternatives, including both excavated and imported materials is provided in Table 11. Gravel, sand, and other naturally occurring fill materials are described, as well as excavated earth and concrete. No rock riprap use is anticipated.

C.9.2 Potential for Contamination of Dredged or Fill Materials

An evaluation of the potential for contamination of dredged or fill materials that would be used in the project alternatives is presented in Table 12. The information presented in this table is based on the District's current knowledge of the materials to be used or encountered during construction.

C.10 Actions to Minimize Adverse Effects (40 CFR 230.10(d) Subpart H)

Table 13 summarizes actions that would be taken to minimize the adverse effects of the practicable alternatives. The actions identified in Table 13 would address the location of discharges, the materials to be discharged, control of materials after discharge, the methods of dispersion, the applicable discharge technologies, the effects on plant and animal populations, the effects on human uses, and possible other actions.

C.11 Factual Determinations of Impacts (Short-Term and Long-Term) (40 CFR 230.11)

The factual determinations of short-term and long-term impacts associated with the practicable alternatives are shown in Table 14. These determinations address physical substrate, water quality, circulation and fluctuation, suspended particulate and turbidity, aquatic ecosystem and organisms, proposed disposal sites, cumulative effects on the aquatic ecosystem, and secondary effects on the aquatic ecosystem.

C.12 Alternative with Least Adverse Impact on Aquatic Ecosystems and Wetlands

Tables 3 through 14 present the specific impacts, both adverse and beneficial, on aquatic ecosystems and wetlands as well as the human use characteristics of the practicable alternatives.

C.12.1 The Proposed Action

The Proposed Action would permanently remove 1.0 acre of low-value wetlands and would temporarily impact 0.3 acre of low-value wetlands that would be restored after construction. The potential continuation of groundwater pumping to support population growth would cause drawdown of groundwater levels relative to baseline and a potential impact on existing wetlands. Wetlands that could be potentially impacted are those that occur in the area where the wetland water supply may decline because of groundwater drawdown of one foot or more relative to existing conditions. The wetland acreage and specific locations of potential wetland impacts compared to existing conditions is not measurable based on the available information. However, it is expected that a considerable amount of wetland area could be potentially affected. The delivery of M&I water could have some benefit on these wetlands. Some increased level of groundwater recharge resulting from the application of the M&I secondary use water would provide a wetland benefit. The quantity and location of the wetlands that could benefit from the secondary use water is not measurable based on available information. (see Section 3.4.8.3 Groundwater Hydrology).

The Proposed Action would benefit aquatic resources and T&E aquatic species (June sucker) by increasing flows in the Provo River. Overall game fish biomass would increase by 19,496 pounds (+30 percent) over baseline. June sucker spawning habitat in the Provo River between the Tanner Race Diversion and Interstate 15 would increase by 122 percent to 192 percent over baseline because of increased water volume and stream surface area. June sucker spawning habitat from Interstate 15 to Utah Lake would increase by 86 percent to 181 percent over baseline. Hobble Creek aquatic habitat would be benefited by a 53 percent increase in flow over baseline. Leatherside chub populations in the Spanish Fork River could have adverse impacts from a 32 percent to 66 percent decrease in flows.

Total phosphorus (TP) concentrations in Utah Lake would be reduced and diluted by the tributary inflows containing Bonneville Unit water under the ULS Proposed Action. The net TP load into Utah Lake would be 291.6 tons per year, which would be no change from historic conditions. Total dissolved solids (TDS) concentrations in Utah Lake would be reduced and diluted by the tributary inflows containing the Bonneville Unit water under the ULS. Projected cumulative TDS concentrations in Utah Lake would range from 659 to 1,124 mg/L (-8.0 to -15.5 percent) under the Proposed Action. Cumulative TDS concentrations in Utah Lake would decrease from existing conditions under the Proposed Action. The net TDS load into Utah Lake would be 338,392 tons per year, which would be a decrease of 584 tons per year from historic baseline (-0.2 percent). Modeled water quality characteristics in the Provo River indicate that total phosphorus concentrations would increase to above the pollution indicator for three months per year under average conditions and decrease from levels already above the pollution indicator during two months per year. Total phosphorus concentrations would be below the pollution indicator during the other 7 months per year. Hobble Creek and Spanish Fork River water quality generally would be within model margin of error compared to existing conditions.

C.12.2 Bonneville Unit Water Alternative

The Bonneville Unit Water Alternative would permanently remove 1.0 acre of low-value wetlands and would temporarily impact 0.2 acre of low-value wetlands that would be restored after construction. The potential continuation of groundwater pumping to support population growth would cause drawdown of groundwater levels relative to baseline and a potential impact on existing wetlands. Wetlands that could be potentially impacted are those occurring in the area where the wetland water supply may decline because of groundwater drawdown of one foot or more relative to existing conditions. The wetland acreage and specific locations of potential wetland impacts compared to existing conditions is not measurable based on the available information. However, it is expected that a considerable amount of wetland area could be potentially affected. The delivery of M&I water could have some benefit on these wetlands. Some increased level of groundwater recharge resulting from the application of the M&I secondary use water would provide the wetland benefit. The quantity and location of the wetlands that could benefit from the secondary use water is not measurable based on available information. (see Section 3.4.8.3 Groundwater Hydrology).

The Bonneville Unit Water Alternative would benefit aquatic resources and T&E aquatic species (June sucker) by providing spawning and rearing flows from May through July in the Provo River. Overall game fish biomass would increase by 10,220 pounds (+15.6 percent) over baseline. June sucker spawning habitat in the Provo River between the Tanner Race Diversion and Interstate 15 would increase by 64 percent to 134 percent and Interstate 15 to Utah Lake by 64 percent to 111 percent over baseline. Aquatic habitat in Hobble Creek would be benefited by an increase in flows of 107 percent over baseline. Leatherside chub populations in the Spanish Fork River could have adverse impacts from a 12 percent to 20 percent decrease in flows.

Total phosphorus concentrations in Utah Lake would be reduced and diluted by the tributary inflows containing Bonneville Unit water under the ULS Bonneville Unit Water Alternative. The net TP load into Utah Lake would be 295.8 tons per year, which would be a 4.2 ton per year increase (+1.4 percent) over historic conditions. Projected cumulative TDS concentrations in Utah Lake would range from 634 to 1,059 mg/L (-11.5 to -20 percent) under the Bonneville Unit Water Alternative. Cumulative TDS concentrations in Utah Lake would decrease from existing conditions under the Bonneville Unit Water Alternative. The net TDS load into Utah Lake would be 349,021 tons per year, which would be an increase of 10,046 tons per year from historic baseline (+3 percent). Modeled water quality parameters in the Provo River, Hobble Creek and the Spanish Fork River generally would be within model margin of error compared to existing conditions.

C.12.3 No Action Alternative

The No Action Alternative would have no direct adverse impacts on the aquatic ecosystem because there would no construction and no operational change from baseline. Under the No Action Alternative, groundwater pumping in southern Utah County would increase, expediting the decline of the water table. The wetland acreage and specific locations of potential wetland impacts relative to baseline is not measurable based on the information available for use in the analysis (see Section 3.4.8.5 Groundwater Hydrology). However, it is expected that a considerable amount of wetland area could be potentially impacted by continued groundwater pumping. There would be no impacts on aquatic resources or T&E species.

Total phosphorus concentrations in Utah Lake would remain unchanged or slightly increase from the tributary inflows containing Bonneville Unit water under the ULS No Action Alternative. The net TP load into Utah Lake would be 294.1 tons per year, which would be a 2.5 ton per year increase (+0.9 percent) over existing conditions. Projected cumulative TDS concentrations in Utah Lake would range from 666 to 993 mg/L (-7.0 to -25 percent) under the No Action Alternative. Cumulative TDS concentrations in Utah Lake would decrease from existing conditions under the No Action Alternative. The net TDS load into Utah Lake would be 347,440 tons per year, which would be an increase of 8,465 tons per year from historic baseline (+2.5 percent). Modeled water quality parameters in the Provo River, Hobble Creek and the Spanish Fork River generally would be within model margin of error compared to existing conditions.

C.12.4 Conclusion

The Proposed Action is the practicable alternative that would result in the least overall adverse impacts on the aquatic ecosystem. The Proposed Action would reduce TP concentrations in Utah Lake from existing conditions, would not change the net TP load into Utah Lake, would cause slight increases and decreases in cumulative TDS concentrations in Utah Lake, and would decrease the net TDS load into Utah Lake. The Bonneville Unit Water

Alternative would reduce TP concentrations in the lake, would increase the TP load into Utah Lake by 4.2 tons per year, would cause slight increases and decreases in cumulative TDS concentrations in Utah Lake, and would increase the net TDS load into Utah Lake by 10,046 tons per year. Utah Lake is listed on the State of Utah's 303(d) list as impaired for TP and TDS. The Proposed Action would have the least water quality impact on the aquatic ecosystem in Utah Lake. The change in TP concentrations in Hobble Creek would be the same for the practicable alternatives. Water quality in the Spanish Fork River would be slightly better under the Bonneville Water Unit Alternative than the Proposed Action, however, there would be no exceedance of water quality standards under the Proposed Action. There would be no other adverse water quality impacts under the practicable alternatives.

There would be no difference in the quantity of impacts on non-jurisdictional wetlands between the practicable alternatives. All wetland impacts will be mitigated and there would be "no net loss of wetlands" under either practicable alternative.

The Proposed Action would have the greatest benefits on aquatic resources and aquatic recreation resources by increasing fish biomass and angler days more than the Bonneville Unit Water Alternative.

The Proposed Action would provide the most benefits for threatened and endangered aquatic species and would have the least adverse impact on the aquatic ecosystem in the Provo River.

A summary of impacts on the aquatic ecosystem is presented below for the Proposed Action and the Bonneville Unit Water Alternative. Numbers in parentheses indicate percent change from existing conditions. Impacts that would be the same for both practicable alternatives are not shown.

Summary of Impacts on Aquatic Ecosystems for the Proposed Action and Bonneville Unit Water Alternative

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Proposed Action	Bonneville Unit Water Alternative
Surface Water Hydrology	**Surface Water Hydrology**
Provo River	**Provo River**
Murdock Diversion to I-15: 216 cfs (+20%)	Murdock Diversion to I-15: 194 cfs (+8%)
I-15 to Utah Lake: 157 cfs (+38%)	I-15 to Utah Lake: 135 cfs (+18%)
Hobble Creek	**Hobble Creek**
From Mapleton Lateral to Utah Lake: 46 cfs (+53%)	From Mapleton Lateral to Utah Lake: 62 cfs (+107%)
Spanish Fork River:	**Spanish Fork River**:
From Diamond Fork Cr. to Spanish Fork Diversion: 250 cfs (-32%)	From Diamond Fork Cr. to Spanish Fork Diversion: 316 cfs (-13%)
From Spanish Fork Diversion to East Bench 64 cfs (-60%)	From Spanish Fork Diversion to East Bench 130 cfs (-19%)
From East Bench Diversion to Mill Race 49 cfs (-66%)	From East Bench Diversion to Mill Race 115 cfs (-20%)
Mill Race Canal to Lakeshore Gage: 135 cfs (-41%)	Mill Race Canal to Lakeshore Gage: 202 cfs (-12%)
Jordan River	**Jordan River**
From Utah Lake Outlet to Jordan Narrows: 484 cfs (-7%)	From Outlet of Utah Lake to Jordan Narrows: 520 cfs (0%)

Summary of Adverse Impacts on the Aquatic Ecosystem for the Proposed Action and the Bonneville Unit Water Alternative

Proposed Action	Bonneville Unit Water Alternative
Water Quality **Utah Lake** Total phosphorus concentrations would decrease Total phosphorus load: No change compared to existing conditions Total dissolved solids concentration range: 659 to 1,124 mg/L (-8.0 to -15.5%) Total dissolved solids load decrease: 584 tons per year (-0.2%) **Provo River Below Murdock Diversion** Dissolved oxygen concentration: 10.3 mg/L (+2%) Water temperature: 10.3 °C (-1%) Total dissolved solids concentration: 257 mg/L (-6.9%) Total phosphorus concentration: 0.06 mg/L (0%) **Hobble Creek From Mapleton-Springville Lateral to Utah Lake** Dissolved oxygen concentration: 10.3 mg/L (+17%) Water temperature: 9.3 °C (-12%) TDS concentrations: 230 mg/L (-21%) Total phosphorus concentration: 0.05 mg/L (+25%) **Spanish Fork River** Dissolved oxygen concentration: 11.7 mg/L (-0.8%) Water temperature: 10.7°C (+8.1%) Total dissolved solids concentration: 345 mg/L (+21%) Total phosphorus concentration: 0.15 mg/L (+25%) Selenium concentration: 0.78 µg/L (+8.3%)	**Water Quality** **Utah Lake** Total phosphorus concentrations would decrease Total phosphorus load increase: 4.2 tons per year (+2.1%) compared to existing conditions Total dissolved solids concentration range: 634 to 1,059 mg/L (-11.5 to -20%) Total dissolved solids load increase: 10,046 tons per year (+3%) **Hobble Creek From Mapleton-Springville Lateral to Utah Lake** Dissolved oxygen concentration: 10.5 mg/L (+19%) Water temperature: 9.3 °C (-12%) TDS concentrations: 219 mg/L (-25%) Total phosphorus concentration: 0.05 mg/L (+25%) **Spanish Fork River** Dissolved oxygen concentration: 11.9 mg/L (+0.8%) Water temperature: 9.8°C (-1.0%) Total dissolved solids concentration: 309 mg/L (+8.4%) Total phosphorus concentration: 0.13 mg/L (+8.3%) Selenium concentration: 0.72 µg/L (+4.3%)
Aquatic Resources Overall game fish biomass would experience an increase of 19,496 pounds over baseline (+30%)	**Aquatic Resources** Overall game fish biomass would experience an increase of 10,220 pounds over baseline (+15.6%)
Wetland Resources Total permanent loss of wetland would be 1.0 acre Total Temporary wetland impacts would be 0.3 acre	**Wetland Resources** Total permanent loss of wetland would be 1.0 acre Total Temporary wetland impacts would be 0.2 acre
Aquatic Recreation Resources Annual angler days on the Provo River and Spanish Fork River (public access available) would increase by 34,438 over baseline (+31.2%)	**Aquatic Recreation Resources** Annual angler days on the Provo River and Spanish Fork River (public access available) would increase by 18,054 over baseline (+16.5%)

C.13 Findings of Compliance - Comparison of C.11 to C.3 through C.10 (40 CFR 230.12)

Factual determinations in Section C.11 (Table 14) are supported by the materials presented in Sections C.3 (Table 3) through C.10 (Table 13).

C.13.1 Discharge Sites Complying with Requirements of 404(b)(1) Guidelines

All discharge sites would comply with 404(b)(1) guidelines, with the exception of less than 0.1 acre of low-value non-jurisdictional wetlands under the Proposed Action and less than 0.1 acre of low-value non-jurisdictional wetlands under the Bonneville Unit Water Alternative. The District would mitigate impacts on these non-jurisdictional wetland areas.

1.0 acre of non-jurisdictional wetlands permanently lost under the Proposed Action and Bonneville Unit Water Alternative would be mitigated under District policy, although not required under 404 guidelines.

C.13.2 Discharge Sites Complying with Requirements of 404(b)(1) Guidelines with Inclusion of Actions to Minimize Adverse Effects

Same as Section C.13.1.

C.13.3 Discharge Sites Not Complying with Requirements of 404(b)(1) Guidelines

None.

C.13.3.1 Practicable Alternatives with Less Adverse Impact on the Aquatic Ecosystem

None.

C.13.3.2 Significant Degradation of Aquatic Ecosystem

Significant degradation of the aquatic ecosystem by the alternatives is summarized in Section C.12.

C.13.3.3 Appropriate and Practicable Measures to Minimize Harm on the Aquatic Ecosystem Not Included

All appropriate and practicable measures to minimize harm on the aquatic ecosystem are included in the SOPs outlined in Table 3 and in EIS Chapter 1, Section 1.8.8.

Table 2
Construction Features of Utah Lake Drainage Basin Water Delivery System Practicable Alternatives

Feature	Spanish Fork Canyon – Provo Reservoir Canal Alternative (Proposed Action)	Bonneville Unit Water Alternative	Strawberry Reservoir-Daniels Summit Alternative	Strawberry Reservoir-Deer Creek Reservoir Alternative	No Action Alternative
Sixth Water Power Facility and Transmission Line	45 MW generator and 15.5 miles of overhead transmission line upgraded to 138 kV from Sixth Water Power Facility to Highway 6	45 MW generator and 15.5 miles of overhead transmission line upgraded to 138 kV from Sixth Water Power Facility to Highway 6	45 MW generator and 15.5 miles of overhead transmission line upgraded to 138 kV from Sixth Water Power Facility to Highway 6	45 MW generator and 15.5 miles of overhead transmission line upgraded to 138 kV from Sixth Water Power Facility to Highway 6	Not constructed
Upper Diamond Fork Power Facility and Underground Cable	5 MW generator and 1.5 miles of 25 kV underground cable (existing) through Tanner Ridge Tunnel to Sixth Water Transmission Line	5 MW generator and 1.5 miles of 25 kV underground cable (existing) through Tanner Ridge Tunnel to Sixth Water Transmission Line	5 MW generator and 1.5 miles of 25 kV underground cable (existing) through Tanner Ridge Tunnel to Sixth Water Transmission Line	5 MW generator and 1.5 miles of 25 kV underground cable (existing) through Tanner Ridge Tunnel to Sixth Water Transmission Line	Not constructed
Spanish Fork Canyon Pipeline	7.0 mile steel pipeline, 84-inches diameter from Spanish Fork Flow Control Structure at mouth of Diamond Fork Creek to Moark Junction	7.0 mile steel pipeline, 72-inches diameter from Spanish Fork Flow Control Structure at mouth of Diamond Fork Creek to Moark Junction	7.0 mile steel pipeline, 72-inches diameter from Spanish Fork Flow Control Structure at mouth of Diamond Fork Creek to Moark Junction	7.0 mile steel pipeline, 72-inches diameter from Spanish Fork Flow Control Structure at mouth of Diamond Fork Creek to Moark Junction	Not constructed
Spanish Fork-Santaquin Pipeline	17.5 mile steel pipeline, ranging from 60- to 36-inches diameter, from terminus of Spanish Fork Canyon Pipeline to Santaquin	17.5 mile steel pipeline, ranging from 48- to 36-inches diameter, from terminus of Spanish Fork Canyon Pipeline to Santaquin (CUPCA Section 207 feature)	17.5 mile steel pipeline, ranging from 60- to 36-inches diameter, from terminus of Spanish Fork Canyon Pipeline to Santaquin	17.5 mile steel pipeline, ranging from 60- to 36-inches diameter, from terminus of Spanish Fork Canyon Pipeline to Santaquin	Not constructed
Santaquin – Mona Reservoir Pipeline	7.7 mile steel pipeline, 30-inches diameter, from turnout at end of Spanish Fork – Santaquin Pipeline to the outlet structure at Mona Reservoir (CUPCA Section 207 feature)	Not constructed	7.7 mile steel pipeline, 30-inches diameter, from turnout at end of Spanish Fork – Santaquin Pipeline to the outlet structure at Mona Reservoir (CUPCA Section 207 feature)	7.7 mile steel pipeline, 30-inches diameter, from turnout at end of Spanish Fork – Santaquin Pipeline to the outlet structure at Mona Reservoir (CUPCA Section 207 feature)	Not constructed

Table 2
Construction Features of Utah Lake Drainage Basin Water Delivery System Practicable Alternatives

Feature	Spanish Fork Canyon – Provo Reservoir Canal Alternative (Proposed Action)	Bonneville Unit Water Alternative	Strawberry Reservoir-Daniels Summit Alternative	Strawberry Reservoir-Deer Creek Reservoir Alternative	No Action Alternative
Mapleton-Springville Lateral Pipeline (CUPCA Section 207)	5.7 mile steel pipeline, 48-inches diameter, from terminus of Spanish Fork Canyon Pipeline to Hobble Creek	5.7 mile steel pipeline, 48-inches diameter, from terminus of Spanish Fork Canyon Pipeline to Hobble Creek	5.7 mile steel pipeline, 48-inches diameter, from terminus of Spanish Fork Canyon Pipeline to Hobble Creek	5.7 mile steel pipeline, 48-inches diameter from terminus of Spanish Fork Canyon Pipeline to Hobble Creek	Not constructed
Spanish Fork – Provo Reservoir Canal Pipeline	19.7 mile steel pipeline, ranging from 60- to 48 inches diameter, from terminus of Spanish Fork Canyon Pipeline to Provo Reservoir Canal and Jordan Valley Aqueduct	Not constructed	Not constructed	Not constructed	Not constructed
Strawberry Valley Transmission Line Upgrade	Not constructed	Not constructed	12 miles upgraded 24.9 kV overhead power line from Moon Lake Electric substation to Strawberry Pump Station	12 miles upgraded 24.9 kV overhead power line from Moon Lake Electric substation to Strawberry Pump Station	Not constructed
Strawberry Pump Station	Not constructed	Not constructed	11,250 hp, 120 cfs pump station near Syar Tunnel Inlet at Strawberry Reservoir	11,250 hp, 120 cfs pump station near Syar Tunnel Inlet at Strawberry Reservoir	Not constructed
Strawberry Reservoir-Deer Creek Reservoir Pipeline	Not constructed	Not constructed	Not constructed	32.3 mile steel pipeline, ranging from 42- to 60-inches diameter from Strawberry Pump Station to Provo River above Deer Creek Reservoir	Not constructed

Table 2
Construction Features of Utah Lake Drainage Basin Water Delivery System Practicable Alternatives

Feature	Spanish Fork Canyon – Provo Reservoir Canal Alternative (Proposed Action)	Bonneville Unit Water Alternative	Strawberry Reservoir-Daniels Summit Alternative	Strawberry Reservoir-Deer Creek Reservoir Alternative	No Action Alternative
McGuire Power Facility and Underground Transmission Cable	Not constructed	Not constructed	Not constructed	6.2 MW generator and 9.5 miles of 25 kV underground cable from McGuire Power Facility along Highway 40 to Strawberry Valley Transmission Line	Not constructed
Daniels Power Facility, Underground Cable and Transmission Line	Not constructed	Not constructed	Not constructed	5.6 MW generator, 1.5 miles of 12.5 kV underground cable, and 4.5 miles of 12.5 kV overhead transmission line from Daniels Power Facility to existing Heber City substation	Not constructed
Charleston Power Facility and Transmission Line	Not constructed	Not constructed	Not constructed	Two 2.2 MW generators and 1.8 miles of 12.5 kV overhead transmission line from Charleston Power Facility to existing Heber City substation	Not constructed
Strawberry Reservoir-Daniels Summit Pipeline	Not constructed	Not constructed	12.5 mile steel pipeline, 42-inches diameter, from Strawberry Pump Station to Daniels Summit and headwaters of Daniels Creek	Not constructed	Not constructed

Table 3
(C.3.1) Comparison of Potential Impacts on Aquatic Ecosystems

Ecosystem	Spanish Fork Canyon – Provo Reservoir Canal Alternative (Proposed Action)	Bonneville Unit Water Alternative	No Action Alternative
C.3.1.1 Water Quality	**Construction:** Standard Operating Procedures (SOPs) to protect water quality during construction would include the following (see EIS Chapter 1, Section 1.8.8): • Construction activities will be performed according to the Final Draft Nonpoint Source Water Pollution Control Plan of Hydrologic Modifications in Utah (Robinson 1994). The measures identified in this plan specify construction practices where there is potential for disturbing stream channels, riparian areas and floodplains. These practices are designated as Utah's Best Management Practices for nonpoint source water pollution control. • The possibility of accidental releases of contaminants into surface and possibly ground waters will be managed according to spill containment and countermeasure requirements of the District's construction specifications. Requirements include worker education, incident reporting and remediation provisions in the event of a spill. The District's construction contractor(s) will be required to prepare spill prevention containment and control plans, and report spills to local, state and federal agencies. • Construction workers will be careful to avoid allowing wet concrete to escape into waterways and other sensitive aquatic habitats. • Concrete trucks and equipment will be washed only in approved areas that will not impact streams or sensitive aquatic habitats. • Appropriate Utah water quality permits would be obtained prior to construction in or near water resources. • Construction of pipeline trenches will incorporate erosion control SOPs to avoid or minimize adverse ground and surface water quality impacts.	**Construction**: Same as the Proposed Action	**Construction**: No features would be constructed.

Table 3
(C.3.1) Comparison of Potential Impacts on Aquatic Ecosystems

Ecosystem	Spanish Fork Canyon – Provo Reservoir Canal Alternative (Proposed Action)	Bonneville Unit Water Alternative	No Action Alternative
C.3.1.1 Water Quality	**Operation**: Utah Lake: (EIS Section 3.3.8.3.1.1) Total P: Total P concentrations would reduce from dilution by tributary inflows Total P load would remain the same as existing conditions. TDS: TDS concentrations would range from 659 to 1,124 mg/L (-8.0 to -15.5% from existing conditions). TDS inflow concentrations would dilute Utah Lake TDS. TDS load would decrease by 584 tons per year (-0.2%) Provo River below Murdock Diversion (EIS Chapter 3, Section 3.3.8.3.2.1) Total P: Total P concentrations in the lower Provo River would increase during some months. Total P concentrations would exceed the pollution indicator (0.05 mg/L) during May, September and October, however, total P concentrations would be decreased from existing conditions above the pollution indicator during May and September. Most of the total P likely would be soluble reactive P and utilized by submerged aquatic vegetation in the river, which could increase macroinvertebrate occurrence and abundance. The un-interrupted in-stream flows in the lower Provo River would provide aquatic habitat benefits that would outweigh the increased total P concentrations. The annual flow-weighted average total P concentration would be 0.06 mg/L under existing conditions and the Proposed Action operation. Temperature: Water temperatures in the Provo River would be consistently below the State standard of 20 degrees C; changes under this alternative would result in no significant adverse impact. Water temperatures in the lower Provo River would decrease during the summer as a result of in-stream flows from Strawberry Reservoir water being colder during this time of the year than the Provo River flows. Conversely, temperatures would slightly increase during the winter months. DO: Existing DO data were collected in the Sixth Water Aqueduct outlet, reflecting the low seasonal DO concentrations of water released from Strawberry Reservoir through the Syar Tunnel. Downstream from the Sixth Water Aqueduct in the Diamond Fork System, this water would be re-aerated through multiple mechanisms. The Bonneville Unit water would be discharged to the lower Provo River at saturated DO conditions, and resulting lower Provo River DO concentrations would increase or remain unchanged from existing conditions.	**Operation**: Utah Lake: (EIS Section 3.3.8.4.1.1) Total P: Total P concentrations would reduce from dilution by tributary inflows Total P load would increase 4.2 tons per year, an increase of 1.4% over existing conditions. TDS: TDS concentrations would range from 634 to 1,059 mg/L (-11.5 to -20% from existing conditions). TDS load would increase by 10,046 tons per year (+3%) Provo River: No change.	**Operation**: Utah Lake: (EIS Section 3.3.8.5.1.1) Total P: Total P concentrations would remain the same or increase slightly Total P load would increase 2.5 tons per year, an increase of 0.9% over existing conditions. TDS: TDS concentrations would range from 666 to 963 mg/L (-7.0 to -25% from existing conditions). TDS load would increase by 8,465 tons per year (+2.5%) Provo River: No change.

Table 3
(C.3.1) Comparison of Potential Impacts on Aquatic Ecosystems

Ecosystem	Spanish Fork Canyon – Provo Reservoir Canal Alternative Proposed Action	Bonneville Unit Water Alternative	No Action Alternative
C.3.1.1 Water Quality	Spanish Fork River: (EIS Chapter 3, Section 3.3.8.3.2.3) Total P: Total P concentrations would remain unchanged or slightly increase, with flow-weighted average annual total P concentrations increasing by 0.01 to 0.15 mg/L. Total P concentrations would exceed the pollution indicator in May, June, July, August, September and October, however, existing condition concentrations would exceed the pollution indicator during the same months. Most of the total P likely would be soluble reactive P and utilized by submerged aquatic vegetation in the river, which could increase macroinvertebrate occurrence and abundance, and improve fish habitat conditions. Selenium: Selenium concentrations would remain below or near the analytical detection limit because of river and stream dilution by flows released into Diamond Fork Creek and Spanish Fork River. Temperature: There would be no significant adverse impact Hobble Creek: (EIS Chapter 3, Section 3.3.8.3.2.2) Total P: Total P concentrations in Hobble Creek would increase from existing conditions during months of minimal to no natural flow. Total P concentrations would exceed the pollution indicator during May, July, August, September and October. Most of the total P likely would be soluble reactive P and utilized by submerged aquatic vegetation in the creek, which could increase macroinvertebrate occurrence and abundance. The un-interrupted in-stream flows in Hobble Creek would provide aquatic habitat benefits that would outweigh the increased total P concentrations. The annual flow-weighted average total P concentration would be 0.05 mg/L under the Proposed Action operation, an increase of 0.01 mg/L from existing conditions. DO: Existing DO data were collected in the Sixth Water Aqueduct outlet, reflecting the low seasonal DO concentrations of water released from Strawberry Reservoir through the Syar Tunnel. Downstream from the Sixth Water Aqueduct in the Diamond Fork System, this water would be re-aerated through multiple mechanisms. The Bonneville Unit water would be discharged to Hobble Creek at saturated DO conditions, and resulting Hobble Creek DO concentrations would increase from existing conditions.	Spanish Fork River: (EIS Chapter 3, Sect 3.3.8.4.2.2) Total P: Total P would increase to above pollution indicator level compared to existing conditions during May, June, July, August, September and October in upper river. Temperature: Same as Proposed Action Hobble Creek: (EIS Chapter 3, Section 3.3.8.4.2.1) Total P: Same as Proposed Action. DO: Same result as Proposed Action.	Spanish Fork River: Total P: Total P would exceed the pollution indicator in all months except August, November and December. Hobble Creek: Same as existing conditions for all constituents.

Table 3
(C.3.1) Comparison of Potential Impacts on Aquatic Ecosystems

Ecosystem	Spanish Fork Canyon – Provo Reservoir Canal Alternative (Proposed Action)	Bonneville Unit Water Alternative	No Action Alternative
C.3.1.1 Water Quality	**Mitigation:** Utah Lake: No mitigation necessary. Lower Provo River: No mitigation necessary. Hobble Creek: No mitigation necessary. Spanish Fork River: No mitigation necessary. **Monitoring:** None **Cumulative Impacts:** There would be no measurable cumulative impacts on water quality in the Provo River, Hobble Creek, and Spanish Fork River under the Proposed Action. There would be cumulative impacts on water quality in Utah Lake from some increased TDS concentrations that would occur as a result of other actions when lower TDS concentration water would flow into the lake under the Proposed Action. These cumulative impacts would not be significant.	**Mitigation:** Utah Lake: May be appropriate, none identified. Lower Provo River: None. Hobble Creek: None. Spanish Fork River: None. **Monitoring:** None **Cumulative Impacts:** TDS in Utah Lake, same as described for the Proposed Action.	**Mitigation:** None. **Monitoring**: None. **Cumulative Impacts:** TDS in Utah Lake, same as described for the Proposed Action.

Table 3
(C.3.1) Comparison of Potential Impacts on Aquatic Ecosystems

Ecosystem	Spanish Fork Canyon – Provo Reservoir Canal Alternative (Proposed Action)	Bonneville Unit Water Alternative	No Action Alternative
C.3.1.2 Aquatic Resources	**Construction:** Standard Operating Procedures (SOPs) to protect aquatic resources during construction would include the following (see EIS Chapter 1, Section 1.8.8): • When necessary, in-channel work will be accomplished during low or no flow periods to the extent possible. • When necessary, in-channel work resulting in sediment and turbidity will be minimized. • Impacts on aquatic resources can be avoided and minimized by following hazardous materials procedures included under the health and safety SOPs, the restoration and erosion control SOPs, and wetlands SOPs. With the SOPs in place, construction would not impact aquatic resources	**Construction:** Same as the Proposed Action	**Construction:** No construction.

Table 3
(C.3.1) Comparison of Potential Impacts on Aquatic Ecosystems

Ecosystem	Spanish Fork Canyon – Provo Reservoir Canal Alternative (Proposed Action)	Bonneville Unit Water Alternative	No Action Alternative
C.3.1.2 Aquatic Resources	**Operation**: Provo River: Annual average flows below the Murdock Diversion would increase by 20% to 38% over baseline and would result in an increase in game fish biomass and macroinvertebrate populations because of increased habitat associated with increased water volume and stream surface area. (EIS Chapter 3, Sections 3.6.8.3.1.4, 3.6.8.3.1.5)	**Operation:** Provo River: Annual average flows below the Murdock Diversion would increase by 8% to 18% over baseline and would result in an increase in game fish and macroinvertebrate populations because of increased habitat associated with increased water volume and stream surface area. (EIS Chapter 3, Sections 3.6.8.4.1.1, 3.6.8.4.1.2)	**Operation**: Provo River: Impacts same as the Bonneville Unit Water Alternative.

Table 3
(C.3.1) Comparison of Potential Impacts on Aquatic Ecosystems

Ecosystem	Spanish Fork Canyon – Provo Reservoir Canal Alternative (Proposed Action)	Bonneville Unit Water Alternative	No Action Alternative
C.3.1.2 Aquatic Resources	**Operation: (continued)** Hobble Creek: Annual average flows would increase by 53% over baseline and would result in an increase in game fish and macroinvertebrate populations because of increased habitat associated with increased water volume and stream surface area. (EIS Chapter 3, Section. 3.6.8.3.1.6)	Hobble Creek: Annual average flows in Hobble Creek would increase by 107% over baseline and would and would result in an increase in game fish and macroinvertebrate populations because of increased habitat associated with increased water volume and stream surface area. (EIS Chapter 3, Section 3.6.8.4.1.3)	Hobble Creek: No impact.
	Spanish Fork River: Annual average flows would decrease by 32% to 66 % below baseline and would result in a decrease in game fish and macroinvertebrate populations because of decreased habitat associated with decreased water volume and stream surface area. (EIS Chapter 3, Section 3.6.8.3.1.7)	Spanish Fork River: Annual average flows in the Spanish Fork River would decrease by 12% to 20 % from baseline and baseline and would result in a decrease in game fish and macroinvertebrate populations because of decreased habitat associated with decreased water volume and stream surface area. (EIS Chapter 3, Section 3.6.8.4.1.4)	Spanish Fork River: Changes in flows would not cause quantifiable impacts.

Table 3
(C.3.1) Comparison of Potential Impacts on Aquatic Ecosystems

Ecosystem	Spanish Fork Canyon – Provo Reservoir Canal Alternative (Proposed Action)	Bonneville Unit Water Alternative	No Action Alternative
C.3.1.2 Aquatic Resources	**Mitigation and Monitoring:** None. **Cumulative Impacts:** The operation of the Proposed Action would result in improving fish habitat in the lower Provo River and in Hobble Creek. In conjunction with the planned improvements under the June Sucker Recovery Implementation Program (JSRIP). Fish habitat would likely be improved to a larger extent than would occur with just the actions of the JSRIP or the Proposed Action. The exact amount of improvement can not be quantified until the actual projects to occur under the JSRIP are specifically identified. Improvements would result from the JSRIP actions to improve the habitat in Hobble Creek. Any resulting increase in habitat conditions would likely increase the fish biomass.	**Mitigation and Monitoring:** None. **Cumulative Impacts:** The cumulative impacts would be similar to those under the Proposed Action.	**Mitigation and Monitoring:** None. **Cumulative Impacts:** None
C.3.1.3 Wetland Resources	**Construction:** The following Standard Operating Procedures (SOPs) will help minimize adverse impacts on wetlands during construction (see EIS Chapter 1, Section 1.8.8): • Direct and indirect impacts on wetlands will be avoided, unless there are no other practical alternatives (as defined in 40 CFR 230.3). Procedures to avoid impacts will include protecting wetlands with silt fencing during construction and avoiding quantity and quality impacts on surface water and groundwater resources that serve as a source of water for wetlands. • The contractor will be required to prepare a pipeline construction plan for approval by the District before starting any pipeline construction that may affect wetlands and riparian vegetation adjacent to roadways. The plan will document methods to protect wetlands and riparian vegetation from construction impacts.	**Construction**: SOPs same as Proposed Action	**Construction**: No construction.

Table 3
(C.3.1) Comparison of Potential Impacts on Aquatic Ecosystems

Ecosystem	Spanish Fork Canyon – Provo Reservoir Canal Alternative (Proposed Action)	**Bonneville Unit Water Alternative**	**No Action Alternative**
C.3.1.3 Wetland Resources	**Construction: (continued)** • Where impacts on wetlands cannot be avoided, they will be minimized to the extent possible. Heavy equipment in wetland areas will be operated on temporary earth fills placed on geotextile mats to minimize soil disturbance. Construction barriers will be installed to prevent unnecessary damage to adjacent wetlands. • Materials excavated from the pipeline trench will be placed on the adjacent roadway or in other upland areas. No excavated material will be placed in any wetlands. Wetland soils will be removed, segregated and stockpiled in upland areas. Wetland topsoil will be replaced in the top 6 to 12 inches of the pipeline trench, and the disturbed area will be graded to match previous contour elevations and revegetated with a mixture of desirable wetland plant species. • Pipelines will be installed using construction measures such as cutoff walls if a bedding material is used that could otherwise cause wetlands to be drained. Construction of the Proposed Action would result in the permanent loss of 1.0 acre of riparian forest and scrub-shrub wetland from construction of the Mapleton – Springville Lateral Pipeline, which would eliminate the canal water source that supports the wetlands. Construction of drain or discharge structures would result in the permanent loss of less than 0.1 acre of riparian forest, scrub-shrub and emergent marsh wetlands. Wetland functions associated with the 1.0 acre of wetland would be permanently lost. A total of 0.3 acre of wetland would be temporarily lost, but then restored upon completion of construction.	**Construction: (continued)** One acre of wetland habitat would be lost from construction of the Mapleton-Springville Lateral Pipeline and less than 0.1 acre from construction of drain or discharge structures. Wetland functions associated with the 1.0 acre of wetland would be permanently lost. A total of 0.2 acre of wetlands would be temporarily lost, but then restored upon completion of construction.	

Table 3
(C.3.1) Comparison of Potential Impacts on Aquatic Ecosystems

Ecosystem	Spanish Fork Canyon – Provo Reservoir Canal Alternative (Proposed Action)	Bonneville Unit Water Alternative	No Action Alternative
C.3.1.3 Wetland Resources	**Operations**: The potential continuation of groundwater pumping to support population growth would cause the drawdown of groundwater levels relative to baseline and the potential impact on existing wetlands. Wetlands that could be potentially impacted are those that occur in the area where the wetland water supply may decline due to the groundwater drawdown of one foot or more relative to existing conditions. The wetland acreage and specific locations of potential wetland impacts compared to existing conditions is not measurable based on the available information. However, it is expected that a considerable amount of wetland area could be potentially affected. The delivery of M&I water could have some benefit on these wetlands. Some increased level of groundwater recharge resulting from the application of the secondary use M&I water would provide the wetland benefit. The quantity and location of the wetlands that could benefit from the secondary use water is not measurable based on available information. (see Section 3.4.8.3 Groundwater Hydrology).	**Operations**: Same as Proposed Action	**Operations**: Potential increased pumping resulting from population growth would cause the drawdown of groundwater levels relative to existing conditions and the potential impacts on wetlands. Wetlands that could be potentially impacted are those that occur in the area where the wetland water supply may decline due to the groundwater drawdown of one foot or more relative to existing conditions. The wetland acreage and specific locations of potential wetland impacts relative to existing conditions is not measurable based on available information. However, it is expected that a considerable amount of wetland area could be potentially impacted.

Table 3
(C.3.1) Comparison of Potential Impacts on Aquatic Ecosystems

Ecosystem	Spanish Fork Canyon – Provo Reservoir Canal Alternative (Proposed Action)	Bonneville Unit Water Alternative	No Action Alternative
C.3.1.3 Wetland Resources	**Mitigation and Monitoring:** Mitigation. Under the Proposed Action, a total of 1.0 acre comprised of 16 small, scattered, non-jurisdictional wetlands would be permanently lost and a total of 0.3 acre comprised of 12 small, scattered non-jurisdictional wetlands would be temporarily impacted by construction. After completion of construction, the temporarily impacted wetlands would be restored by replacing wetland soils and revegetating the areas with plants that match existing species. These wetlands are expected to be fully restored and functional within three growing seasons. Mitigation for permanently lost and temporarily impacted non-jurisdictional wetlands would be off-site and out-of-kind but would include wetlands in a much larger contiguous complex with high functional value and habitat for TES species. Proposed mitigation for the ULS project would include about 10 acres of the 85.5-acre Mona Springs Unit. This would result in a mitigation ratio of approximately 9.7:1. This is substantial mitigation for both temporary and permanent loss of small, scattered, non-jurisdictional wetlands that currently have low functional value and do not support any TES species. (See Section 3.25.3 of the EIS)	**Mitigation and Monitoring:** Mitigation. 1.0 acre of wetland from pipeline construction and drain or discharge structures would be permanently lost. Temporary wetland impacts of 0.2 acre, would occur but wetlands would be restored upon completion of construction. Mitigation would be the same as the Proposed Action.	**Mitigation and Monitoring:** None.
	Mitigation and Monitoring: Monitoring. None. **Cumulative Impacts:** The Mitigation Commission has acquired land and water for the Utah Lake Wetland Preserve. More acquisitions are expected before 2016. This will enhance wetland areal extent, plant communities and wetland values within the ULS project area.	**Monitoring**. None. **Cumulative Impacts** Same as Proposed Action.	**Monitoring:** None **Cumulative Impacts:** Same as Proposed Action.

Table 3
(C.3.1) Comparison of Potential Impacts on Aquatic Ecosystems

Ecosystem	Spanish Fork Canyon – Provo Reservoir Canal Alternative (Proposed Action.)	Bonneville Unit Water Alternative	No Action Alternative
C.3.1.4 Threatened & Endangered Aquatic Species	**Construction:** Standard Operating Procedures (SOPs) to protect water quality during construction would protect T&E aquatic species (see EIS Chapter 1, Section 1.8.8): • With the SOPs in place, construction would not impact threatened and endangered aquatic species.	**Construction:** Same as the Proposed Action. .	**Construction:** No construction.
	Operation: <u>Provo River</u>: Operation would increase potential June sucker spawning habitat in the Provo River between the Tanner Race Diversion and Interstate 15 by 122 % to 192% over baseline because of increased water volume and stream surface area. June sucker spawning habitat from Interstate 15 to Utah Lake would increase by 86% to 181% over baseline. Backwater/edge and slow/shallow habitats utilized by early life stages of June sucker would decrease slightly in Tanner Race to I-15, but would be unchanged from I-15 to Utah Lake. There would be a significant, long-term benefit to June sucker populations under the Proposed Action. (EIS Chapter 3, Section 3.9.8.3.2.1 A)	**Operation:** <u>Provo River</u>: Operation of the would increase June sucker spawning habitat in the Provo River between the Tanner Race Diversion and Interstate 15 by 64% to 134% and below Interstate 15 by 64% to 111% over baseline because of increased habitat associated with increased water volume and stream surface area. Backwater/edge and slow flow/shallow habitats would decrease slightly above Interstate 15, but would increase by 324% over baseline from Interstate 15 to Utah Lake. (EIS, Chapter 3, Section 3.9.8.6.2.1)	**Operation:** <u>Provo River</u>: Operation of the affect on June sucker would be the same as described under the Bonneville Unit Water Alternative (EIS Chapter 3, Section 3.9.8.4.2.2). (EIS Chapter 3, Section 3.9.8.6.1.1)

Table 3
(C.3.1) Comparison of Potential Impacts on Aquatic Ecosystems

Ecosystem	Spanish Fork Canyon – Provo Reservoir Canal Alternative (Proposed Action)	Bonneville Unit Water Alternative	No Action Alternative
C.3.1.4 Threatened & Endangered Aquatic Species	**Mitigation and Monitoring:** None. **Cumulative Impacts:** Cumulative impacts on June sucker would likely be positive under the Proposed Action in conjunction with the potential improvements that could occur under the June sucker RIP. As discussed in Section 1.10.3.1.2, Chapter 1 certain water management aspects planned under the JSRIP have been incorporated into the design of the Proposed Action and effects have been analyzed as part of the Proposed Action. The Proposed Action would deliver water to Hobble Creek which would benefit June sucker, however, without the in-stream habitat improvements proposed in the June Sucker RIP, it is unlikely that the increased flow would result in any major improvement in June sucker habitat. Additional flows provided to the lower Provo River under the Proposed Action could have a significant positive impact on the June sucker. However, the Proposed Action operations in conjunction with the June sucker RIP would likely have significant positive cumulative effects on June sucker.	**Mitigation and Monitoring:** None. **Cumulative Impacts:** The potential positive cumulative effects on June sucker would be similar to those discussed under the Proposed Action.	**Mitigation and Monitoring:** None. **Cumulative Impacts:** None.

Table 3
(C.3.1) Comparison of Potential Impacts on Aquatic Ecosystems

Ecosystem	Spanish Fork Canyon – Provo Reservoir Canal Alternative (Proposed Action)	Bonneville Unit Water Alternative	No Action Alternative
C.3.1.5 Sensitive Aquatic Species	**Construction:** Standard Operating Procedures (SOPs) to protect sensitive species during construction would be the same as those for aquatic Threatened and Endangered Species. Construction of the Proposed Action would not impact Sensitive species. **Operation:** Spanish Fork River: Average annual flow would decrease by 32% to 66 % from baseline and would have negative impacts on leatherside chub habitat because of decreased habitat associated with decreased water volume and stream surface area. (EIS, Chapter 3, Section 3.10.8.3.2.1 A).	**Construction:** Same as the Proposed Action. **Operation:** Average annual flows in the Spanish Fork River would decrease by 12% to 20% from baseline and could have small adverse impacts on leatherside chub habitat because of decreased spawning habitat associated with decreased water volume and stream surface area. (EIS, Chapter.3, Section 3.10.8.4.2.1 B).	**Construction:** No construction. **Operation:** There would be no flow changes from baseline, therefore Leatherside Chub habitat and populations would not change from baseline conditions.
	Mitigation/Monitoring To offset potential impacts on leatherside chub, the joint-lead agencies commit to supporting the Utah Division of Wildlife Resources in evaluating population and habitat status, or determining threats and/or identifying conservation actions that could protect and where appropriate enhance leatherside chub. This would occur first in the Spanish Fork River but if necessary, in other streams of the Utah Lake drainage. **Cumulative Impacts:** None.	**Mitigation and Monitoring:** Same as Proposed Action. **Cumulative Impacts:** None.	**Mitigation and Monitoring** None. **Cumulative Impacts:** None.

Table 4
(C.3.2) Practicable Alternatives to Discharge of Dredged or Fill Material in Special Aquatic Sites

Special Aquatic Site	Spanish Fork Canyon – Provo Reservoir Canal Alternative (Proposed Action)	Bonneville Unit Water Alternative	No Action Alternative
C.3.2.1 Wetlands	**Construction:** There are no practicable alternatives to the alternative as presented. All other practicable alternatives were considered in project development and eliminated because of impacts on wetlands or other aquatic ecosystems.	Same as Proposed Action.	No features would be constructed with the No Action Alternative so there would be no impact on wetlands
C.3.2.2 Mudflats	No Impacts	No Impacts	No Impacts
C.3.2.3 Vegetated Shallows	No Impacts	No Impacts	No Impacts
C.3.2.4 Riffle and Pool Complexes	Impacts on riffle and pool complexes in streams would be avoided by utilizing techniques such as microtunneling or bore/jack for pipe installation under streambeds, unless there are no other practicable alternatives (as defined in 40 CFR 230.3). Many discharge impacts on riffle and pool complexes would be avoided by following hazardous materials procedures included under the SOPs for health and safety, restoration and erosion control, and wetlands (EIS Chapter. 1, Section 1.8.8.2). Where construction impacts on riffle and pool complexes cannot be avoided, whether permanent or temporary, practicable alternatives would include minimizing the following activities to the extent possible: 1. In-channel work that results in sediment entrainment and turbidity 2. In-channel work during high flow periods 3. Heavy equipment use in streambeds at stream crossings	Same as Proposed Action.	**Construction:** No construction.

Table 5
(C.3.3) Practicable Alternatives That Would Have Less Adverse Impact on Aquatic Ecosystems

	Spanish Fork Canyon – Provo Reservoir Canal Alternative (Proposed Action)	Bonneville Unit Water Alternative	No Action Alternative
C.3.3.1 Cost Considerations	**Construction**: Estimated total costs = $458.8 million Projected cost of ULS water in Salt Lake County and southern Utah County = $301.73 per acre-foot	**Construction**: Estimated total costs = $184 million Projected cost of ULS water in southern Utah County = $334.00 per acre-foot	**Construction**: Estimated construction costs =$0 Diversion dam modification estimated cost ($15 million) was included in the Diamond Fork System FS-FEIS.
C.3.3.2 Existing Technology	**Construction:** Existing technologies for transporting fabricated pipe, fill, and materials include large highway trucks and loaders. Existing technologies for excavation, installation, and backfilling of pipelines include large excavators, dozers, haul trucks, and compactors. Pipe would be assembled using existing welding methods and equipment. Cranes and large excavation equipment would be used to place pipe. Disturbed roadways would be repaved after backfilling using existing paving equipment. Disturbed vegetated areas would be revegetated using seed broadcasters and drills where appropriate. All aspects of the project can be constructed using existing technology.	**Construction:** Same as Proposed Action.	**Construction:** No construction.
C.3.3.3 Logistics in Light of Overall Project Purposes	Can accomplish project purposes with reasonable logistical implementation	Can only accomplish some project objectives because of limited scope of water delivery. Logistically feasible to accomplish those objectives.	Does not accomplish project objectives.

Table 6
(C.4) Alternative Evaluation for Violations Caused By Discharge of Dredged or Fill Material

	Spanish Fork Canyon – Provo Reservoir Canal Alternative (Proposed Action)	Bonneville Unit Water Alternative	No Action Alternative
C.4.1 Violations of Applicable State Water Quality Standards	**Construction:** No violations of applicable state water quality standards resulting from discharge of dredged or fill material would occur. Standard operating procedures to be used during construction would prevent discharges of these materials into waters of the United States (EIS Section 1.8.8). **Operation:** Utah Lake: None. Provo River: None. Hobble Creek: None. Spanish Fork River: None. No groundwater quality violations are expected (EIS Section 3.3.8.3.3).	**Construction:** No violations of applicable state water quality standards resulting from discharge of dredged or fill material would occur. Standard operating procedures to be used during construction and operation would prevent discharges of these materials into waters of the United States (EIS Section 1.8.8). **Operation:** Utah Lake: Same as Proposed Action Provo River: Same as Proposed Action Hobble Creek: Same as Proposed Action Spanish Fork River: Same as Proposed Action. No groundwater quality violations are expected (EIS Section 3.5.8.4.1).	**Construction:** No construction. **Operation:** No groundwater quality violations are expected (EIS Section 3.5.8.5).
C.4.2 Violations of Applicable Toxic Effluent Standard or Prohibition under Section 307 of the Clean Water Act	**Construction:** No violations of applicable toxic effluent standards or prohibitions as specified under Section 307 of the Clean Water Act resulting from discharge of dredged or fill material would occur. (EIS Section 1.8.8).	**Construction:** Same as Proposed Action.	**Construction:** No construction or change in operations from baseline.

Table 6

(C.4) Alternative Evaluation for Violations Caused By Discharge of Dredged or Fill Material

	Spanish Fork Canyon – Provo Reservoir Canal Alternative (Proposed Action)	**Bonneville Unit Water Alternative**	**No Action Alternative**
C.4.2 Violations of Applicable Toxic Effluent Standard or Prohibition under Section 307 of the Clean Water Act	**Operation:** No volatile organic compounds, acid organic compounds, semi-volatile organic compounds, or pesticides listed under Section 307 CWA would be discharged. There would be no discharge of naturally-occurring metals listed in Section 307. Of the listed toxic pollutants, selenium would continue to flow down Spanish Fork River at concentrations far below the state water quality standards.	**Operation**: Same as Proposed Action.	**Operation**: None.
C.4.3 Jeopardizes the Continued Existence of Species Listed as Endangered under the ESA or Results in Possible Destruction or Modification of Critical Habitat	**Construction**: The Proposed Action would not jeopardize the continued existence of species listed as endangered under the ESA and would not result in destruction or modification of critical habitat as a result of discharge of dredged or fill material (EIS Section 3.9.8.3). **Operation**: No impacts.	**Construction**: Same as Proposed Action. **Operation**: No impacts.	**Construction**: No construction. **Operation**: No impacts.

Table 7
(C.5) Potential Impacts on Physical and Chemical Components of the Aquatic Ecosystem

	Spanish Fork Canyon – Provo Reservoir Canal Alternative (Proposed Action)	Bonneville Unit Water Alternative	No Action Alternative
C. 5.1. Substrate	**Construction:** A total of 0.3 acre of wetland would be temporarily lost, but would be restored upon completion of construction. A total of 1.0 acre of riparian forest, scrub-shrub, and emergent marsh wetlands would be permanently lost from construction of the Mapleton-Springville Lateral Pipeline and drain or discharge structures on other pipelines. The Mapleton – Springville Lateral Pipeline would be buried in the existing Mapleton Lateral canal. Standard operating procedures (SOPs, see EIS Chapter 1, Section 1.8.8) would be implemented to protect existing substrates. No excavated material would be discharged into any wetland. All soil excavated from the pipeline trench would be placed on upland areas or stockpiled on existing roadbeds. The Spanish Fork – Santaquin Pipeline crossing of the Spanish Fork River would be constructed by microtunneling (EIS Chapter 1, Table 1-5); less than 0.01 acre of substrates would be affected by construction of a drain structure. The Spanish Fork – Provo Reservoir Canal Pipeline crossings of the Hobble Creek and Spring Creek would be constructed by the jack/bore technique; the Provo River crossing would be constructed by microtunneling (EIS Chapter 1, Table 1-10 and Section 1.4.4.4). Less than 0.01 acre of substrates would be affected by construction of the discharge structure. The Spanish Fork Canyon Pipeline would not cross wetland substrates; SOPs would prevent impacts to adjacent substrates. Less than 0.01 acre of substrate would be impacted at the discharge of the Santaquin – Mona Reservoir Pipeline. **Operation:** No impacts.	**Construction:** The Santaquin – Mona Reservoir Pipeline and the Spanish Fork – Provo Reservoir Canal Pipeline would not be constructed, otherwise same as the Proposed Action. **Operation:** No impacts.	**Construction:** There would be no construction and substrates would not be affected. **Operation:** No impacts.

Table 7
(C.5) Potential Impacts on Physical and Chemical Components of the Aquatic Ecosystem

	Spanish Fork Canyon – Provo Reservoir Canal Alternative (Proposed Action)	Bonneville Unit Water Alternative	No Action Alternative
C.5.2 Suspended Particulates and Turbidity	**Construction:** The Mapleton Lateral would be dewatered during construction of the Mapleton – Springville Lateral Pipeline; suspended particulates and turbidity would not be affected. Crossings of rivers, creeks and drainages by the Spanish Fork – Santaquin and Spanish Fork – Provo Reservoir Canal Pipelines would be by jack/bore or microtunnel; suspended particulates and turbidity would not be affected. The Spanish Fork Canyon and Santaquin – Mona Reservoir Pipelines would not cross water bodies or drainages and would not affect suspended particulates and turbidity. **Operation**: No impacts.	**Construction:** The Santaquin – Mona Reservoir Pipeline and the Spanish Fork – Provo Reservoir Canal Pipeline would not be constructed, otherwise same as the Proposed Action. **Operation:** No impacts.	**Construction:** No construction. **Operation:** No impacts.
C.5.3 Water Quality	**Construction:** Same as C.5.2. **Operation:** <u>Utah Lake</u>: Total P concentrations would be reduced by tributary inflows. Total P load would remain the same as existing conditions. TDS concentrations would essentially remain unchanged from historic baseline conditions; TDS inflow concentrations would reduce in-lake TDS concentrations. TDS load would decrease 584 tons per year, a decrease of 0.2% over existing conditions. <u>Provo River</u>: Total P concentrations would exceed the pollution indicator of 0.05 mg/L in May, July, August, September and October of each year (EIS Section 3.3.8.3.2.1), with total P concentrations decreasing from existing conditions in May and September. Late summer flows are less than 4 cfs in many years under existing conditions. <u>Hobble Creek</u>: Total P concentrations would exceed the pollution indicator during months with little or no natural flow (EIS Section 3.3.8.3.2.2).	**Construction:** The Santaquin – Mona Reservoir Pipeline would not be constructed, otherwise same as the Proposed Action. **Operation:** <u>Utah Lake</u>: Total P concentrations would be reduced by tributary inflows. Total P load would increase 4.2 tons per year, an increase of 1.4% over existing conditions. TDS concentrations would decrease from existing conditions. TDS load would increase by 10,046 tons per year (+3%) <u>Provo River</u>: Unchanged from existing conditions. <u>Hobble Creek</u>: Same as Proposed Action Water quality impacts are discussed under item C.4.1 in Table 6.	**Construction:** No construction. **Operation:** <u>Utah Lake</u>: Total P concentrations would remain unchanged or increase slightly. Total P load would increase 2.7 tons per year, an increase of 0.9% from existing conditions. TDS concentrations would decrease from historic baseline. TDS load would increase by 8,465 tons per year (+2.5%).

Table 7
(C.5) Potential Impacts on Physical and Chemical Components of the Aquatic Ecosystem

	Spanish Fork Canyon – Provo Reservoir Canal Alternative (Proposed Action)	Bonneville Unit Water Alternative	No Action Alternative
C.5.3 Water Quality	Spanish Fork River: Selenium concentrations would remain below or near the analytical detection limit of 1.0 µg/L (EIS Section 3.3.8.3.2.3). Water quality impacts associated the Proposed Action are discussed under item C.4.1 in Table 3.	Spanish Fork River: Same as Proposed Action. Water quality impacts associated with the Bonneville Unit Water Alternative are discussed under item C.4.1 in Table 3.	Spanish Fork River: Same as Proposed Action.
C.5.4 Current Patterns and Water Circulation	**Construction:** The Mapleton – Springville Lateral Pipeline would be installed in the existing Mapleton Lateral alignment under dewatered conditions. A pipeline would carry the water previously carried by the lateral. The Spanish Fork – Provo Reservoir Canal, Spanish Fork Canyon, Spanish Fork – Santaquin and Santaquin – Mona Reservoir Pipelines would not affect current patterns or water circulation. Pipeline stream crossings would be accomplished by microtunneling. **Operation:** During operation, the rates of discharge to the Spanish Fork River, Hobble Creek, and the Provo River would change. The range of projected flow rates would not exceed the maximum channel capacities for these stream channels, therefore the types of current patterns and water circulation would not change. However, the duration of flow rates will be regulated more than under baseline conditions, which would affect current patterns specifically associated with increases or decreases in durations of flow rates. Specific changes are described in C.5.5 below. These changes would result in increased duration of higher flow rates in the lower Provo River and lower Hobble Creek. The increased duration of higher flow rates would improve the aquatic ecosystem habitat in these streams below the points of pipeline discharge by providing attraction flows, by increasing the volume of	**Construction:** The Santaquin – Mona Reservoir Pipeline would not be constructed, otherwise same as the Proposed Action. **Operation:** Same as Proposed Action.	**Construction:** No construction. **Operation:** No impacts.

Table 7
(C.5) Potential Impacts on Physical and Chemical Components of the Aquatic Ecosystem

	Spanish Fork Canyon – Provo Reservoir Canal Alternative (Proposed Action)	Bonneville Unit Water Alternative	No Action Alternative
C.5.4 Current Patterns and Water Circulation	habitable stream channel and by tempering the range of variations of temperature and dissolved oxygen below the mixing zones. This tempering will occur because water brought from Strawberry Reservoir through the pipelines will be drawn from below the reservoir surface and will be less subject to ambient weather variations. The flow rates in the Spanish Fork River below the confluence with Diamond Fork would decrease compared to baseline conditions, which would adversely impact aquatic habitat in that reach by reducing available habitat and attraction flows. Overall, the alternative would result in a net increase in aquatic habitat.		
C.5.5 Normal Water Fluctuations	**Construction:** No impact. **Operation:** <u>Utah Lake</u> Water level elevation in Utah Lake would be within historic operational levels (EIS Section 3.2.8.2.6). <u>Provo River</u>: Average annual flows from Deer Creek Reservoir to the Murdock Diversion would change by less than 10% (EIS Section 3.2.8.3.1). Annual average flows in the Provo River from below the Murdock Diversion to Utah Lake would increase by 20% to 38% over baseline (EIS Section 3.2.8.3.1).	**Construction:** The Santaquin – Mona Reservoir Pipeline would not be constructed, otherwise same as the Proposed Action. **Operation:** <u>Utah Lake</u> Same as Proposed Action <u>Provo River</u>: Same as Proposed Action Annual average flows in the Provo River from below the Murdock Diversion to Utah Lake would increase by 8 to 18% over baseline (EIS Section 3.2.8.4.1).	**Construction:** No construction. **Operation:** No impact (EIS Section 3.2.8.2.6). <u>Provo River</u>: Average annual flows from Deer Creek Reservoir to the Murdock Diversion would change by less than 10% (EIS Section 3.2.8.5.1).

Table 7
(C.5) Potential Impacts on Physical and Chemical Components of the Aquatic Ecosystem

	Spanish Fork Canyon – Provo Reservoir Canal Alternative (Proposed Action)	Bonneville Unit Water Alternative	No Action Alternative
C.5.5 Normal Water Fluctuations	Hobble Creek: Annual average flows from the Mapleton Lateral to Utah Lake would increase by 53% over baseline (EIS Section 3.2.8.3.1). Spanish Fork River: Average annual flows in the Spanish Fork River from Diamond Fork Creek to Utah Lake would decrease by 32% to 66% from baseline (EIS Section 3.2.8.3.1). Jordan River: Average annual flows in the Jordan River from Utah Lake to Jordan Narrows would decrease by 7% from baseline.	Hobble Creek: Average annual flows from the Mapleton Lateral to Utah Lake would increase by 107% over baseline (EIS Section 3.2.8.4.1). Spanish Fork River: Average annual flows from Diamond Fork Creek to Utah Lake would decrease by 13% to 20% from baseline (EIS Section 3.2.8.4.1). Jordan River: Average annual flows in the Jordan River from Utah Lake to Jordan Narrows would increase by 3% from baseline.	Provo River: Average annual flows in the Provo River from the Murdock Diversion to Utah Lake would be the same as the Bonneville Unit Water Alternative (EIS Section 3.2.8.5.1). Spanish Fork River: Average annual flows would change by less than 10% (EIS Section 3.2.8.5.1). Jordan River: Average annual flows in the Jordan River from Utah Lake to Jordan Narrows would increase by 1% from baseline.

Table 8
(C.6) Potential Impacts on Biological Characteristics of the Aquatic Ecosystem

	Spanish Fork Canyon – Provo Reservoir Canal Alternative (Proposed Action)	Bonneville Unit Water Alternative	No Action Alternative
C.6.1 Threatened and Endangered Species	**Construction:** No effects. **Operation:** Operation would increase potential June sucker spawning habitat in the Provo River between the Tanner Race Diversion and Interstate 15 by 122 % to 192% over baseline because of increased water volume and stream surface area. June sucker spawning habitat from Interstate 15 to Utah Lake would increase by 86% to 181% over baseline. Backwater/edge and slow/shallow habitats utilized by early life stages of June sucker would decrease slightly in Tanner Race to I-15, but would be unchanged from I-15 to Utah Lake. There would be a significant, long-term benefit to June sucker populations. (EIS Chapter 3, Section 3.9.8.3.2.1 A)	**Construction:** No effects. **Operation:** Operation would increase June sucker spawning habitat in the Provo River between the Tanner Race Diversion and Interstate 15 by 64% to 134% and below Interstate 15 by 64% to 111% over baseline because of increased habitat associated with increased water volume and stream surface area. Backwater/edge and slow flow/shallow habitats would decrease slightly above Interstate 15, but would increase by 324% over baseline from Interstate 15 to Utah Lake. (EIS, Chapter 3, Section 3.9.8.6.2.1)	**Construction:** No construction. **Operation:** Same as Bonneville Unit Water Alternative
C.6.2 Fish, Crustaceans, Mollusks and Other Aquatic Organisms in the Food Web	**Construction:** No impact. **Operation:** <u>Provo River</u>: Annual average flows below the Murdock Diversion would increase by 20% to 38% over baseline resulting in an increase in game fish and macroinvertebrate populations because of increased habitat associated with increased water volume and stream surface area.	**Construction:** No impact. **Operation:** <u>Provo River</u>: Annual average flows below the Murdock Diversion would increase by 8% to 18% over baseline resulting in an increase in game fish and macroinvertebrate populations because of increased habitat associated with increased water volume and stream surface area.	**Construction:** No construction. **Operation:** Same as Bonneville Unit Water Alternative.

Table 8
(C.6) Potential Impacts on Biological Characteristics of the Aquatic Ecosystem

	Spanish Fork Canyon – Provo Reservoir Canal Alternative (Proposed Action)	**Bonneville Unit Water Alternative**	**No Action Alternative**
C.6.2 Fish, Crustaceans, Mollusks and Other Aquatic Organisms in the Food Web	Hobble Creek: Annual average flows would increase by 53% over baseline and would result in an increase in game fish and macroinvertebrate populations because of increased habitat associated with increased water volume and stream surface area. Spanish Fork River: Annual average flows below Diamond Fork Creek would decrease by 32% to 66 % from baseline and would have adverse impacts on game fish and macroinvertebrate populations because of decreased habitat associated with decreased water volume and stream surface area. Overall the game fish biomass would experience an increase of 19,496 pounds over baseline (+30%).	Hobble Creek: Annual average flows would increase by 107% over baseline and would result in an increase in game fish and macroinvertebrate populations because of increased habitat associated with increased water volume and stream surface area. Spanish Fork River: Annual average flows would decrease by 12% to 20 % from baseline and would have adverse impacts on game fish and macroinvertebrate populations because of decreased habitat associated with decreased water volume and stream surface area. Overall the game fish biomass would experience an increase of 10,220 pounds over baseline (+15.6%).	Fish biomass would increase by 9,703 pounds over baseline (+14.9%).
C.6.3 Other Wildlife	**Construction:** No impacts. **Operation:** No impacts.	**Construction:** No impacts. **Operation:** No impacts.	**Construction:** No construction. **Operation**: No impacts.

Table 9
(C.7) Potential Impacts on Special Aquatic Sites

	Spanish Fork Canyon – Provo Reservoir Canal Alternative (Proposed Action)	Bonneville Unit Water Alternative	No Action Alternative
C.7.1 Wetlands	**Construction:** Permanent loss of 1.0 acre of small, scattered riparian forest and scrub-shrub wetlands from construction of the Mapleton – Springville Lateral Pipeline, which would eliminate the canal water source that supports the wetlands. Construction of pipeline drain or discharge structures would result in the permanent loss of less than 0.1 acre of riparian forest, scrub-shrub and emergent marsh wetlands. Wetland functions associated with the 1.0 acre of wetland would be permanently lost. Construction of the pipelines would temporarily impact approximately 0.3 acre of wet meadow, emergent marsh, riparian forest and scrub-shrub wetlands. The wetlands would be reclaimed and wetland functions would re-establish after restoration.	**Construction:** Loss of one acre of wetland habitat lost from construction of the Mapleton-Springville Lateral Pipeline and less than 0.1 acre loss from construction of drain or discharge structures. Wetland functions associated with the 1.0 acre of wetland would be permanently lost. Construction of the pipelines would temporarily impact approximately 0.2 acre of wet meadow, emergent marsh, riparian forest and scrub-shrub wetlands. The wetlands would be reclaimed and wetland functions would re-establish after restoration.	**Construction:** No impacts.

Table 9
(C.7) Potential Impacts on Special Aquatic Sites

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	Spanish Fork Canyon – Provo Reservoir Canal Alternative (Proposed Action)	Bonneville Unit Water Alternative	No Action Alternative
C.7.1 Wetlands	**Operation:** The potential continuation of groundwater pumping to support population growth would cause the drawdown of groundwater levels relative to baseline and the potential impact on existing wetlands. Wetlands that could be potentially impacted are those that occur in the area where the wetland water supply may decline due to the groundwater drawdown of one foot or more relative to existing conditions. The wetland acreage and specific locations of potential wetland impacts compared to existing conditions is not measurable based on the available information. However, it is expected that a considerable amount of wetland area could be potentially affected. The delivery of M&I water could have some benefit on these wetlands. Some increased level of groundwater recharge resulting from the application of the secondary use M&I water would provide the wetland benefit. The quantity and location of the wetlands that could benefit from the secondary use water is not measurable based on available information. (see Section 3.4.8.3 Groundwater Hydrology).	**Operation:** Same as Proposed Action.	**Operation:** Potential increased pumping resulting from population growth would cause the drawdown of groundwater levels relative to existing conditions and the potential impacts on wetlands. Wetlands that could be potentially impacted are those that occur in the area where the wetland water supply may decline due to the groundwater drawdown of one foot or more relative to existing conditions. The wetland acreage and specific locations of potential wetland impacts relative to baseline is not measurable based on available information. However, it is expected that a considerable amount of wetland area could be potentially impacted. (See EIS Chapter 3, Section 3.7.8.4.3).

Table 9
(C.7) Potential Impacts on Special Aquatic Sites

	Spanish Fork Canyon – Provo Reservoir Canal Alternative (Proposed Action)	Bonneville Unit Water Alternative	No Action Alternative
C.7.2 Mudflats	Water surface elevations in Utah Lake, Jordanelle and Deer Creek reservoirs would be within historic fluctuations during operation of the alternative. Mudflats would not be impacted.	Same as the Proposed Action	No Impacts.
C.7.3 Vegetated Shallows	Water surface elevations in Utah Lake, Jordanelle and Deer Creek reservoirs would be within historic fluctuations during operation. Vegetated shallows would not be impacted.	Same as the Proposed Action	No Impacts.
C.7.4 Riffle and Pool Complexes	The aquatic habitat model indicates the net effect of the higher anticipated flows with the Proposed Action, as would be the case in the Provo River and Hobble Creek, would mean a net increase in riffle and pool complexes and consequently an increase in macroinvertebrates and fish production. Lower flows, as expected in the Spanish Fork River, would mean just the opposite. The overall impact is a substantial net increase in June sucker habitat and total fish biomass (Table 8).	Same as the Proposed Action	No impacts.

Table 10
(C.8) Potential Impacts on Human Use Characteristics

	Spanish Fork Canyon – Provo Reservoir Canal Alternative (Proposed Action)	Bonneville Unit Water Alternative	No Action Alternative
C.8.1 Municipal and Private Water Supplies	There would be no impacts on municipal or private water supplies in quantity or quality from discharge of dredged or fill material.	Same as Proposed Action	No impacts.
C.8.2 Recreational Fisheries	**Construction:** No impact **Operation:** Provo River: Annual average flows below the Murdock Diversion would increase by 20% to 38% over baseline and would result in an increase in game fish and macroinvertebrate populations because of increased habitat associated with increased water volume and stream surface area.	**Construction:** No impact **Operation:** Provo River: Annual average flows below the Murdock Diversion would increase by 8% to 18% over baseline and would result in an increase in game fish and macroinvertebrate populations because of increased habitat associated with increased water volume and stream surface area.	**Construction:** No Construction. **Operation**: No impact

Table 10
(C.8) Potential Impacts on Human Use Characteristics

	Spanish Fork Canyon – Provo Reservoir Canal Alternative (Proposed Action)	**Bonneville Unit Water Alternative**	**No Action Alternative**
C.8.2 Recreational Fisheries	<u>Hobble Creek</u>: Annual average flows would increase by 53% over baseline and would result in an increase in game fish and macroinvertebrate populations because of increased habitat associated with increased water volume and stream surface area. <u>Spanish Fork River</u>: Annual average flows would decrease by 32% to 66 % from baseline and would result in a decrease in game fish and macroinvertebrate populations because of decreased habitat associated with decreased water volume and stream surface area. Fish Biomass: Overall game fish biomass would increase by 19,496 pounds (+30%).	<u>Hobble Creek</u>: Annual average flows would increase by 107% over baseline and would result in an increase in game fish and macroinvertebrate populations because of increased habitat associated with increased water volume and stream surface area. <u>Spanish Fork River</u>: Annual average flows would decrease by 12% to 20 % from baseline and would result in a decrease in game fish and macroinvertebrate populations because of decreased habitat associated with decreased water volume and stream surface area. Fish Biomass: Overall game fish biomass would increase by 10,220 pounds (+15.7%).	Fish Biomass: Overall game fish biomass would increase by 9,703 pounds (+14.9%)
C.8.3 Water-Related Recreation	**Construction:** No impacts **Operation:** There would be an overall increase of 36,438 angler days/year from baseline	**Construction:** No impacts **Operation:** There would be an overall increase of 18,054 angler days/year from baseline	**Construction:** No Construction. **Operation:** There would be an overall increase of 19,716 angler-days/year from baseline

Table 10
(C.8) Potential Impacts on Human Use Characteristics

	Spanish Fork Canyon – Provo Reservoir Canal Alternative (Proposed Action)	Bonneville Unit Water Alternative	No Action Alternative
C.8.4 Aesthetics	**Construction:** Sixth Water Transmission Line: long-term visual resource impacts would occur from new, taller poles that would be visible along Rays Valley Road. Upper Diamond Fork Power Facility: long-term impacts would occur from construction of the power facility, which would be visible from Diamond Fork Road and persons fishing or recreating along Diamond Fork Creek. Construction features to reduce impacts would include a concrete foundation with earthtone river pebbles embedded in the surface; integrally-colored concrete logs would frame the structure with a rust colored, metal, pitched roof to simulate a rustic log cabin. The concrete foundation, concrete logs, river pebbles and metal roof colors would be selected to blend with surrounding soil and vegetation colors. **Operation:** No impacts.	**Construction:** Impacts from construction of Sixth Water Transmission Line and the Upper Diamond Fork Power Facility would be the same as the Proposed Action. **Operation:** No impacts.	**No Construction:** No impact. **Operation:** No impacts.

Table 11
(C.9.1) Description of Dredged or Fill Materials

	Spanish Fork Canyon – Provo Reservoir Canal Alternative (Proposed Action)	Bonneville Unit Water Alternative	No Action Alternative
C.9.1.1 Gravel	An evaluation of potential contaminant sources in the projected pipeline alignments indicates that no contaminated soils would be anticipated during construction of the pipelines (EIS Section 3.17.8.2). All gravel used for pipe bedding would be clean imported material free of biological, chemical or other pollutants.	Same as the Proposed Action.	No construction
C.9.1.2 Sand	Sands excavated from existing wetland areas adjacent to highways have the potential to contain some pollutants from road runoff, which could include herbicides and volatile organic compounds (VOCs), although such contamination has not been documented (EIS Section 3.17.8.2). These materials when excavated for pipeline construction would not be discharged into the aquatic ecosystem.	Same as the Proposed Action.	Not applicable.
C.9.1.3 Other Naturally-Occurring Inert Materials	Rock and soil excavated from pipeline alignments in and near existing wetlands and points of discharge that are adjacent to highways have the potential to contain some pollutants from road runoff, which could include herbicides and volatile organic compounds (VOCs), although such contamination has not been documented (EIS Section 3.17.8.2). These materials when excavated for pipeline construction would not be discharged into the aquatic ecosystem.	Same as the Proposed Action.	Not applicable.
C.9.1.4 Rock Riprap	Rock riprap comprised of inert natural rock materials would be placed along the Provo River where the Spanish Fork-Provo Reservoir Canal Pipeline would discharge Bonneville Unit water across a weir into the river. Rock riprap of the same composition would be placed along Hobble Creek where the Mapleton-Springville Lateral Pipeline would discharge Bonneville Unit water to the creek. The rock riprap would be installed at the toe of these discharge structures within the water column to help dissipate energy from the water discharges, protect the structures from flows and debris, and protect the banks around the structures from erosion. Up to 300 cubic yards of rock riprap would be placed for erosion protection.	Same as the Proposed Action for Hobble Creek only. No rock riprap would be placed in the Provo River under this alternative.	Not applicable.
C.9.1.5 Excavated Earth Used for Trench Backfill	All excavated earth used for trench backfill would be pollution-free.	Same as the Proposed Action.	Not applicable.
C.9.1.6 Concrete	All concrete used for construction would be pollutant-free.	Same as the Proposed Action.	Not applicable.

Table 12
(C.9.2) Potential for Contamination of Dredged or Fill Materials

	Spanish Fork Canyon – Provo Reservoir Canal Alternative (Proposed Action)	Bonneville Unit Water Alternative	No Action Alternative
C.9.2.1 Gravel	Contact with contaminated material would not be anticipated.	Same as Proposed Action.	Not Applicable
C.9.2.2 Sand	Contact with contaminated material would not be anticipated.	Same as Proposed Action.	Not Applicable
C.9.2.3 Other Naturally-Occurring Inert Materials	Contact with contaminated material would not be anticipated.	Same as Proposed Action.	Not Applicable
C.9.2.4 Rock Riprap	Contact with contaminated material would not be anticipated.	Same as Proposed Action.	Not Applicable
C.9.2.5 Excavated Earth Used for Trench Backfill	Contact with contaminated material would not be anticipated.	Same as Proposed Action.	Not Applicable
C.9.2.6 Concrete	Contact with contaminated material would not be anticipated.	Same as Proposed Action.	Not Applicable

Table 13
(C.10) Actions to Minimize Adverse Effects

	Spanish Fork Canyon – Provo Reservoir Canal Alternative (Proposed Action)	Bonneville Unit Water Alternative	No Action Alternative
C.10.1 Location of Discharge	**Construction:** Standard Operating Procedures (EIS Section 1.8.8) would control placement of excavated material to prevent placement or stockpiling in wetlands or waterways, except for temporary storage during excavation. Sediment runoff from excavated material would be controlled by silt fencing and other barriers to prevent adverse discharge. Pipeline alignments were selected to minimize disruption of wetlands and waterways to the extent practicable. Alignments would be in or along the edge of roadways and within rights-of-way wherever feasible. Existing wetlands and shallow groundwater areas are avoided except where doing so would result in substantial additional cost and effort. Wetlands would be restored after construction is completed. Wetlands are expected to be fully restored after three growing seasons. **Operation:** Pipeline discharge structures will be designed to minimize erosion effects and to promote benefits to aquatic ecosystems.	**Construction:** Same as Proposed Action. **Operation:** Same as Proposed Action	**Construction:** No construction.
C.10.2 Material to be Discharged	**Construction:** Excavated materials and fill would be prevented from discharging to wetlands and waterways by Standard Operating Procedures (EIS Section 1.8.8). Selected SOPs are identified in C.10.3. Materials excavated from wetlands would be natural gravel, sand, silt, clay, and cobbles, depending upon the specific location. Material imported for fill would be clean and free of pollutants. **Operation:** Pipeline discharges would be clean water from Strawberry Reservoir.	**Construction:** Same as Proposed Action. **Operation:** Same as Proposed Action.	**Construction:** No construction.

Table 13
(C.10) Actions to Minimize Adverse Effects

	Spanish Fork Canyon – Provo Reservoir Canal Alternative (Proposed Action)	**Bonneville Unit Water Alternative**	**No Action Alternative**
C.10.3 Control of Material After Discharge	**Construction:** ▪ Only temporary storage of excavated material would occur near wetlands or waterways. Backfilled material would be compacted and revegetated, and runoff from disturbed areas would be controlled by Standard Operating Procedures (EIS Section 1.8.8), including the following actions: ▪ Silt fences, staked rice wattles, or sandbags between excavated stockpiles and castings and adjacent wetlands and waterways ▪ Temporary slope breakers on grades, including soil piles, silt fence, straw bales, and sandbags ▪ Mulch applied on steep slopes, sites with high erosion potential, and windy sites ▪ Erosion control fabric on water body banks during final re-contouring or on extremely steep slopes ▪ Stockpiling and replacing topsoil from disturbed areas ▪ Grading and revegetation of excavation spoils ▪ Prompt cleanup of disturbed areas after backfilling ▪ Revegetation of disturbed areas using indigenous seed mixes ▪ Traffic control in disturbed areas to minimize erosion ▪ Ramping of water discharges (runoff, dewatering) to prevent erosion ▪ Protect existing plant roots where practical ▪ Temporary fencing to prevent livestock disturbance of revegetated areas ▪ Temporary earth fill work areas in wetlands for heavy equipment where wetland work is unavoidable ▪ Stockpiling and replacement of excavated wetland soils ▪ Cutoff walls in pipeline excavations where draining of wetlands could occur ▪ Power poles and access roads would not be located in wetlands or riparian corridors ▪ In-channel work would minimize sediment entrainment and turbidity ▪ Open-trench in any one area would be limited to 500 feet per day ▪ Contractors would be required to develop and implement spill prevention, containment, and control plans ▪ Discharge of wet cement into wetlands and waterways would be prevented ▪ Trucks and equipment would be washed in areas away from wetlands and waterways	**Construction:** Same as Proposed Action.	**Construction:** No construction.

Table 13
(C.10) Actions to Minimize Adverse Effects

	Spanish Fork Canyon – Provo Reservoir Canal Alternative (Proposed Action)	Bonneville Unit Water Alternative	No Action Alternative
C.10.3 Control of Material After Discharge	**Construction: (continued)** ▪ Applicable Utah water quality permits would be obtained prior to construction in or near water resources ▪ Salt will not be used in snow removal efforts on National Forest System roads ▪ Drains and ditches will be kept functional to prevent ponding ▪ All debris will be removed from road surfaces and ditches ▪ Monitoring of revegetated areas and erosion control structures will occur as needed to achieve restored conditions ▪ Material not used for backfill would be removed from wetland and waterway areas and deposited in upland areas. **Operation:** Pipeline outfalls and discharge areas would be designed and constructed to prevent scouring and erosion of stream channels and reservoir banks.		
C.10.4 Method of Dispersion	**Construction:** Backfill in excavations would be limited to the excavated areas and would not be dispersed in wetlands or waterways. Standard Operating Procedures (EIS Section 1.8.8) would prevent dispersion of other excavated or fill materials within wetlands and waterways. **Operation:** Water discharged from pipeline outfalls would be controlled to prevent sudden surges in flowrate that could promote erosion or mobilize sediments.	**Construction:** Same as Proposed Action. **Operation**: Same as Proposed Action.	**Construction:** No construction.
C.10.5 Applicable Discharge Technology	**Construction:** Excavation and backfill would be performed by earthwork equipment, including graders, excavators, backhoes, trenchers, etc. SOPs identified in C.10.3 would be used to control discharge. **Operation:** None.	**Construction:** Same as Proposed Action. **Operation**: None.	**Construction:** No construction.

Table 13
(C.10) Actions to Minimize Adverse Effects

	Spanish Fork Canyon – Provo Reservoir Canal Alternative (Proposed Action)	Bonneville Unit Water Alternative	No Action Alternative
C.10.6 Effects on Plant and Animal Populations	**Construction:** Plants and animals inhabiting excavated areas (pipelines, structures, etc.) in wetlands and waterways would be displaced during construction. The proposed displacement would involve a small area (EIS Section 3.7.8.3.3). Plants that could not be salvaged would be replaced by revegetation. Animals are expected to re-inhabit disturbed areas after revegetation. No net impact on long-term plant and animal populations would be expected as a direct result of this project. **Operation:** <u>Game and Non-game Wildlife:</u> Populations and habitat would not be significantly adversely impacted. (EIS Section 3.8.8.3.3). **Aquatic Resources** Fish populations would generally benefit under the Proposed Action because of improved habitat (EIS Section 3.8.6.3.4). Overall game fish would increase by 19,496 pounds from baseline. <u>T&E Species:</u> June sucker spawning and rearing habitat would increase in the lower Provo River between 86% to 192% and habitat would increase Hobble Creek because of flow supplementation. <u>Sensitive Species:</u> Leatherside chub habitat in the Spanish Fork River would decrease because of flow reductions ranging from 32% to 66%.	**Construction:** Animal displacement would occur in a small area (EIS Section 3.7.8.4.3). Otherwise, same as Proposed Action (EIS Section 3.8.8.4.3). **Operation:** <u>Game and Non-game Wildlife:</u> Same as Proposed Action (EIS Section 3.8.8.3.4) **Aquatic Resources** Fish populations would generally benefit from the Bonneville Unit Water Alternative because of improved habitat (EIS Section 3.8.6.3.5). Overall game fish biomass would increase by 10,220 pounds from baseline. <u>T&E Species:</u> June sucker spawning and rearing habitat would increase in the lower Provo River between 64% to 134% and habitat would increase in Hobble Creek because of flow supplementation. <u>Sensitive Species:</u> Leatherside chub habitat in the Spanish Fork River would decrease because of flow reductions of 13% to 20%.	**Construction:** No construction. **Operation:** <u>Game and Non-game Wildlife:</u> Local species impacts may occur because of loss of wetland habitat, but loss of species is not anticipated (EIS Section 3.8.8.5). **Aquatic Resources** Overall game fish biomass would increase by 9,703 pounds from baseline. <u>T&E Species:</u> No Change. <u>Sensitive Species:</u> No change.

Table 13
(C.10) Actions to Minimize Adverse Effects

	Spanish Fork Canyon – Provo Reservoir Canal Alternative (Proposed Action)	Bonneville Unit Water Alternative	No Action Alternative
C.10.7 Effects on Human Use	Standard Operating Procedures (EIS Section 1.8.8) would limit access to active construction areas in wetlands and waterways because of safety concerns. All access roadways would remain open except for short closures required during construction across or near roadways. Agriculture: Approximately 43.1 acres of cropland would be temporarily removed from production during construction. 7.7 acres of orchards would be temporarily removed from production during construction. 7.1 acres of production would be permanently removed from production during operation (EIS Section 3.11.8.3.4). Socioeconomic: Socioeconomic impacts (EIS Section 3.12.8.3.3) are as follows: Construction activities would create about 800 to 1,190 jobs (annual equivalent). Construction activities would result in an increase of approximately $72 million in direct impacts. The additional indirect income that would be generated by construction activities is estimated to be about $79 million. Total direct and indirect impacts would equal approximately $151 million. Construction activities would result in $270 million in new equipment and materials purchases spread throughout the local, state, and national economies. Operations would not create any measurable income impacts. Some construction and operation impacts would occur on local businesses and landowners, but the magnitude of such impacts would be minimized by the SOPs (see EIS Section 1.8.8.12). However, some disruptions of public and business services would occur, and would be of short duration. The projected water rate for ULS M&I water in Salt Lake County and southern Utah County would be $301.73 per acre-foot. Strawberry Water Users Association power generation revenue from the Upper Generator would be about $502,342 per year, which would be a decrease of about $6,125 per year (-1.2 percent) from baseline conditions. Construction would result in a peak annual reduction in gross crop revenues of approximately $77,300, with a permanent annual reduction of about $34,600. Peak decreases in regional household income for the construction phase would be less than $100,000, with permanent decreases being less than $50,000. Operation of the Proposed Action would result in increased recreational fishing that would generate $1,288,083 per year in angler-day benefits.	Standard Operating Procedures (EIS Section 1.8.8) would limit access to active construction areas in wetlands and waterways because of safety concerns. All access roadways would remain open except for short closures required during construction across or near the roadways. Agriculture: Approximately 14.3 acres of cropland would be temporarily removed from production during construction. 16.7 acres of orchards would be temporarily removed from production during construction. 7.1 acres of production would be permanently removed from production during operation (EIS Section 3.11.8.4.3). Socioeconomic: Construction activities would create about 620 to 930 jobs (annual equivalent). Construction activities would result in an increase of approximately $37 million in direct impacts. The additional indirect income that would be generated by construction activities is estimated to be about $41 million. Total direct and indirect impacts would equal approximately $78 million. Construction activities would result in $147 million in new equipment and materials purchases spread throughout the local, state, and national economies. The projected water rate for ULS M&I water in southern Utah County would be $334.00 per acre-foot. Strawberry Water Users Association power generation revenue changes from the Upper Generator would be the same as for the Proposed Action. Changes in crop revenue and household income would be the same as for the Proposed Action. Operation of the Bonneville Unit Water Alternative would result in increased recreational fishing that would generate $638,208 per year in angler-day benefits.	Socioeconomic: The No Action Alternative would result in increased recreational fishing in the lower Provo River that would generate $696,960 per year in angler-day benefits.

Table 13
(C.10) Actions to Minimize Adverse Effects

	Spanish Fork Canyon – Provo Reservoir Canal Alternative (Proposed Action)	Bonneville Unit Water Alternative	No Action Alternative
C.10.7 Effects on Human Use	Visual Impacts: (EIS Section 3.14.8.3.8) include the following: Construction of the Sixth Water Transmission Line would cause long-term, significant visual impacts because the new 81-foot steel towers would permanently change visual quality and would be visible in the foreground view from Rays Valley Road for about 8.2 miles. Construction of the Upper Diamond Fork Power Facility would cause long-term, visual impacts because grading would modify an existing ridge landform and a permanent structure would be built. Measure designed to reduce the visual impact of the power facility building include a concrete foundation with earthtone river pebbles embedded in the surface; integrally-colored concrete logs would frame the structure with a rust colored, metal, pitched roof to simulate a rustic log cabin. The concrete foundation, concrete logs, river pebbles and metal roof colors would be selected to blend with surrounding soil and vegetation colors. The Sixth Water Transmission Line would cause long-term significant visual impacts because the 81-foot steel towers would be constructed in retention areas, causing permanent changes in visual scale, line, color and texture that are not compatible with the characteristic landscape. Construction of the Upper Diamond Fork Power Facility would cause long-term, significant visual impacts since it would be located in a retention area. The power facility structure would cause permanent changes in visual scale, landform, line, color and texture that are not compatible with the characteristic landscape. Recreation: The Proposed Action would result in an increase of 36,438 angler-days per year (EIS Section 3.15.8.3.3).	Visual Impacts: Same as Proposed Action. Recreation: Increase of 18,054 angler-days per year (EIS Section 3.15.8.4.2)	Visual Impacts: No construction. Recreation: Increase of 19,716 angler-days per year (EIS Section 3.15.8.5)
C.10.8 Other Actions	Not applicable.	Not applicable.	Not applicable.

Table 14
(C.11) Factual Determinations of Impacts (Short-Term and Long-Term)

	Spanish Fork Canyon – Provo Reservoir Canal Alternative (Proposed Action)	Bonneville Unit Water Alternative	No Action Alternative
C.11.1 Physical Substrate Determinations	**Construction:** Short-term: temporary disturbance of 0.3 acre of wetland substrate and function, which would be restored after construction is complete. Wetlands are expected to be fully restored after three growing seasons. Long-term: permanent loss of 1.0 acre of wetland substrate and functions.	**Construction:** Short-term: temporary disturbance of 0.2 acre of wetland substrate and functions that would be restored after construction is complete. Wetlands are expected to be fully restored after three growing seasons. Long-term: permanent loss of 1.0 acre of wetland substrate and functions.	**Construction:** No impacts.
C.11.2 Water Quality, Circulation and Fluctuation Determinations	**Water Quality:** Water quality impacts are presented in detail in Table 3. Total P and TDS concentrations would remain unchanged or reduce in-lake concentrations. Net TP and TDS loads would decrease. Total P concentrations in Hobble Creek would increase during months with low or no natural flow under baseline conditions. The benefits of in-stream flows would outweigh the increased total phosphorus concentrations in summer months. Total P could slightly increase in Spanish Fork River. **Circulation and Fluctuation:** Circulation and fluctuation changes in reservoirs, lakes, and streams would be long-term impacts Utah Lake: The change in discharges into Utah Lake from tributaries would be very small in comparison to the volume of the lake as to have no significant impact to the circulation and fluctuation patterns. Streams: Provo River: Flow from Jordanelle Reservoir to Murdock Diversion would change by less than 10% from baseline, which would have a nominal impact on aquatic ecosystems in that reach of the river.	**Water Quality:** Water quality impacts are presented in detail in Table 3. Total P concentrations would decrease from dilution. Total P load would increase in Utah Lake. TDS concentrations would generally decrease in Utah Lake. TDS load would increase in Utah Lake. Hobble Creek phosphorus would increase during months with low or no natural flow. The benefits of in-stream flows would outweigh the increased total phosphorus concentrations in summer months. **Circulation and Fluctuation:** Utah Lake: Same as the Proposed Action Streams: While the percentage flow changes for the streams would be slightly different from the Proposed Action, the magnitude and direction of the impacts would be essentially the same.	**Water Quality:** Total P concentrations would remain unchanged or increase slightly. Total P load would increase in Utah Lake. TDS concentrations would decrease in Utah Lake. TDS load would increase in Utah Lake. **Circulation and Fluctuation:** **Long-term:** No changes from simulated baseline conditions. Streams: No changes from simulated baseline conditions.

Table 14
(C.11) Factual Determinations of Impacts (Short-Term and Long-Term)

	Spanish Fork Canyon – Provo Reservoir Canal Alternative (Proposed Action)	Bonneville Unit Water Alternative	No Action Alternative
C.11.2 Water Quality, Circulation and Fluctuation Determinations	Provo River flow from the Murdock Diversion to Utah Lake would increase by 20% to 38% over baseline, would have a significant impact on water circulation and fluctuation in Hobble Creek, serving to increase the biotic productivity in the lower Provo River. Hobble Creek: Flow from the Mapleton Lateral to Utah Lake would increase by 53% over baseline, which would respond similarly to the Provo River below Murdock Diversion. Spanish Fork River: Flow from Diamond Fork Creek to Utah Lake would decrease by 32% to 66% from baseline would result in significantly reducing the biotic productivity of the river. Jordan River: Flow from Utah Lake to Jordan Narrows would change by less than 10%, which would have a nominal impact on the aquatic ecosystems of the river.	Streams: Same as the Proposed Action for Hobble Creek and Spanish Fork River only.	Utah Lake: Bonneville Unit flows to make the Jordanelle Reservoir exchange would enter Utah Lake and there would be minor changes in the circulation or fluctuation patterns in the lake. The changes would be small in magnitude compared to natural forces on the lake such as the frequent winds that result in water column mixing and turbid conditions.
C.11.3 Suspended Particulate and Turbidity Determinations	There would be no short-term construction or long-term operation impacts to suspended particulates and turbidity from discharges into the waterways with implementation of SOPs, because any increase or decrease in flows would be within the historic range.	Same as the Proposed Action	No construction.
C.11.4 Contaminant Determinations	**Construction:** Any likelihood of contamination through the introduction of undesirable discharge into the aquatic environment during construction would be eliminated or minimized through adherence to the SOPs (EIS Section 1.8.8).	Same as the Proposed Action	No construction.

Table 14
(C.11) Factual Determinations of Impacts (Short-Term and Long-Term)

	Spanish Fork Canyon – Provo Reservoir Canal Alternative (Proposed Action)	Bonneville Unit Water Alternative	No Action Alternative
C.11.4 Contaminant Determinations	**Operation:** During operation phase, there are no toxics that would be discharged into water bodies within the project area (see C.11.2). Natural selenium would continue to flow down Sixth Water Creek, Diamond Fork Creek, and Spanish Fork River at concentrations near or slightly above the detection limit.	Same as Proposed Action.	No construction.
C.11.5 Aquatic Ecosystem and Organism Determinations	**Long-term**: All impacts on aquatic ecosystems and organisms would be during the operational phase of the project. Reservoirs and Lakes: No significant change is expected to the aquatic organisms and ecosystems of Utah Lake. Provo River: Positive impacts would occur on game fish and macroinvertebrates in the Provo River below Murdock Diversion from increased habitat associated with increased flows of 20% to 38% over baseline. Game fish biomass in the Provo River would increase from baseline by 18,081 pounds. June sucker spawning habitat in the Provo River between the Tanner Race Diversion and Interstate 15 would increase by 122 % to 192% over baseline because of increased water volume and stream surface area. June sucker spawning habitat from Interstate 15 to Utah Lake would increase by 86% to 181% over baseline. Hobble Creek: Positive impacts would occur on game fish and macroinvertebrates in Hobble Creek from increased habitat associated with increased flows of 53% over baseline.	June sucker spawning habitat in the Provo River between the Tanner Race Diversion and Interstate 15 would increase by 64% to 134% and Interstate 15 to Utah Lake by 64% to 111% over baseline because of increased habitat associated with increased water volume and stream surface area. Provo River: Positive impacts would occur on game fish and macroinvertebrates in the Provo River below Murdock Diversion from increased habitat associated with increased flows of 8% to 18% over baseline. Game fish biomass in the Provo River would increase from baseline by 9,703pounds. Hobble Creek: Positive impacts would occur on game fish and macroinvertebrates in Hobble Creek from increased habitat associated with increased flows of 107% over baseline.	Game fish biomass would increase from baseline by 9,703 pounds.

Table 14
(C.11) Factual Determinations of Impacts (Short-Term and Long-Term)

	Spanish Fork Canyon – Provo Reservoir Canal Alternative (Proposed Action)	Bonneville Unit Water Alternative	No Action Alternative
C.11.5 Aquatic Ecosystem and Organism Determinations	Spanish Fork River: Adverse impacts would occur on leatherside chub, game fish and macroinvertebrates in the Spanish Fork River below Diamond Fork Creek from decreased habitat associated with decreases in annual average flows of 32% to 66% from baseline conditions.	Spanish Fork River: Adverse impacts would occur on leatherside chub, game fish and macroinvertebrates in the Spanish Fork River below Diamond Fork Creek from decreased habitat associated with decreases in annual average flows of 13% to 20% from baseline conditions.	
C.11.6 Proposed Disposal Site Determinations	There would be no disposal of excavated material into the aquatic environment. All material excavated from pipeline trenches in excess of backfill needs will be disposed of in approved upland sites. Rock riprap would placed for erosion protection into the Provo River and Hobble Creek where Bonneville Unit water discharges would be made.	Same as the Proposed Action for Hobble Creek only.	None.
C.11.7 Determination of Cumulative Effects on the Aquatic Ecosystem	**Operation:** Operation of the Proposed Action would result in the improvement of fish habitat in the lower Provo River and in Hobble Creek. In conjunction with the planned improvements under the June Sucker Recovery Implementation Program (JSRIP), there would likely be a positive cumulative impact on fish habitat. Fish habitat would likely be improved to a larger extent than would occur with just the actions of the RIP or the Proposed Action. The exact amount of improvement can not be quantified until the actual projects to occur under the RIP are specifically identified. Improvements would result from the RIP actions to modify the diversion dams on the Provo River and improve the habitat in Hobble Creek. Any resulting increase in habitat conditions would likely increase the fish biomass, which is estimated to occur under the operation of the Proposed Action.	Same as the Proposed Action.	None.

Table 14
(C.11) Factual Determinations of Impacts (Short-Term and Long-Term)

	Spanish Fork Canyon – Provo Reservoir Canal Alternative (Proposed Action)	Bonneville Unit Water Alternative	No Action Alternative
C.11.8 Determination of Secondary Effects on the Aquatic Ecosystem	**Construction:** ULS pipeline construction would have no known secondary effects on the aquatic ecosystem.	Same as the Proposed Action.	Irrigation diversion structures on the Spanish Fork River would be modified under the No Action Alternative to measure stream flows and provide fish passage around the diversions. Construction of these improvements would have temporary secondary effects on the aquatic ecosystem and would be performed under an individual 404 permit.
	Operation: Discharge of Bonneville Unit water into the lower Provo River and Hobble Creek under the Proposed Action would cause water levels in these streams to increase compared to baseline conditions. The secondary effects would include year-round in-stream flows in reaches of these streams that often do not flow during a portion of the summer months under existing conditions. Any water level fluctuations would be appropriately ramped to avoid rapid changes in water levels in these streams. Discharge of Bonneville Unit water into these streams would have secondary effects in the form of changes in water quality conditions, including increased dissolved oxygen concentrations, decreased summer water temperatures, and decreased TDS concentrations.	Same as the Proposed Action in Hobble Creek only. No Bonneville Unit water would be discharged to the Provo River under the Bonneville Unit Water Alternative.	None.

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State of Utah

Department of Environmental Quality

Dianne R. Nielson, Ph.D.
Executive Director

DIVISION OF WATER QUALITY
Walter L. Baker, P.E.
Acting Director

OLENE S. WALKER
Governor

GAYLE F. McKEACHNIE
Lieutenant Governor

September 16, 2004

Mr. Max Dodson
Environmental Protection Agency Region 8
999 18th Street Suite 500
Denver, CO 80202-2466

Dear Mr. Dodson:

Subject:
Water Quality Certification for the **Utah Lake Drainage Basin Water Delivery System** (ULS System)

Applicant:
Central Utah Water Conservancy District
355 West University Parkway
Orem, UT 84048

Location:
Portions of Utah, Wasatch, and Summit Counties. State of Utah

Purpose:
Convey approximately 85,627 ac-ft of Bonneville Unit water received from the Diamond Fork System to points of use in southern Utah County and to the Provo Reservoir Canal in northern Utah for eventual M&I use in Salt Lake County

Area Description:
See: *Supplement to the Bonneville Unit Definite Plan Report, Draft Definite Plan Report, March 2004, Chapter 5.*

We have reviewed the referenced application. It is our opinion that applicable water quality standards will not be violated if appropriate Best Management Practices (BMPs) are incorporated to minimize the erosion-

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T.D.D. (801) 536-4414 • *www.deq.utah.gov*

sediment load to any adjacent waters during project activities. We recommend that appropriate water quality parameters of adjacent waters be monitored for effectiveness.

The Division of Water Quality requests the following conditions be included in the permit, if appropriate, as follows:

1. Whenever an applicant causes the water turbidity in an adjacent surface water to increase 10 NTUs or more, the applicant shall notify the Division of Water Quality.

2. The applicant shall not use any fill material that may leach organic chemicals (e.g., discarded asphalt) or nutrients (e.g., phosphate rock) into the receiving water.

3. Applicant shall protect any potentially affected fish spawning areas.

Pursuant to Section 401(a)(1) of the Federal Water Pollution Control Act, as amended in 1987, it is hereby certified that any discharge resultant from the project will comply with applicable State water quality standards and, to the best of our knowledge, will comply with applicable provision of Sections 301, 302, 303, 306, and 307 of said Act.

Sincerely,

Walter L. Baker, P.E.
Acting Director

WLB: WOM:fb

FILE: 401 CERTIFICATION
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Utah Lake Drainage Basin
Water Delivery System
Bonneville Unit, Central Utah Project

Final
Environmental Impact Statement

Appendix D
Visual Resources
Figures and Maps

Appendix D
Visual Resources Figures and Maps

Photo No. 1 Berm across Sheep Creek Valley below Sub-station Site looking East

Photo No. 2 Sub-station site in Sheep Creek Valley above berm looking North

Figure D-1a
Rays Valley Powerline Visual Photos
July 7, 2003

Photo No. 3 Proposed Sub-station Site above berm looking North

Photo No. 4 Looking North up Sheep Creek Road above Sub-station site

Figure D-1b
Rays Valley Powerline Visual Photos
July 7, 2003

Photo No. 5 Looking South down Sheep Creek Road
approximately 1 mile above Sub-station site

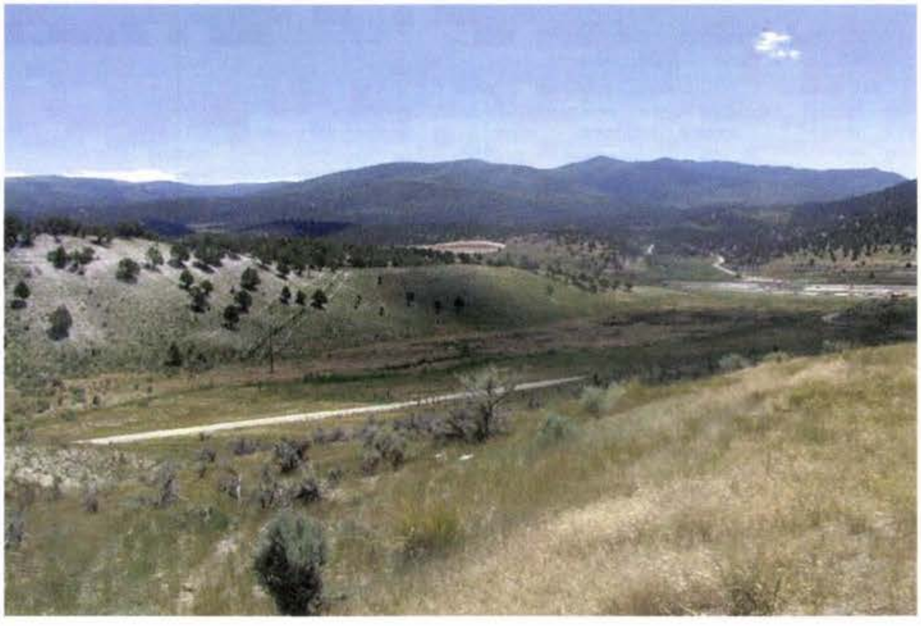


Photo No. 6 Looking South down Sheep Creek Valley from Rays Valley Road
approximate milepost 0.4 above Highway 6

Figure D-1c
Rays Valley Powerline Visual Photos
July 7, 2003

Photo No. 7 Looking South down Sheep Creek Valley from Rays Valley Road from approximate milepost 0.4 above Highway 6

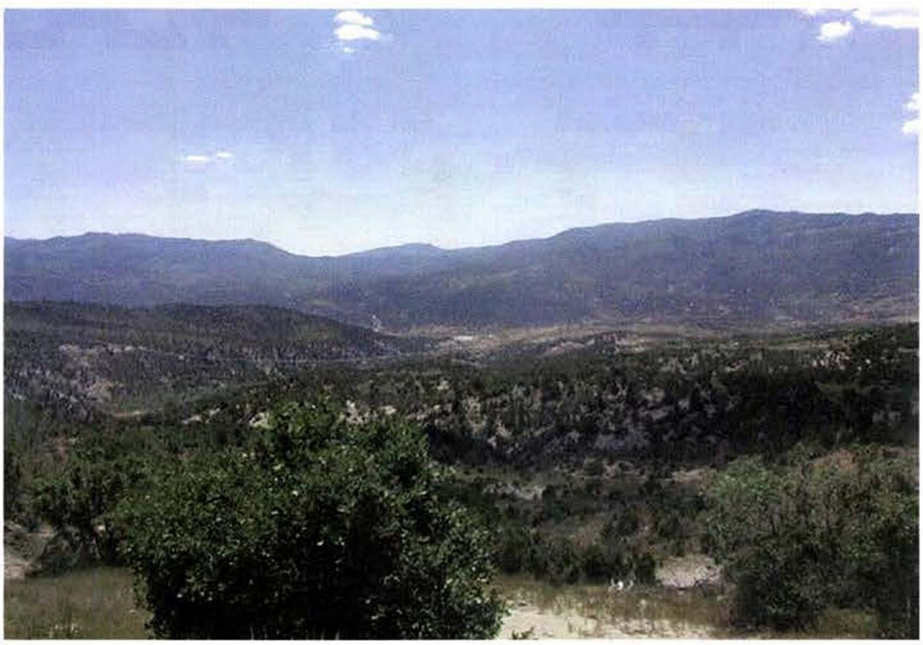


Photo No. 8 Looking South from Rays Valley Road from approximate milepost 0.7 above Highway 6

Figure D-1d
Rays Valley Powerline Visual Photos
July 7, 2003

Photo No. 9 Looking South from Rays Valley Road from approximate milepost 0.7 above Highway 6

Photo No. 10 Looking south from Rays Valley Road at approximate milepost 2.4

Figure D-1e
Rays Valley Powerline Visual Photos
July 7, 2003

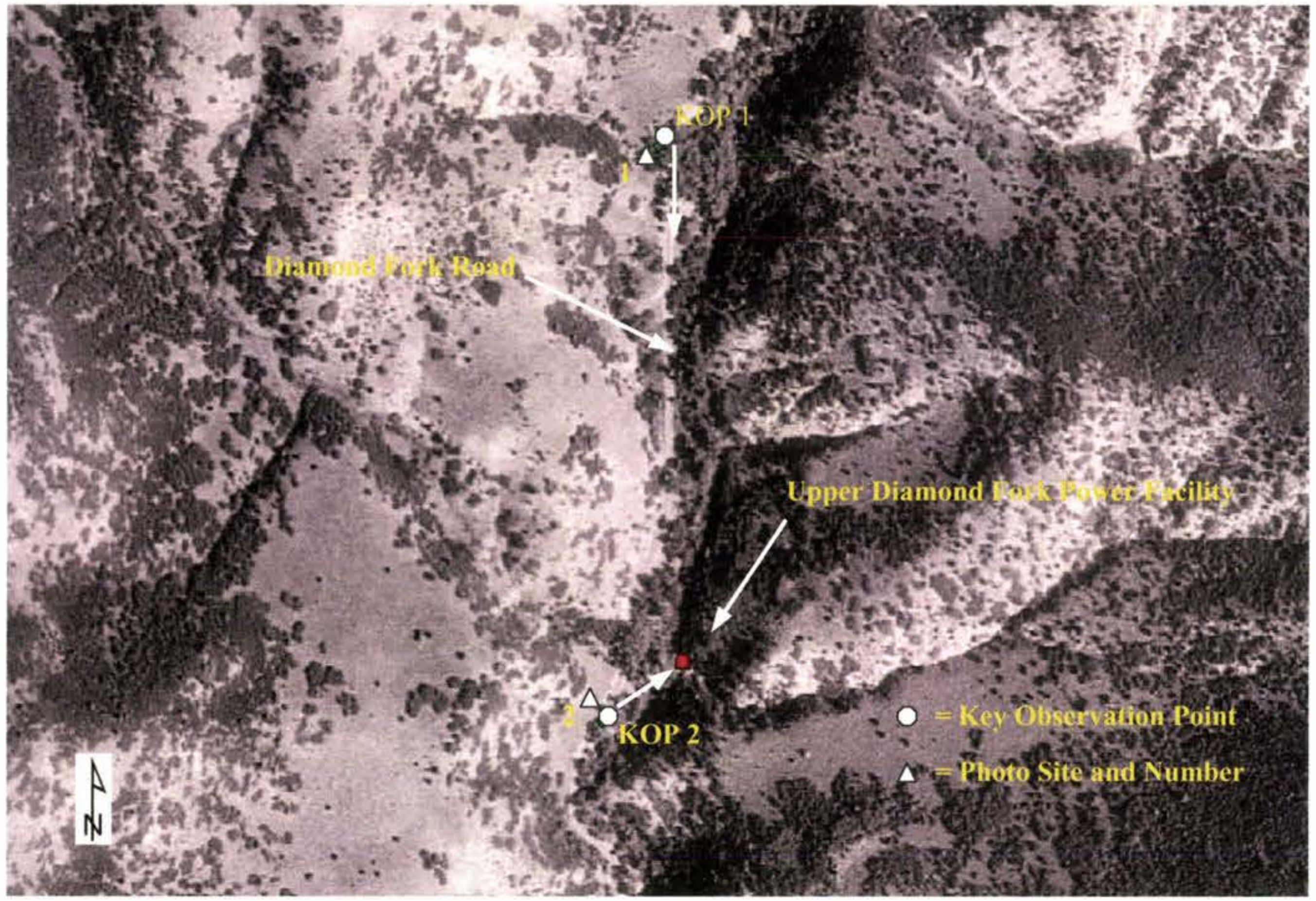
Photo No. 11 Looking northeast across Sheep Creek Canyon from Rays Valley Road (approximate milepost 3.3)

Photo No. 12 Power Line crossing Rays Valley Road at Milepost 6.5 looking west

Figure D-1f
Rays Valley Powerline Visual Photos
July 7, 2003

Photo No. 13 Looking south on Rays Valley Road at milepost 9

Figure D-1g
Rays Valley Powerline Visual Photos
July 7, 2003



Aerial Photograph of Upper Diamond Fork Power Facility with Key Observation Points (KOP)

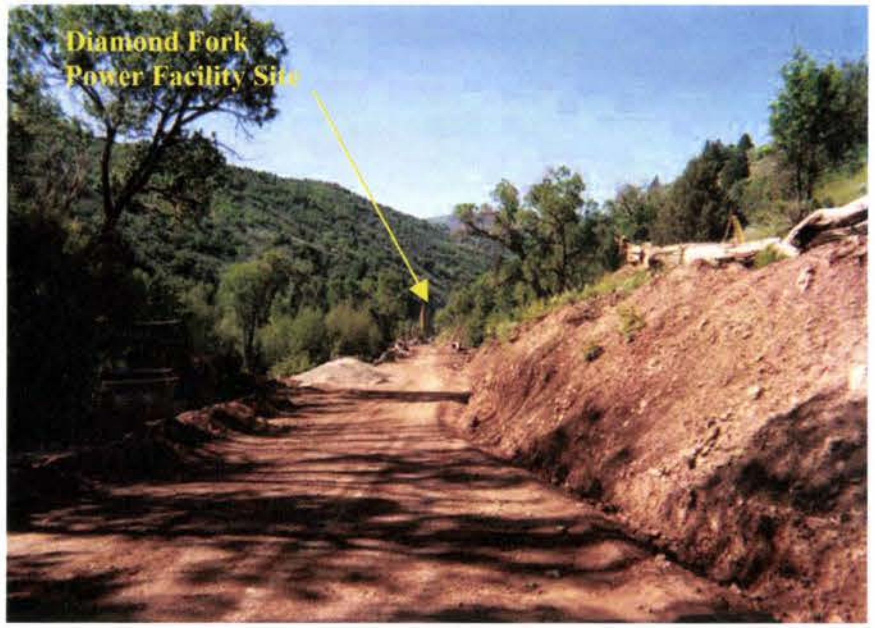


Photo No. 1. Looking down Diamond Fork Canyon Road from KOP 1 toward power facility site

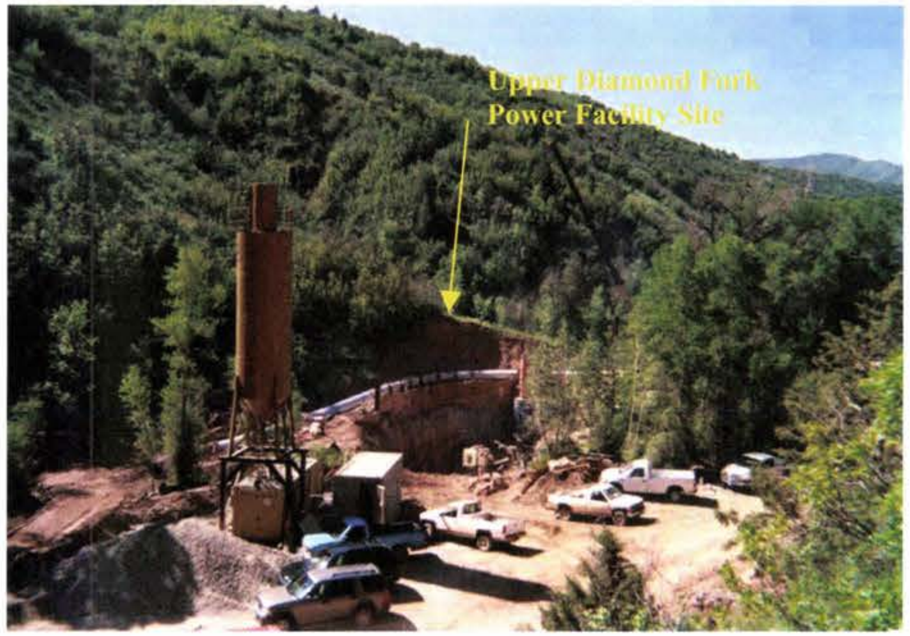
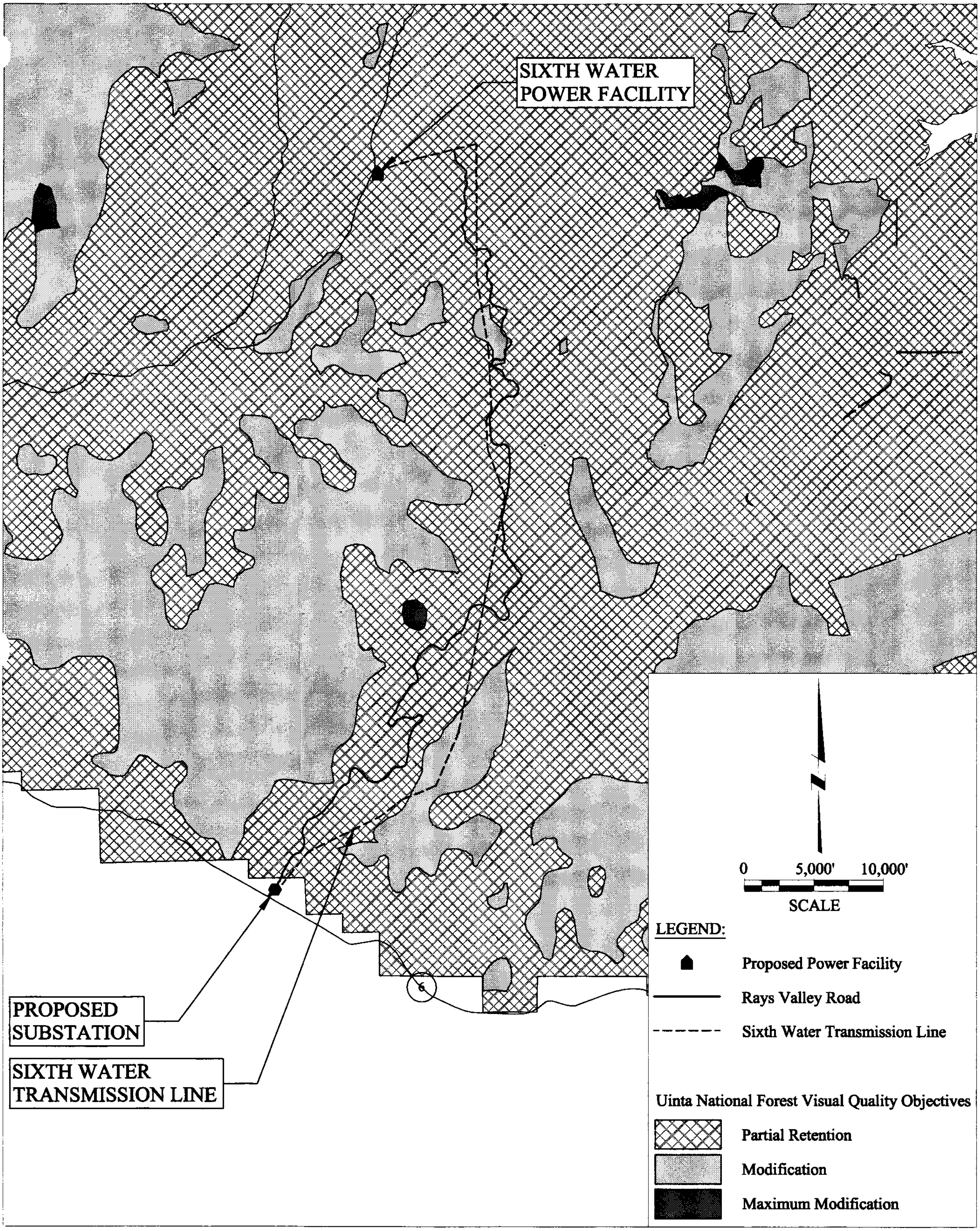


Photo No. 2. Looking at power facility site from KOP 2 across Diamond Fork Creek

Figure D-2
Upper Diamond Fork Power Facility
Views From Key Observation Points



Map D-1

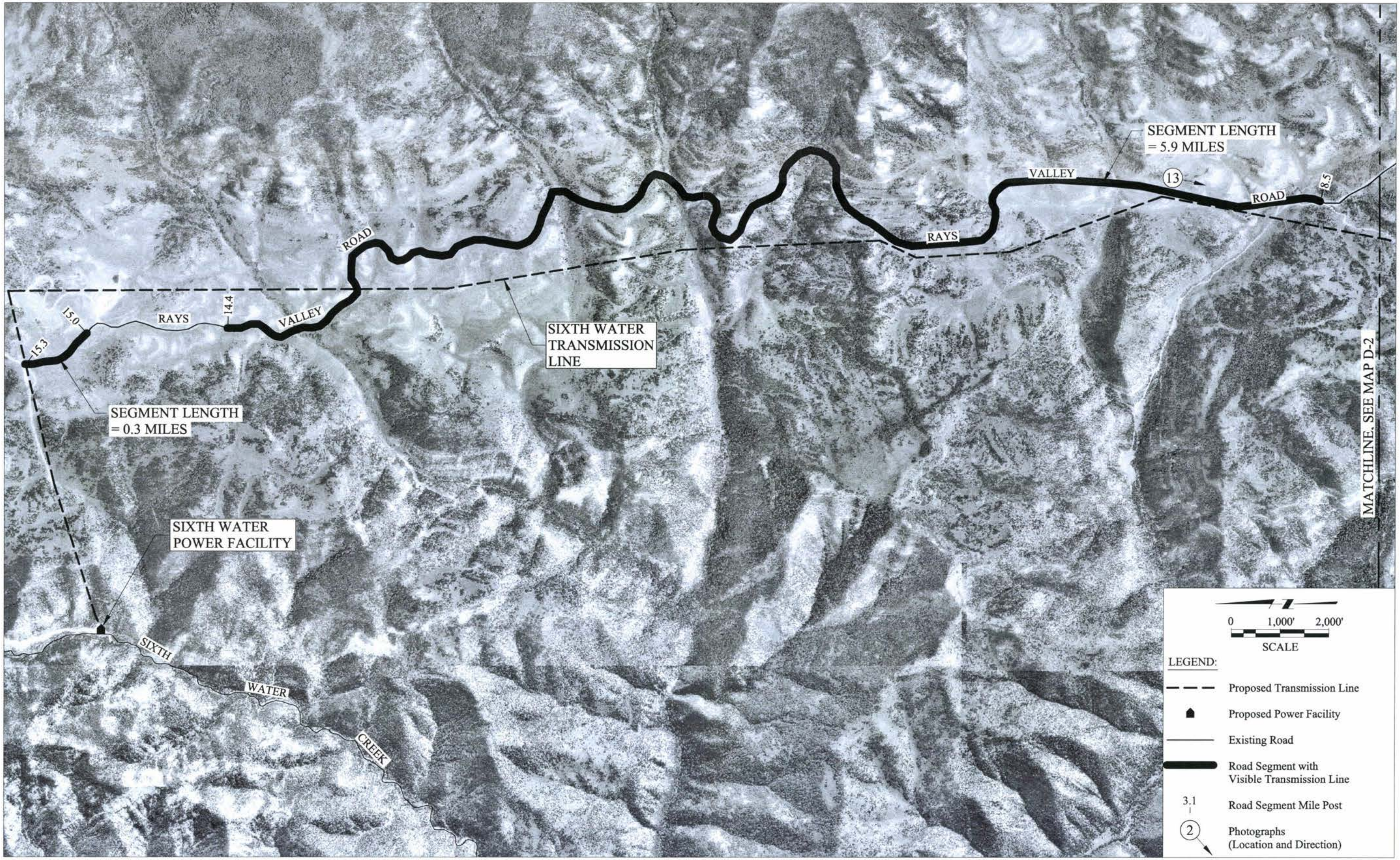
Sixth Water Power Facility, Transmission Line and Substation

Uinta National Forest Visual Quality Objectives

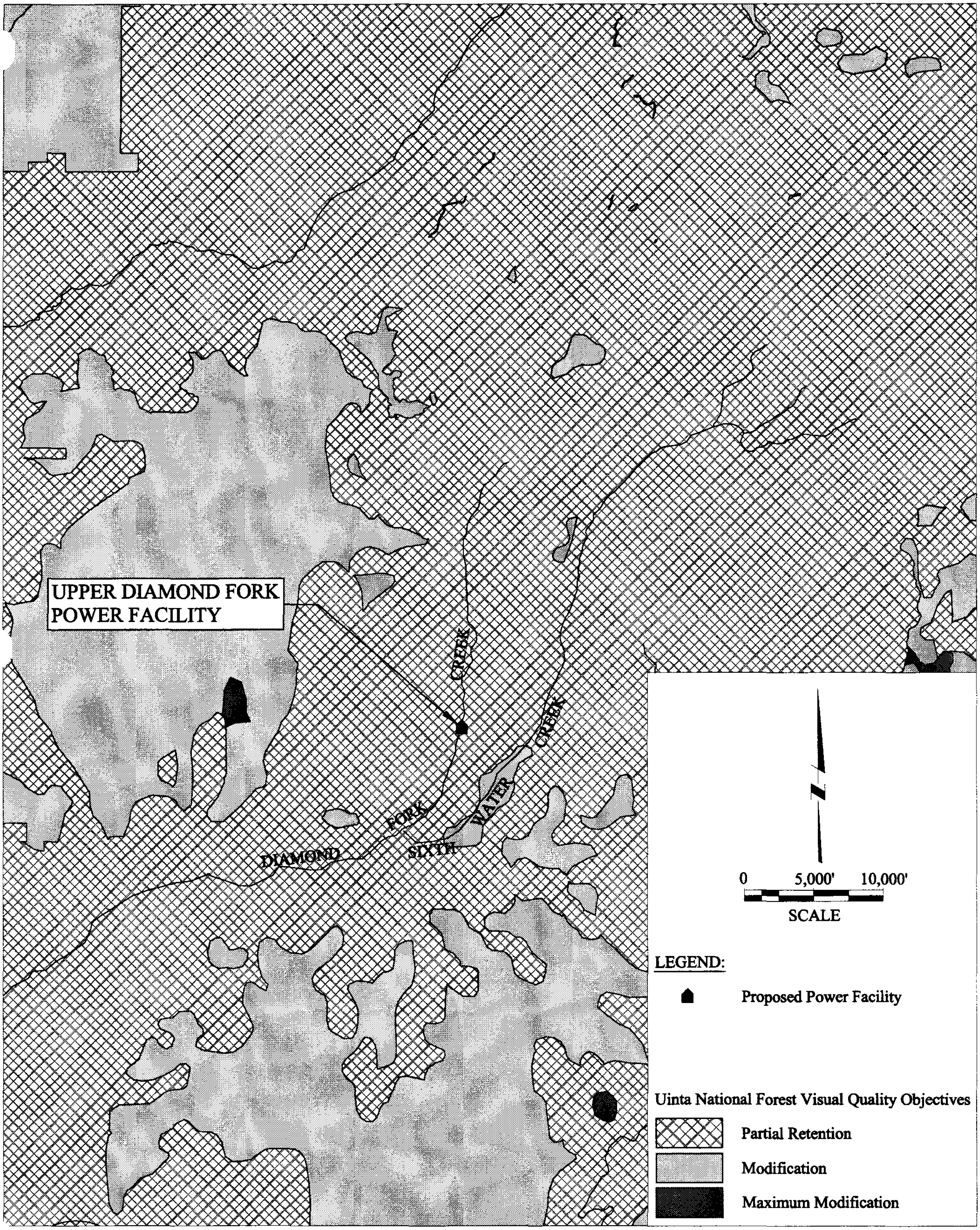
Map D-2

Sixth Water Transmission Line Corridor Through Rays Valley

Location of Photographs and Delineation of Segment Lengths



Map D-3
Sixth Water Transmission Line Corridor Through Rays Valley
Location of Photographs and Delineation of Segment Lengths



Map D-4
Upper Diamond Fork Power Facility
Uinta National Forest Visual Quality Objectives

Utah Lake Drainage Basin
Water Delivery System
Bonneville Unit, Central Utah Project

Final
Environmental Impact Statement

Appendix E
Impact Analysis Methodologies

Appendix E
Impact Analysis Methodologies

E.1 Introduction

This appendix describes the methodology used to analyze impacts on the following resources presented in Chapter 3:

- Threatened and Endangered Species
- Agriculture and Soils
- Socioeconomics
- Paleontological Resources

E.2 Threatened and Endangered Species

E.2.1 Wildlife Species

The amount of general habitat disturbance and removal that would occur from construction of the Proposed Action and other alternatives of the Utah Lake Drainage Basin Water Delivery System (ULS) project was obtained from the following sections of the ULS Draft Environmental Impact Statement (DEIS):

- Chapter 1, Section 1.10.6, Tables 1-41, 1-42 and 1-43
- Chapter 3, Section 3.7 (Wetlands)
- Chapter 3, Section 3.8 (Wildlife Resources and Habitat)

The effects of operations were obtained from the following sections:

- Chapter 3, Section 3.2 (Surface Water Hydrology)
- Chapter 3, Section 3.4 (Groundwater Hydrology)

Occurrence data for threatened and endangered (T&E) species were provided by the Utah Division of Wildlife Resources in Geographic Information System (GIS) format for the ULS area of potential effect. Maps showing these occurrences within or adjacent to the general habitat disturbance areas were developed for individual species in a GIS for each alternative. These maps were used to analyze the direct effects on T&E wildlife species habitat from disturbances due to construction and operation, including direct alteration or loss of habitat and reduction in habitat value from construction noise. Effects were classified by the duration of project-related disturbance as follows:

- Temporary effects: Effects are considered temporary if the habitat would recover from disturbance within 3 years following construction activities.

- Permanent effects: Effects are considered permanent if the habitat would be eliminated or not recover.

The analysis evaluated loss of habitat in terms of minimum home range requirements and critical habitats of species, where known; quantifying T&E wildlife species mortality and direct and indirect effects, to the extent possible; and determining the amount and location of habitat that would be affected by an increase in noise levels (see details of noise effect analysis in Appendix A of the Draft Wildlife Resources and Habitat Technical Report for the Utah Lake Drainage Basin Water Delivery System (CUWCD 2003f). Habitats adjacent to high ambient noise traffic corridors and urban areas were eliminated from consideration of noise disturbance.

E.2.2 Aquatic Species

The initial evaluation of the effects on aquatic species was based on agency consultation and literature review. Potentially affected species were then identified, followed by a literature search to describe habitat parameters for each species, and mapping of known distributions. This information was used to further refine the potential for finding each species in the area of potential effect.

Five federally endangered fish species and one federally endangered aquatic invertebrate (snail) species were identified as having potential to occur within the area of potential effect.

E.2.2.1 Fish

E.2.2.1.1 Instream Flow Incremental Methodology/Physical Habitat Simulation data and modeling. Fish habitat was assessed using existing Incremental Flow Instream Methodology (IFIM) data for the Provo River. The most widely used method to quantify the base flow component of fish habitat is the Physical Habitat Simulation (PHABSIM) component of the IFIM. PHABSIM models physical habitat for aquatic species based on their requirements for depth, velocity and substrate.

The hydraulic properties of the river (depth and velocity at stream cross-sections) were modeled using baseline flow levels and those specified under each alternative. These results were then integrated with study reach characteristics and fish habitat requirements to estimate the relationship between habitat availability and flow within study reaches for individual species at different life stages. Habitat was modeled as Weighted Usable Area (WUA), which is an index of total habitat per 1,000 linear feet of river. In this analysis, habitat availability for adult spawning June sucker was evaluated for the baseline condition and alternatives.

Because data on specific habitat requirements for some species are limited, a second more general modeling approach was used to evaluate flow effects on niche habitats: backwater-edge, slow flow-shallow, moderate flow-shallow, fast flow-shallow, moderate flow-mid-depth, fast flow-mid-depth, and moderate flow-deep. Habitat availability, calculated in WUA, was determined for each niche for each alternative.

Species were categorized as using one or more niche at different life stages. This approach provides a more coarse measure of habitat usage than the habitat suitability by species model. A given habitat niche may be the only one used by a species at a certain life stage, but the niche could include area used by other species. Of the habitat niches evaluated by BIO-WEST, the moderate flow-mid-depth niche is the only one used by adult spawning June suckers (BIO-WEST 2003a).

For the lower 5 miles of the Provo River, June sucker habitat was evaluated based on detailed cross-section data collected at two locations (Site 1 and Site 2c, shown on Map E-1 in the Draft Threatened and Endangered Species and Sensitive Species Technical Report). The cross-section at Site 1, downstream of the Fort Field Diversion, represents the prime June sucker spawning habitat in the Provo River. Site 2c was located between the Fort Field and Tanner Race Diversions. The Tanner Race Diversion, just downstream of the State Street Bridge in Provo, is an absolute physical barrier to June sucker movement up the Provo River.

No specific June sucker spawning habitat was identified in the cross-section taken at Site 2c, thus the potential for changes in spawning habitat could not be estimated in this reach. However, because June sucker habitat corresponds to the moderate-mid-depth habitat niche, changes in this category were used to represent a potential change in June sucker spawning habitat in the reach from Fort Field Diversion to Tanner Race Diversion.

E.2.2.1.2 Verification and Calibration. As part of the IFIM study, BIO-WEST performed a sensitivity analysis to compare habitat suitability by species and life stage to the habitat niche approach. This was done by modeling several species using both methods and comparing the relationships between the two model results. Results indicated that relationships were similar for all species evaluated, while the total amount of habitat availability calculated under the two approaches differed. This was expected because the habitat niche approach is a more general measure than the species-specific habitat suitability method.

Hobble Creek Geomorphic Survey. A qualitative determination of potential effects on channel processes and the consequent effect on June sucker from increased flow in Hobble Creek was made using assessment methodologies adapted from the Rosgen Stream Classification System. The focus of this work was to assess overall existing channel stability; identify point sources of lateral bank erosion and channel incision; identify sediment deposition zones; and estimate potential effects on channel stability from sustained increased flow. The relationships between movement of substrate material and some measure of stream power or average bed shear stress were based on knowledge of the relationships between discharge and channel geometry and hydraulics. Estimated were used for altered conditions of substrate movement that would be caused by increased flow.

The first step was to conduct a brief Level 1 (pre-field) characterization of historic and existing channel and riparian condition of the affected reach. This characterization was made from review of readily available sources that might include topographic maps, aerial photography, flow data, channel and aquatic habitat surveys and land management information. This characterization resulted in a delineation of valley type, landform and channel type, and provided a framework for conducting a field survey.

The second step was to conduct a field survey through the reach to verify the Level 1 morphological characterization of channel types and channel processes, characterize bank and channel bed stability, and identify active and potential erosion sources and sediment deposition within the Hobble Creek channel. The survey included reconnaissance-level collection of data on channel dimension, plan form, profile, substrate, composition of bank materials, value of habitat, and effects on water quality.

The survey included preparation of a unit file for both the stream classification and erosion surveys; analysis of data to estimate potential effects on channel form, including sediment erosion and deposition, from increased flows in Hobble Creek; and preparation of a working table describing existing channel stability conditions, probable effects from changing flows, and potential to contribute to June sucker recovery.

Construction Surveys. Construction surveys included overlaying streamside construction locations on fish species transmission data and surveying areas of intersection for construction and species transmission to determine the presence and description of potential habitat such as spawning and juvenile rearing.

E.2.2.2 Aquatic Invertebrates

The desert (or Utah) valvata (*Valvata utahensis*) is the only federally listed aquatic invertebrate that could potentially occur in the area of potential effect, based on agency consultation and literature review. However, no field surveys were performed to evaluate potentially suitable habitat since this snail is presumed not to be present in Utah.

E.2.3 Plant Species

The following methods were used to determine and analyze effects on plant T&E species.

- **Consultation and Literature Search.** A literature search was performed to describe the habitat parameters for each listed T&E species to further refine the potential for each species to be found in the proposed effect area of influence. These areas were mapped and a search protocol was developed for each species and each area of potential effect.

- **Potential for Habitat Analysis.** All areas in the area of potential effect that were not eliminated from further studies during the literature search were surveyed for potential habitat of any listed T&E species. Areas identified as potential habitat were located on a GPS for a return survey for presence and absence during the flowering period. Since most plants have a short time when ground surveys can easily identify them, a preliminary field survey for potential habitat was conducted to reduce the need for detailed surveys over the entire effect area of influence later in the season during a short flowering period.

- **Potential (or occupied) Habitat Survey.** Qualified biologists surveyed all areas identified from the Potential for Habitat Analysis for presence of T&E species. Areas surveyed in previous years were re-surveyed to be consistent. In the case of the terrestrial orchid, Ute ladies'-tresses, some species may be present in an area, but not visible every year. Presence and absence was noted, and presence quantified and located with GPS and mapped.

- **Associated Vegetation Analysis.** In the case of Ute ladies'-tresses, a quick associated vegetation composition analysis was conducted in association with pollination studies at two select sub-populations along the lower Diamond Fork Creek (Sipes and Tepedino 1996). This information was coordinated with ongoing pollination studies to assess the quality of occupied habitat in support of Ute ladies'-tresses pollinators.

Potential and occupied habitat were identified, located by GPS and mapped, and species presence was quantified. This was followed by an analysis that included the following estimates:

- The number of individuals of a population potentially directly affected by construction activities and operational changes

- Total area of potential habitat

- The area of occupied habitat potentially directly affected by construction activities and operational changes

- The potential effects on associated vegetation that could support pollinators of listed species in occupied habitat

HEC-RAS modeling was used to predict water surface elevations from predicted flow scenarios and to correlate them with mean colony elevations at select occupied Ute ladies'-tresses habitats. Baseline and proposed flows (in cubic feet per second) were used as input for the modeling program, and water surface elevations for these flows were developed at each of selected colony cross-sections.

Within the context of the assumptions, the analysis was based on the difference between the elevation of plants and the elevation of the river surface. The mean elevation of the habitat was estimated from the hydrologic cross-sections rather than surveying all plants in any drainage for elevation. The elevation of habitat at the cross-section was used in the model even if it was not the actual mean colony elevation. The absolute elevation of the occupied habitat is not important compared to the relationship of the habitat to the river channel. The relative relationship between habitat and water surface elevations is maintained by selecting the mean elevation for the entire habitat from the cross-sections.

E.3 Agriculture and Soils

E.3.1 Introduction

The agriculture analysis is based on data developed for the Spanish Fork-Nephi Irrigation System (SFN) Draft Environmental Impact Statement (DEIS) (CUWCD 1998a). The geographic area analyzed by that effort encompassed the irrigated agricultural land in southern Utah County and dryland agricultural land in Juab County that would be affected by construction of facilities associated with the ULS alternatives.

Agricultural demand for irrigation water in southern Utah County is not met by existing water supplies. As a result, crop yield is often reduced by late-season water shortages. Supplemental irrigation water has been delivered to southern Utah County for several years, and current crop yields reflect those deliveries. The SFN baseline data do not include consideration for supplemental water delivery, and provide the basis for estimating agricultural production to measure construction impacts.

Construction of facilities associated with the ULS alternatives could result in impacts on agriculture – mainly temporary losses in production associated with installation of project facilities and permanent loss of orchard crop acreage in the permanent easement. The impact of these types of losses on the farmer would be addressed by the easement acquisition procedures (see Chapter 1, Section 1.4.3.1 and Section 1.4.3.2) that would provide payment for right-of-way acquisition and crop loss. Impacts on agriculture from construction would be to the regional economy from losses in crop production.

E.3.2 Assumptions

- The baseline crop yields from the SFN DEIS (CUWCD 1998a) provide a reasonable estimate of crop production under existing conditions in southern Utah County without temporary supplemental irrigation water. The SFN baseline crop yield data were based on historic water availability as determined by modeling hydrologic conditions over a 44-year period. Additional modeling performed for the ULS may identify changes in historic water supply conditions, but they would be minor. Based on a review of current crop production data for the area it was determined that crop yields had not varied drastically from those reported in CUWCD 1998a.

- The SFN DEIS cropping patterns have not changed. Even though the amount of cropland has been reduced, a review of current cropping patterns did not reveal any major change in patterns from those used in CUWCD 1998a.

- Rotational agricultural crops would be replanted in the temporary and permanent construction easements. Easement deed restrictions would not prevent the replanting of rotational crops within the easement areas.

- Orchard crops would be replanted within the temporary construction easement. Orchard crops would be the likely land use after completion of construction and compensation for crop loss and easement acquisition would fund the planting. Since the rights-of-way would be through orchard land it would likely be economically feasible to replant the portion of the orchard lost to the temporary construction easement.

- Orchard crops would not be replanted in the permanent easement, but affected areas may be replanted to rotational crops. Easement deed restrictions would prohibit the establishment of permanent orchard crops within the permanent easement. Growers would want to return the land to crop production and project features would not affect the planting of rotational agricultural crops within the permanent easement after construction.

E.3.3 Impact Analysis Methodology

E.3.3.1 Determination of ULS Baseline Conditions

The SFN analysis was largely performed during 1995 and 1996, and encompassed a larger area in southern Utah County, including land in the Elberta area and Juab County (see SFN DEIS Section 3.9.6, Table 3.9-1). The SFN analysis identified 10 general land areas based on crop type and irrigation method (see SFN DEIS Section 3.9.5.1). The SFN impact area of influence encompassed the land eligible to receive Central Utah Project Bonneville Unit water (about 79,950 acres). The affected acreage was based on an analysis of areas most likely to purchase Bonneville Unit water and was developed to analyze and calculate impacts on agriculture.

The ULS impact area of influence would be that land affected by construction of the proposed ULS facilities, which would be within the SFN area. Crop production in affected areas would be consistent with baseline SFN conditions.

Impacts from construction would occur on existing irrigated cropland in southern Utah County. Therefore, SFN general land areas 3a, 3a', 4, 5, 6, part of 7 and 8 were not used in the analysis of construction impacts. General land area 5 in Juab County was used to estimate the impacts on dryland agriculture from construction of the Santaquin-Mona Reservoir Pipeline.

Based on the location of the proposed pipeline segments associated with the ULS alternatives, the following SFN land use areas (see Map 3-9 in Chapter 3, ULS DEIS) were used in determining the baseline conditions for the ULS project:

General Land Area 1: 22,240 acres in southern Utah County largely irrigated with unimproved flood irrigation systems. The cropping pattern includes alfalfa (55 percent), barley (25 percent), corn grain (10 percent) and corn silage (10 percent).

General Land Area 2: 15,910 acres in southern Utah County largely irrigated with unimproved flood irrigation systems. The cropping pattern includes alfalfa (67 percent), barley (21 percent), corn grain (3 percent), corn silage (7 percent) and oat hay (2 percent).

General Land Area 3: 8,280 acres in southern Utah County primarily irrigated with sprinkler and mini-spray irrigation systems, including some flood irrigation. The cropping pattern includes tart cherries (46 percent) and apples (54 percent).

General Land Area 5: 10,680 acres in eastern Juab County planted to winter wheat and summer fallow (90 percent) and dryland alfalfa (10 percent).

General Land Area 7: 9,520 acres with 6,570 acres in southern Utah County irrigated with sprinkler irrigation systems. The cropping pattern includes alfalfa (79 percent), barley (7 percent), corn grain (2 percent) and corn silage (12 percent).

E.3.3.2 Agricultural Production

The cropping pattern and agricultural production associated with the five SFN general land areas were used to develop the cropping pattern to estimate construction impacts. The comprehensive crop budget analysis prepared for SFN was used to estimate agricultural production under baseline and impacts to agricultural production from construction. The SFN crop budget, crop yield, and agricultural economic data were gathered from a combination of sources:

- Extensive on-farm surveys and interviews with farmers and irrigation company representatives in southern Utah and eastern Juab counties
- Interviews with Payson Fruit Growers Association members
- Utah State University Extension Service staff
- Utah Agricultural Statistics reports
- Technical Guide Crop Yields and Budgets
- Soil Survey of Utah County, Central Part, NRCS 1972
- Soil Survey of Fairfield-Nephi Area, Utah, NRCS, 1984
- Bonneville Unit Definite Plan Report, Reclamation 1988a
- Local knowledge and professional judgment

E.3.3.3 Determination of ULS Construction Impacts

Aerial photography, ULS system facilities design schematics and layouts, and ground reconnaissance was used to identify pipeline segments where construction would result in impacts on crop production. The impacted acreage within the temporary and permanent easements was determined by scaling the dimensions from design drawings, and the impacted acreage was tabulated by SFN general land area to determine the type of crops that would be impacted.

Each pipeline segment was analyzed to determine the location of impacted land in relation to the SFN general land areas. The cropping pattern was estimated using the crop mix in the SFN general land areas. Where a pipeline segment crossed two SFN general land areas, a weighted yield value was calculated based on the average yield and acreage occurring in each SFN general land area. These data were segregated by pipeline segment, easement area and crop type.

Pipeline mileposts were used to provide an approximate location of the impacted crops. Estimates of construction-related impacts on crop production were developed using the impacted acreage and baseline crop yield from the SFN data.

E.4 Socioeconomics

E.4.1 Economics

E.4.1.1 Assumptions

Net migration rates are zero, i.e. out-migration equals in-migration. The existing birth rate would remain constant over the planning period. Population and employment relationships remain generally stable through time, with some moderate reallocations among the principal economic sectors. The migration and birth rates are estimated from U.S. Census data and the Utah state agency planning reports. The changes to population and employment will remain stable for several years, given the size of the regional population and forecast economic trends. No major changes have been forecast.

E.4.1.2 Impact Analysis Methodology

E.4.1.2.1 Description. For regional and "secondary" economic impact assessment, the Regional Economic Development (RED) approach was adopted for use. The RED approach relies on local and fiscal impact assessment methods, economic base analysis, economic sector input-output analysis, and economic sector forecasting.

The economics section baseline data and analyses were based on local, state, and federal agency data sources. Forecasts and projections used within the "baseline" conditions represent the best available technical assumptions and analyses for each subject area. Historical data have been verified using multiple sources, and population and employment forecasts and projections are calibrated to existing empirical data. Water demand forecasts were based on existing empirical data, with future demand recalibrated—rates of use per capita—to account for the effects of programmatic measures and price-induced conservation (elasticity of demand).

The incremental construction impacts were estimated using conventional engineering standards for projects of this nature. Secondary income and employment impacts from the construction activity were estimated using direct effect multipliers derived from Utah state prepared input-output analyses, principal investigator preparation of input-output analyses using IMPLAN models and data sets, and the regional account models (RIMS II) used by the Bureau of Economic Analysis.

The new resource costs were based on known costs for similar projects or engineering estimates.

The workforce and economics associated with each feature of an alternative would be small in comparison to the potential effect of the alternative. The construction schedule for each alternative (see Chapter 1, Section 1.10.1) shows construction of multiple features associated with an alternative occurring at the same time, or overlapping each other. Therefore, the impact analysis was performed on the alternative as a whole instead of analyzing the impact of each feature to develop an analysis of the maximum potential impact of the alternative.

E.4.2 Agriculture Economics

This section describes the methodology used to analyze impacts on agricultural economics from the ULS alternatives. The analysis is based on data developed for the SFN DEIS (CUWCD 1998a) and the analysis of impacts on agricultural production presented in Chapter 3, Section 3.11 Agriculture and Soils.

Construction of features associated with the ULS alternatives could impact agricultural economics – primarily temporary and permanent losses in revenue from agricultural production associated with installation of project features. The SOPs developed to address local impacts would provide payments to land owners and farmers for easement acquisition and lost crop production revenue. Impacts on agricultural production and economics are expressed as changes to the agricultural sector.

E.4.2.1 Assumptions

- The SFN DEIS analysis of agricultural economics under baseline and project conditions provides a close approximation of conditions under the ULS baseline and project alternatives. The baseline and impact conditions for both analyses are similar, with much of the same data content and type of data. Where needed, new or updated data were obtained.

- The assumptions described for the analysis of impacts to agricultural production in Section E.3 are valid for the analysis of impacts to agricultural economics. These are conventional analyses used for impact analyses, consistent with NED and RED methods. Data are current and the best obtainable.

- Ten-year normalized crop commodity prices represent a reasonable estimate of current and future crop value. Crop price variability can be substantial from one year to the next. Consequently, a five or ten-year term should be used for averaging, taking into account any unique conditions affecting local or national markets.

- The water cost presently paid for supplemental water deliveries through the Spanish Fork River to irrigation companies in southern Utah County provide a reasonable estimate of ULS temporary water cost. The supplemental water costs represent near-term water costs based on existing water delivery systems. To the extent existing infrastructure is used for near-term water conveyance, the costs should be similar.

E.4.2.2 Impact Analysis Methodology

The analysis of impacts to agricultural economics provides an estimate of the costs and benefits between baseline and the proposed supply at the regional level, and is based on preparation of typical crop production budgets for agricultural enterprises in the impact area of influence. These crop budgets are based on expected average conditions and do not reflect actual conditions for any one irrigation company or farming operation. The crop budget analysis for the ULS was largely based on the SFN data and analysis.

E.4.2.3 Determination of ULS Baseline Conditions

Crop commodity value was estimated using historic data (1993-2002) from the USDA Utah Agricultural Statistics Service (Gentmiller 2003), except for corn silage and grazing (animal unit months), where SFN data were used. The analysis used a 10-year normalized average that is calculated by determining the 10-year average, discarding the two values that deviate farthest from the average, and recalculating the average using the remaining eight values. Corn silage is typically produced and used on-farm for livestock production. The SFN analysis developed grazing values for corn silage ($20 per ton) and grazing ($10 per animal unit month) based on their on-farm contribution for livestock production, which provides an appropriate value for ULS analysis. Table E-1 summarizes annual average crop commodity data.

Table E-1
Summary of Annual Average Crop Commodities

	Commodity Value for Utah – Statewide Average						
	Alfalfa Hay	**Barley**	**Wheat**	**Corn Grain**	**Oat Hay**	**Apples**	**Tart Cherries**
Year	**$/ton**	**$/bu**	**$/bu**	**$/bu**	**$/ton**	**$/lb**	**$/lb**
2002	97.50	2.35	4.70	3.30	57.50	0.183	0.240
2001	97.00	2.14	3.30	2.85	57.00	0.224	0.218
2000	79.50	2.00	3.25	2.61	52.00	0.118	0.220
1999	73.00	1.89	2.60	2.36	37.50	0.219	0.186
1998	77.00	1.86	2.95	2.45	51.50	0.145	0.160
1997	85.00	2.29	3.29	3.05	64.00	0.165	0.160
1996	72.50	2.93	4.45	3.80	46.50	0.136	0.127
1995	66.00	3.08	4.75	3.88	49.50	0.188	0.048
1994	80.00	2.32	3.66	2.92	64.00	0.121	0.103
1993	65.50	2.22	3.40	3.12	50.50	0.121	0.128
High	97.50	3.08	4.75	3.88	64.00	0.224	0.240
Low	65.50	1.86	2.60	2.36	37.50	0.118	0.048
10-year average	79.30	2.31	3.64	3.03	53.00	0.162	0.159
Normalized average	74.81	2.13	3.36	2.83	53.56	0.147	0.163
SFN DEIS	90.00	2.75	4.25	3.20	75.00	0.150	0.150

The District provided the cost estimates for ULS temporary water, which are summarized in Table E-2. The cost for repayment is from the Reclamation (Reclamation 1988a) Definite Plan Report and reflects the amount necessary to repay the cost of project facilities. Operation, maintenance and replacement are costs associated with the operation of water delivery facilities. Strawberry WUA and Irrigation Company costs vary based on where water is delivered. Based on these cost components, the annual ULS supplemental water rate would vary from about $17.60 to $22.10 per acre-foot. The analysis assumes a ULS water cost of $22.10, which is applied as a fixed cost of $19.00 per acre (0.87 acre-feet per acre x $22.10 per acre-foot, rounded to $19.00) for the affected acreage receiving ULS temporary water supply.

Table E-2
Summary of ULS Supplemental Water Cost

Cost Element	Cost Range ($ Per Acre-foot)	
	Low	High
Repayment	5.60	5.60
Operation, Maintenance and Replacement	6.50	6.50
Strawberry WUA	2.00	3.00
Irrigation Company	3.50	7.00
Total	**17.60**	**22.10**

Source: Tullis 2003

Cost of crop production budgets were largely based on the SFN analysis. The SFN data were compared with more recent crop production budgets for Utah County from Utah State University, Extension Economics (Miner 2003). These comparisons revealed close agreement with the earlier SFN work, with differences in crop production costs of 4 percent or lower. The cost of various crop production operations was reviewed with similar results.

Based on theses comparisons, it was concluded that the SFN crop production budgets provided a reasonable estimate of production costs for the ULS analysis. These costs were revised to reflect crop yield differences and the ULS temporary water cost. Table E-3 summarizes the crop production budgets for the baseline condition. Cost and returns from crop production are presented on a per-acre basis.

Table E-3
Summary of Baseline Crop Production Cost and Revenue
(Revenue and Costs Per Acre)

	Alfalfa	Barley	Corn		Oat Hay		Cherries	Apples
			Grain	**Silage**	**Hay**	**Aftermath**		
Revenue								
Units per Acre	ton	Bushel	bushel	ton	ton	Aum	Pound	pound
Yield Per Acre	3.8	95	100	20	2.5	4	10,000	20,000
Value Per Unit ($)	74.81	2.13	2.83	20.00	53.56	10.00	0.16	0.15
Total Revenue	284	202	283	400	134	40	1,600	3,000
Costs								
Land Preparation		34	59	59	34		15	15
Planting		46	90	90	45		350	700
Harvest	190	40	40	100	100		260	575
Irrigation	46	45	54	54	43		240	355
Crop Establishment	10						250	350
Management	10	10	10	10	10		10	10
Interest	15	15	15	15	10		50	92
Miscellaneous	10	10	10	10	10		20	20
Total Costs	281	200	278	338	252		1,195	2,117
Net Revenue	**3**	**2**	**5**	**62**	**-78**		**405**	**883**

E.4.2.4 Determination of ULS Construction Impacts

Impacts on crop production from construction are measured as changes in gross revenue. Gross revenue is determined by multiplying the total production by the normalized commodity value. For example, the loss in gross revenue for alfalfa along the Spanish Fork-Santaquin pipeline would be total production (7.8 acres x 3.5 tons per acre = 27.3 tons) multiplied by the normalized alfalfa commodity value ($74.81 per ton). Table E-4 summarizes the temporary loss in gross revenue from construction on rotational cropland. The total loss in gross revenue from crop production on rotational croplands during construction is approximately $6,916.

Table E-4
Summary of Temporary Crop Loss by Pipeline – Rotational Cropland

Pipeline	Crop	Unit per Acre	Loss in Gross Value from Production			
			Acreage	Yield Per Acre*	Production	Value ($)
Spanish Fork-Santaquin	Alfalfa	ton	7.8	3.5	27.3	2,042
	Barley	bushel	2.0	95.0	190.0	405
	Corn, Grain	bushel	0.3	100.0	30.0	85
	Corn, Silage	ton	0.9	20.0	18.0	360
	Oat Hay	ton	0.2	2.5	0.5	27
		Subtotal	11.2			2,918
Mapleton-Springville Lateral	Alfalfa	ton	2.1	3.6	7.6	568
	Barley	bushel	0.6	94.0	56.4	120
	Corn, Grain	bushel	0.1	100.0	10.0	28
	Corn, Silage	ton	0.2	20.0	4.0	80
	Oat Hay	ton	0.1	2.5	0.3	16
		Subtotal	3.1			813
Santaquin-Mona Reservoir	Alfalfa Hay	Ton	1.3	2.9	3.8	284
	Winter Wheat	bushel	12.5	25.9	324	1,179
		Subtotal	13.8			1,463
		Total	**34.3**			**5,194**

*See Section E.3 for description of methodology for development of crop yield estimates for southern Utah County.

Table E-5 summarizes the temporary impact on orchard crop production from construction.

Table E-5
Summary of Temporary Crop Loss – Orchard Crops*
Spanish Fork-Santaquin Pipeline

	Crop Acreage		Loss in Production (lb/ac)		Value ($)		
Year	**Apples**	**Tart Cherries**	**Apples**	**Tart Cherries**	**Apples**	**Tart Cherries**	**Total**
1	7.7	9.0	20,000	10,000	23,100	14,400	37,500
2	7.7	9.0	20,000	10,000	23,100	14,400	37,500
3	7.7	9.0	20,000	10,000	23,100	14,400	37,500
4	7.7	9.0	18,890	10,000	21,818	14,400	36,218
5	7.7	9.0	16,665	10,000	19,248	14,400	33,648
6	7.7	9.0	12,220	7,730	14,114	11,131	25,245
7	7.7	9.0	8,890	6,365	10,268	9,166	19,434
8	7.7	9.0	6,005	4,545	6,936	6,545	13,481
9	7.7	9.0	4,445	3,180	5,134	4,579	9,713
10	7.7	9.0	2,220	1,235	2,564	1,778	4,343
11	7.7	9.0	0	1,235	0	1,778	1,778
12	7.7	9.0	0	0	0	0	0
Total			129,335	74,290	149,382	106,978	256,360

*See Section E.3 for description of methodology used to determine orchard crop acreage and yield.

Table E-6 summarizes the permanent impacts on orchard crops from construction. This orchard land is within the permanent easement, which precludes future use for orchard crop production.

Table E-6
Summary of Permanent Crop Loss – Orchard Crops
Spanish Fork-Santaquin Pipeline

Crop Acreage		Loss in Production (lb/ac)		Gross Value ($)		
Apples	Tart Cherries	Apples	Tart Cherries	Apples	Tart Cherries	Total
7.1	8.3	20,000	10,000	21,300	13,280	34,580

Table E-7 summarizes construction impacts on gross revenue from crop production.

Table E-7 Summary of Construction Impacts – Loss in Total Gross Revenue			
Pipeline	**Temporary Impact ($)**		**Permanent Impact ($)**
	Rotational Cropland	**Orchard Crops**	**Orchard Crops**
Spanish Fork-Santaquin	2,918	256,360	34,580
Mapleton-Springville Lateral	813	0	0
Santaquin-Mona Reservoir	1,463		
Total	**5,194**	**256,360**	**34,580**

E.5 Paleontological Resources

E.5.1 Assumptions

None.

E.5.2 Impact Analysis Methodology

This analysis involved identifying the following:

- Areas and geological units that contain or have high potential to contain significant fossils
- Known and newly discovered fossil localities within the impact area of influence
- The characteristics of each fossil locality that contributes to significance

The analysis then determined the effect of the alternatives on each fossiliferous formation, and each known or newly discovered fossil locality.

Paleontological resources are considered to be impacted when project construction would cause destruction or damage in areas where there is a high potential for critical or significant fossils, or where known or newly discovered fossil localities rated as critical, significant or important would be destroyed or damaged.

Paleontological research is guided, in part, by a classification system used by the U.S. Bureau of Land Management (BLM) for ranking areas according to their potential to contain vertebrate fossils, or noteworthy occurrences of invertebrate or plant fossils (BLM 1987). A system for classifying the sensitivity of fossil localities was created in 1987 by the Committee on Guidelines for Paleontological Collecting. A modified version of the committee's classification system is used to rank the sensitivity of known and newly discovered fossil localities in the impact area of influence.

The BLM classification system consists of the following:

- Condition 1 – Areas that are known to contain vertebrate fossils or noteworthy occurrences of invertebrate or plant fossils.

- Condition 2 – Areas with exposures of geological units or settings that have high potential to contain vertebrate fossils or noteworthy occurrences of invertebrate or plant fossils. The presence of geologic units from which such fossils have been recovered elsewhere may require further assessment of these units where they are exposed in the area of consideration.

- Condition 3 – Areas that are very unlikely to produce vertebrate fossils or noteworthy occurrences of invertebrate or plant fossils based on their surficial geology, igneous or metamorphic rocks, extremely young alluvium, colluvium, or Aeolian deposits or the presence of deep soils. However, if possible, it should be noted at what depth bedrock may be expected in order to determine if fossiliferous deposits may be uncovered during surface disturbing activities.

The Paleontological Collecting Committee's system consists of the following sensitivity classifications:

- Class 1. Critical – Any reference locality for holotype (the single specimen that was designated as the name-bearer of a species or subspecies) or critical paleontological material, or any type section of geological strata needed for future study

- Class 2. Significant – Any locality that produces rare, well-preserved, or critical fossils usable for taxonomic (classification of organisms), evolutionary, stratigraphic (geologic layers), paleoenvironmental (study of ancient environments), or paleoecological (study of ancient ecosytems) studies.

- Class 3. Important – Any locality that produces common, abundant fossils useful for stratigraphic or population variability studies

- Class 4. Insignificant – Any locality with poorly preserved, common, or stratigraphically unimportant fossil material

- Class 5. Unimportant – Any locality intensively surveyed and determined to be of minimal scientific interest

Utah Lake Drainage Basin
Water Delivery System
Bonneville Unit, Central Utah Project

Final
Environmental Impact Statement

Appendix F
U.S. Fish and Wildlife Service Data

Appendix F

Utah Lake System
Environmental Impact Statement
Biological Assessment

F.1 Introduction

This document is the Biological Assessment on the Spanish Fork Canyon – Provo Reservoir Canal (Proposed Action) for the Utah Lake System (ULS) Environmental Impact Statement (EIS). The ULS EIS is being prepared to address potential effects of constructing and operating the Proposed Action and other ULS alternatives. The ULS is the last of the six original systems of the Bonneville Unit of the Central Utah Project (CUP) that would develop central Utah's water resources for municipal and industrial (M&I) supply, irrigation, fish and wildlife, and recreation. The ULS evolved from and will replace the Irrigation and Drainage System, which was first identified in the Bonneville Unit Final Environmental Impact Statement in 1973 (Reclamation 1973). The other five Bonneville Unit systems are complete and operating, or under construction. The ULS is now proposed to deliver the remaining uncommitted Bonneville Unit water in Strawberry Reservoir as an M&I water supply to Wasatch Front communities. The Central Utah Water Conservancy District (District), U.S. Department of the Interior (DOI) and Utah Reclamation Mitigation and Conservation Commission (Mitigation Commission) are joint-lead agencies (JLA) preparing the EIS.

Section 7(C) of the Endangered Species Act (ESA) requires a federal agency to prepare a Biological Assessment to disclose effects of a Proposed Action on threatened or endangered species listed by the U.S. Fish and Wildlife Service (FWS). Threatened or endangered status is assigned to individual species by the FWS. The Biological Assessment is used by the FWS to determine if there is an effect on a species and to document that the action does not contribute toward the loss of viability of a listed species, contribute to a trend toward a need for federal listing, or jeopardize or adversely modify critical habitat of federally listed species.

In compliance with the ESA, the FWS provided the District with a list of threatened or endangered species known or suspected to occur in the EIS project area (letter dated December 11, 2003 – Attachment 1). Table F-1 presents the threatened or endangered species presented in the FWS list sent to the District and provides a brief discussion of the potential for species occurrence.

Some of the species listed in Table F-1 would not be affected under the Proposed Action because they do not occur in habitat or geographic areas that could be affected by project activities. Previous consultations on species listed in Table F-1 that do not occur in habitat or geographic areas potentially affected by the ULS are addressed in this document.

The species with potential to be affected by project activities are addressed in more detail in this Biological Assessment. These species are: June sucker (*Chasmistes liorus*), Bonytail *(Gila elegans)*, Colorado Pikeminnow *(Ptychocheilus lucius)*, Humpback Chub *(Gila cypha)*, Razorback Sucker *(Xyrauchen texanus)*, Bald eagle (*Haliaeetus leucocephalus*), Canada lynx (*Lynx canadensis*), Ute ladies'-tresses (*Spiranthes diluvialis*), and Western Yellow-billed Cuckoo *(Coccyzus americanus occidentalis)*.

Table F-1
Threatened and Endangered Species Identified During Fish and Wildlife Service Consultation that may Occur in the EIS Study Area

Species	Potential for Occurrence
ENDANGERED SPECIES	
June sucker (*Chasmistes liorus*)	Inhabits Utah Lake. Spawning populations occur in the lower Provo River; the final June Sucker Recovery Plan has designated other tributaries to Utah Lake as potential locations to develop spawning populations.
Bonytail *(Gila elegans)*	Does not occur in the ULS construction and operation effect area of influence; potential effects of depletions from the Colorado River basin occur under the Bonneville Unit of the CUP
Colorado pikeminnow *(Ptychocheilus lucius)*	Does not occur in the ULS construction and operation effect area of influence; potential effects of depletions from the Colorado River basin occur under the Bonneville Unit of the CUP
Humpback chub *(Gila cypha)*	Does not occur in the ULS construction and operation effect area of influence; potential effects of depletions from the Colorado River basin occur under the Bonneville Unit of the CUP
Razorback sucker *(Xyrauchen texanus)*	Does not occur in the ULS construction and operation effect area of influence; potential effects of depletions from the Colorado River basin occur under the Bonneville Unit of the CUP
Utah valvata *(Valvata utahensis)*	Utah Valvata is presumed extirpated from the range that would be affected by Proposed Action.
Clay phacelia *(Phacelia argillacea)*	Does not occur in the effect area of influence; known occurrences are limited to two sites, one at the Tucker rest area along SR-6 in Spanish Fork Canyon and five miles west-northwest of the Tucker population.
THREATENED SPECIES	
Bald eagle (*Haliaeetus leucocephalus*)	Commonly observed from August through March around Utah Lake, lower Diamond Fork Creek, and scattered wetlands.
Canada lynx *(Lynx canadensis)*	Potential habitat occurs in the effect area of influence; Canada lynx hair was found in the Manti-La Sal National Forest south of the affected project area during 2002
Ute ladies'-tresses (*Spiranthes diluvialis*)	Species present within the effect area of influence along the Spanish Fork River.
Deseret milkvetch *(Astragalus desereticus)*	Does not occur in the effect area of influence; deseret milkvetch is endemic to central Utah and known from only one occurrence in the Thistle Creek Valley near the town of Birdseye in Utah County.
CANDIDATE SPECIES	
Western Yellow-billed cuckoo *(Coccyzus americanus occidentalis)*	Records in the affected project area are clustered near Deer Creek Reservoir along the Provo River and Provo City, with other observations at the Brigham Young University Agricultural Station north of Salem City and in Santaquin City

F.2 Proposed Action Features

Table F-2 presents the Proposed Action features, which would deliver 30,000 acre-feet of Bonneville Unit ULS M&I secondary water to southern Utah County and 30,000 acre-feet of M&I water to Salt Lake County. It would involve construction of five new pipelines: 1) from the mouth of Diamond Fork Canyon to the mouth of Spanish Fork Canyon; 2) from the Spanish Fork Canyon Pipeline to Santaquin in southern Utah County; 3) from Santaquin to Mona Reservoir; 4) from the Spanish Fork Canyon Pipeline to Hobble Creek along the Mapleton-Springville Lateral canal alignment; and 5) from the Spanish Fork Canyon Pipeline to the Provo Reservoir Canal.

Table F-2
Features of Utah Lake Drainage Basin Water Delivery System
Spanish Fork Canyon – Provo Reservoir Canal Alternative (Proposed Action)

Feature	Description
Water Supply and Delivery	• 30,000 acre-feet of Bonneville Unit ULS water to southern Utah County starting in 2016 for secondary M&I use • 30,000 acre-feet of Bonneville Unit ULS water to Salt Lake County starting in 2016 for M&I use • 1,590 acre-feet of Bonneville Unit CUP M&I water previously contracted to cities in southern Utah County • DOI acquisition of about 57,000 acre-feet of District secondary water rights in Utah Lake • 10,200 acre-feet conveyance of SVP water to southern Utah County through ULS pipelines • 12,037 acre-feet to promote June sucker spawning and rearing lower Hobble Creek • 16,000 acre-feet for in-stream flows in lower Provo River • 12,165 acre-feet to enhance June sucker spawning and rearing in lower Provo River
Spanish Fork Canyon Pipeline	7.0-mile steel pipeline 84-inches diameter
Sixth Water Power Facility and Transmission Line	45-MW generator with upgrade of 15.5 miles of existing overhead transmission lines
Upper Diamond Fork Power Facility	5-MW generator with existing underground cable through Tanner Ridge Tunnel to Sixth Water Transmission Line
Spanish Fork – Santaquin Pipeline	17.5-mile steel pipeline ranging from 60- to 36-inches diameter
Santaquin – Mona Reservoir Pipeline	7.7-mile steel pipeline 24-inches diameter (pipeline would be constructed; separate NEPA compliance would be required on operation and water supply for potential future conservation pool in Mona Reservoir for June sucker refugia)
Mapleton – Springville Lateral Pipeline	5.7-mile pipeline ranging from 48- to 30-inches diameter from terminus of Spanish Fork Canyon Pipeline to Hobble Creek
Spanish Fork – Provo Reservoir Canal Pipeline	19.7-mile steel pipeline ranging from 60- to 48-inches diameter

The following summarizes the Proposed Action operation.

- 30,000 acre-feet of ULS M&I water would be conveyed to Salt Lake County through a combination of existing facilities (Jordan Aqueduct and Provo Reservoir Canal conveyance facilities) to water treatment plants for treatment and culinary supply. This water would be delivered through the Spanish Fork – Provo Reservoir Canal Pipeline to the enclosed Provo Reservoir Canal during the summer months and conveyed to Salt Lake County. During the winter months, the ULS M&I water would be delivered through the Spanish Fork – Provo Reservoir Canal Pipeline to the Jordan Aqueduct and conveyed to Salt Lake County.

- An annual average of 16,273 acre-feet of Bonneville Unit water from Strawberry Reservoir would be released for in-stream flows in Sixth Water Creek and Diamond Fork Creek and flow down the Spanish Fork River to Utah Lake mainly during the winter months. This water would be subsequently exchanged from Utah Lake to Jordanelle Reservoir. The release of this water would meet the 60-cfs winter and 80-cfs summer minimum flows required in Diamond Fork Creek at Monks Hollow.

- As the ULS facilities are completed, but not later than 2030, 30,000 acre-feet of ULS M&I water would be delivered through new pipelines in southern Utah County under a contract with South Utah Valley Municipal Water Association (SUVMWA).

- Up to 10,200 acre-feet of Strawberry Valley Project (SVP) water owned by the cities comprising SUVMWA would be conveyed to cities in southern Utah County.

- Of the 1,590 acre-feet already contracted to SUVMWA, 590 acre-feet of Bonneville Unit would continue to be used by SUVMWA member cities as secondary M&I water.

- Hydroelectric power would be generated from the M&I water conveyance and contracted to the Western Area Power Administration.

- An annual average of 16,000 acre-feet of water would be delivered to the lower Provo River to assist meeting the in-stream flows towards meeting the 75-cfs target flow and subsequent exchange from Utah Lake to Jordanelle Reservoir. This water would be conveyed through the Spanish Fork – Provo Reservoir Canal Pipeline and discharged to the Provo River at the pipeline crossing. A minimum 75-cfs flow normally occurs in the river between the Olmsted and Murdock diversions during the summer months when releases are made from Deer Creek Reservoir.

- Under the Deer Creek Reservoir–Jordanelle Reservoir operating agreement, an annual 12,165 acre-feet of water would be provided as flows for June sucker spawning and rearing in the lower Provo River to meet JSRIP goals annually.

- Approximately 3,300 acre-feet of lower Provo River water rights already purchased by the Mitigation Commission would flow undiverted to Utah Lake, thereby increasing the summertime flow in the lower Provo River.

- Discharge from the Mapleton-Springville Lateral pipeline into Hobble Creek would consist of 4,000 acre-feet annually to promote June sucker spawning and rearing in lower Hobble Creek, and an annual average of 8,037 acre-feet available throughout the year to provide in-stream maintenance flows. The annual average of 8,037 acre-feet would range from 0 to 32,136 acre-feet depending on the hydrologic year. This water would be part of the exchange from Utah Lake to Jordanelle Reservoir.

F.3 General Procedures

F.3.1 Analysis Methods

The determination of effects of the Proposed Action on threatened and endangered species involved defining the affected environment, evaluating the potential for occurrence, analyzing the effects of the Proposed Action on listed species, identifying cumulative effects and recommending conservation measures to avoid or minimize potential effects. Specific analysis methods, evaluation criteria and survey methods are described in the following subsections.

F.3.2 Assumptions

Several assumptions were made as part of the effects analysis. One assumption was that taking (as defined by the ESA) of individuals of a threatened or endangered species or alteration of their population, distribution, behavior, or habitat as a result of the action, inclusive of construction, operation and maintenance, would be considered an effect. Effects can be beneficial or adverse. For example, creation or enhancement of habitat would be considered a beneficial effect of the action. Loss of threatened or endangered species habitat would be considered an adverse effect of the action.

Another assumption was that lack of documented sightings of a particular species would not necessarily indicate that a species is absent from the study area. Even under optimal field survey conditions, a species may be missed, especially if identification is reliant upon certain characteristics, such as flowering parts on a plant that does not reproduce every year.

F.3.3 Baseline Conditions

Baseline conditions include: 1) past and present impacts of all Federal, state and private actions and other human activities in the effect area of influence; 2) the anticipated effects of all proposed Federal projects in the effect area of influence that have already undergone formal or early Section 7 consultation; and 3) the impact of state or private actions contemporaneous with the consultation process.

Baseline conditions in the Provo River were assumed to be full operation of the M&I System. Baseline conditions in the Spanish Fork River were assumed to be the same as the Interim Operation of the Diamond Fork System Proposed Action, which released 86,100 acre-feet of water into the mouth of Diamond Fork Creek and conveyed to Utah Lake throughout the year.

F.3.4 Evaluation Criteria

If construction, operation and maintenance activities of the Proposed Action would result in the taking of a threatened or endangered species, loss or degradation of habitat, or increased disturbance levels that would cause displacement, increased stress, and/or reduced reproductive success, a "may affect" determination was made. If construction, operation and maintenance activities of the Proposed Action would result in beneficial effects on a threatened or endangered species, a "may affect" determination was made.

F.3.5 Effect Area of Influence

The effect area of influence for the effects analysis on threatened and endangered species is dependent on the species of concern. Map F-1 shows the overall effect area of influence associated with the features of the Spanish Fork Canyon – Provo Reservoir Canal Alternative (Proposed Action).

F.4 Colorado River Fishes

The FWS Biological Opinion for the Duchesne River Basin, Utah (FWS 1998) was that "historic project operations and the development and use of new project water contributes to the endangerment of listed fishes and is likely to jeopardize the continued existence of the Colorado squawfish [pikeminnow], razorback sucker, humpback chub, and bonytail and is also likely to adversely modify their critical habitats in the Duchesne, Green, and Colorado Rivers." "Historic projects" with Federal involvement or control prior to the Bonneville Unit of the CUP included the Strawberry Valley Project, the Provo River Project, the Moon Lake Project, the Midview Exchange, and the Ute Indian Irrigation Project. The Bonneville Unit of the CUP, with a total depletion of 143,200 acre-feet, was included as a historic project with a total of 101,900 acre-feet identified for transbasin diversion to the Bonneville Basin. Future projects identified in the Biological Opinion included the Uintah Unit and the Upalco Unit of the Uintah Basin Replacement Project.

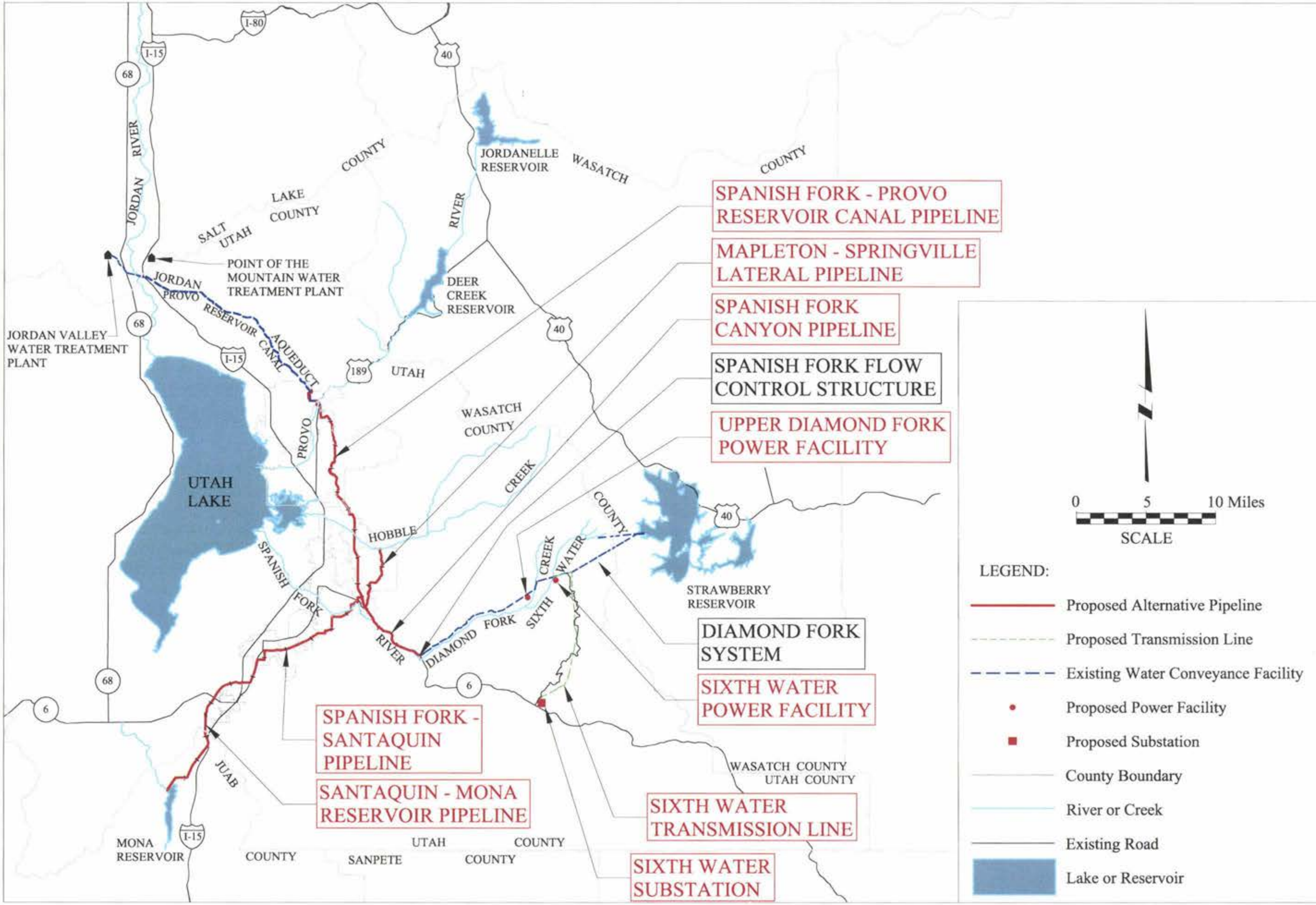
The preferred alternative for ULS includes the depletion from the Colorado River basin of the 101,900 acre-feet transbasin diversion for the Bonneville Unit. Therefore, a review of the status of the Section 7 Consultation for the Duchesne River Basin is warranted in this Biological Assessment.

The 1998 Duchesne River Biological Opinion, issued to DOI, Mitigation Commission, Reclamation, U.S. Bureau of Indian Affairs, and the District, was based on the best scientific and commercial data available at the time including: 1) the level of knowledge of the Duchesne River, 2) the status of the Colorado squawfish [pikeminnow], humpback chub, bonytail, and razorback sucker, 3) the environmental baseline for the Duchesne River basin area, 4) the cumulative effects of non-Federal projects in the Duchesne River basin and 5) the effects of the proposed action (historic project operations and the development and use of new project water). As stated in the Biological Opinion, the FWS determined that completion and /or implementation of all elements of the reasonable and prudent alternative (RPA) would offset impacts of historic and future projects and would avoid the likelihood of jeopardy and the destruction or adverse modification of critical habitats. In addition, successful implementation of all elements of the RPA would allow the Recovery Implementation Program (RIP) for Endangered Fish Species in the Upper Colorado River Basin to serve as the RPA for Federal actions which result in depletion impacts to the Duchesne River. Further, the biological opinion states that the "Service believes that the integrated operation of new and existing facilities, constrained by annual hydrologic conditions and available water storage, can be coordinated to meet the needs of the listed fishes in most years."

RPAs identified in the Biological Opinion consisted of items from the RIP's Recovery Action Plan (RAP). The following identifies the RPAs applicable to the Bonneville Unit of the CUP and the status of action to meet the RPAs.

I.A.1 Conduct hydrology/water availability study. This item has been completed. CH2M Hill (1997) conducted a study with the main purpose of determining the effect of existing projects (both existing and future operation) on Duchesne River flows and to identify possible water sources that could be used to augment river flows to meet preliminary flow recommendations that were identified in the 1998 Biological Opinion. The study pointed to several potential water sources including; Bonneville Unit Fishery Flows, Daniels Creek Diversions, Land Purchase and Fallow, Conservation Projects-Delivery Systems, On-Farm Conservation Projects and Purchase of Existing Water in Storage.

I.D.1. Determine feasibility and benefits of coordinated reservoir operation. Reclamation initiated a coordinated reservoir operations study that was scheduled for completion in June 2003. This study should be brought to completion as soon as practical to provide information necessary to effectively coordinate implementation and protection of in-stream flows. This activity would be completed under the amended Duchesne Biological Opinion.



Map F-1

Features of the Spanish Fork Canyon - Provo Reservoir Canal Alternative (Proposed Action)

I.D.2. Develop agreements, if feasible, to coordinate reservoir operation and protect flows to the Green River. Revised flow recommendations for the Duchesne River required in the RPA to the 1998 Biological Opinion were developed by the RIP and finalized in 2003 (Modde and Keleher 2003). An informal Duchesne River Working Group (DRWG) that includes representatives from the FWS, The State of Utah, Department of Natural Resources (Divisions of Water Rights, Water Resources and Wildlife Resources), the District, the DOI, and the Mitigation Commission, was formed in 2003 to address issues involved with implementation of the flow recommendations, including water availability, water management, and protection of in-stream flows provided for endangered fishes. It is anticipated that this working group will be formalized in the amended Biological Opinion for the Duchesne River. The FWS is in the process of amending the Biological Opinion for the Duchesne River based on the recent flow recommendations and it is anticipated that implementation of flow recommendations will be coordinated through the DRWG. Preliminary investigations into potential water sources for meeting flow recommendations have been promising. Potential water sources are being investigated along with opportunities to modify existing diversion structures (to measure flows and allow fish passage) and develop agreements to provide legal assurances that water identified for endangered fish flows is not diverted for other purposes and can be protected under the State of Utah Water Rights Law to the confluence with the Green River.

I.A.2 Conduct follow-up studies to evaluate and refine flow recommendations. This action has been completed. Studies to develop flow recommendations were funded through the RIP and initiated in 1997. A final report entitled Flow Recommendations for the Duchesne River with a Synopsis of Information Regarding Endangered Fishes (Modde and Keleher 2003) was approved by the RIP in 2003. The year-round flow recommendations were designed to provide for the physical processes needed to maintain channel complexity and substrate quality (high flow needs) and maintain adequate flows for endangered fish access and aquatic productivity needed to sustain the prey base for Colorado pikeminnow (base flow needs). Flow recommendations account for various types of hydrologic conditions by allowing for high peak flows in wet years (>4,000 cfs) while requiring no peak flows in dry years. Base flows were similarly scaled, targeting a minimum of 50 cfs in dry years and up to 115 cfs in wet years.

The FWS has prepared a preliminary draft of an amendment to incorporate new information into the Final Biological Opinion, July 1998 for the Duchesne River Basin and to provide a revised RPA and a re-initiation notice. The RPA for the jeopardy finding in the 1998 Biological Opinion required follow-up studies to evaluate and refine flow recommendations for the Duchesne River. The amendment provides supplemental information on the biology and habitat requirements of the Colorado pikeminnow, razorback sucker, and the flows required to support these species in the Duchesne River. It provides a new RPA that replaces the original RPA developed for the 1998 Biological Opinion. All other sections of the 1998 Biological Opinion remain in effect, including the project description, estimates of depletions, status of the species, conclusions and the incidental take statement.

The RIP for endangered fish species in the Upper Colorado River Basin (FWS, April 4, 2003) outlines procedures for consultation pursuant to Section 7 of the ESA on water projects in the Upper Colorado River Basin. The Section 7 Agreement (including Section 7 Consultation, Sufficient Progress and Historic Project Agreement) was developed to clarify how Section 7 consultations will be conducted on water depletion impacts related to new projects and impacts associated with historic projects in the Upper Colorado River Basin. The RIPRAP was developed in support of the Section 7 Agreement using the best, most current information available and the recovery goals for the four endangered Colorado River fish species.

The District and DOI, although not signatories, participate in the Colorado Fishes RIP. The Mitigation Commission does not or has not participated in the RIP, does not fund the RIP or participate on any committees, and up until 2003, had never been contacted with respect to the RIP. The Mitigation Commission is involved through the working group formed to investigate potential ways to meet in-stream flow targets. The District provides funding and technical resources to ensure success of the RIP in both recovery of the Colorado River fishes and in meeting human water needs. The District will continue to be committed to RIP efforts.

The following sections summarize listing information, life history, species status and state the conclusions of effects from the ULS project on the four endangered Colorado River fish species.

F.4.1 Bonytail (Endangered)

There are no documented collections of bonytail (*Gila elegens*) from the effect area of influence. The bonytail is listed as "endangered" under the federal ESA and by the State of Utah. Bonytail was listed under the federal ESA in 1980 (45 FR 27710), with a final determination of critical habitat on March 21, 1994 (59 FR 13374). A small number of wild adults exist in Lake Mohave on the mainstem Colorado River of the Lower Colorado River Basin (i.e., downstream of Glen Canyon Dam, Arizona) and there are small numbers of wild individuals in the Green River and upper Colorado River sub-basins of the Upper Colorado River Basin (FWS 2002a). Its National Heritage Status in Utah is S1, critically imperiled.

Currently no self-sustaining populations of bonytail exist in the wild, and very few individuals have been caught throughout its range (FWS 2002a). The bonytail is considered adapted to mainstem rivers where it has been observed in pools and eddies (FWS 2002a). Similar to other closely related *Gila* spp., bonytail in rivers probably spawn in spring over rocky substrates; spawning in reservoirs has been observed over rocky shoals and shorelines (FWS 2002a).

There would be no effects on bonytail from construction of any of the ULS features because there has been no occurrence of this species found within the effect area of influence. Depletion effects are addressed through the amended Duchesne River Biological Opinion and RIP, and therefore are not considered part of this biological assessment. Construction, operation and maintenance of the ULS of the Bonneville Unit of the CUP will have no affect on bonytail because of the ongoing actions and District participation in the RIP.

F.4.2 Colorado Pikeminnow (Endangered)

There are no documented collections of Colorado pikeminnow (*Ptychocheilus lucius*) from the effect area of influence. The Colorado pikeminnow is listed as "endangered" under the federal ESA and by the State of Utah. This species was first included in the List of Endangered Species issued by the Office of Endangered Species on March 11, 1967 (32 FR 4001) and was considered endangered under provisions of the Endangered Species Conservation Act of 1969 (16 U.S.C. 668aa). The Colorado squawfish (pikeminnow) was included in the United States List of Endangered Native Fish and Wildlife issued on June 4, 1973 (38 FR No. 106), and it received protection as endangered under Section 4(c)(3) of the original ESA of 1973. The final rule for determination of critical habitat was published on March 21, 1994 (59 FR 13374). Wild, reproducing populations occur in the Green River and upper Colorado River sub-basins of the Upper Colorado River Basin (i.e., upstream of Glen Canyon Dam, Arizona), and there are small numbers of wild individuals (with limited reproduction) in the San Juan River sub-basin (FWS 2002b). The species was extirpated from the Lower Colorado River Basin in the 1970s but has been reintroduced into the Gila River sub-basin, where it exists in small numbers in the Verde River (FWS 2002b). Its National Heritage Status in Utah is S1, critically imperiled.

Currently, three wild populations of Colorado pikeminnow are found in about 2,821 miles of riverine habitat in the Green River, upper Colorado River, and San Juan River sub-basins (FWS 2002b). The Colorado pikeminnow is a long-distance migratory fish, moving hundreds of miles to and from spawning areas. Adults require pools, deep runs, and eddy habitats maintained by high spring flows (FWS 2002b). After hatching and emerging from spawning substrate, larvae drift downstream to nursery backwaters that are restructured by high spring flows and maintained by relatively stable base flows (FWS 2002b).

There would be no effects on Colorado pikeminnow from construction of any ULS features because there has been no occurrence of this species found within the effect area of influence. Depletion effects are addressed through the amended Duchesne River Biological Opinion and RIP, and are not considered part of this biological assessment. Construction, operation and maintenance of the ULS of the Bonneville Unit of the CUP will have no affect on Colorado pikeminnow because of the ongoing actions and District participation in the RIP.

F.4.3 Humpback Chub (Endangered)

There are no documented collections of humpback chub (*Gila cypha*) from the effect area of influence. The humpback chub is listed as "endangered" under the federal ESA and by the State of Utah. This species was first included in the List of Endangered Species issued by the Office of Endangered Species on March 11, 1967 (32 FR 4001) and was considered endangered under provisions of the Endangered Species Conservation Act of 1969 (16 U.S.C. 668aa). The Humpback chub was included in the United States List of Endangered Native Fish and Wildlife issued on June 4, 1973 (38 FR No. 106), and it received protection as endangered under Section 4(c)(3) of the original ESA of 1973. The final rule for determination of critical habitat was published on March 21, 1994 (59 FR 13374). Six extant populations are known: the first five populations are in the Upper Colorado River Basin (i.e., upstream of Glen Canyon Dam, Arizona), and the sixth population is in the Lower Colorado River Basin (FWS 2002c). Its National Heritage Status in Utah is S1, critically imperiled.

Populations of humpback chub are restricted to deep, swift, canyon-bound regions of the mainstem and large tributaries of the Colorado River Basin (FWS 2002c). Adults require eddies and sheltered shoreline habitats maintained by high spring flows (FWS 2002c). Young fish require low-velocity shoreline habitats, including eddies and backwaters, that are more prevalent under base-flow conditions (FWS 2002c).

There would be no effects on humpback chub from construction of any of the ULS features because there has been no occurrence of this species found within the effect area of influence. Depletion effects are addressed through the amended Duchesne River Biological Opinion and RIP, and are not considered part of this biological assessment. Construction, operation and maintenance of the ULS of the Bonneville Unit of the CUP will have no affect on Humpback chub because of the ongoing actions and District participation in the RIP.

F.4.4 Razorback Sucker (Endangered)

There are no documented collections of razorback sucker (*Xyrauchen texanus*) from the effect area of influence. The razorback sucker is listed as "endangered" under the federal ESA and in the State of Utah. The species was listed under the federal ESA in 1991 (56 FR 54957) with critical habitat designated on March 21, 1994 (59 FR 13374). The species is endemic to the Colorado River Basin of the southwestern United States (FWS 2002d). Razorback sucker are currently found in small numbers in the Green River, upper Colorado River, and San Juan River sub-basins; lower Colorado River between Lake Havasu and Davis Dam; reservoirs of Lakes Mead and Mohave; in small tributaries of the Gila River sub-basin (Verde River, Salt River, and Fossil Creek); and in local areas under intensive management such as Cibola High Levee Pond, Achii Hanyo Native Fish Facility, and Parker Strip (FWS 2002d). Its National Heritage Status in Utah is S1, critically imperiled.

Historically, razorback sucker were widely distributed in warm-water reaches of larger rivers of the Colorado River Basin from Mexico to Wyoming (FWS 2002d). Habitats required by adults in rivers include deep runs, eddies, backwaters, and flooded off-channel environments in spring; runs and pools often in shallow water associated with submerged sandbars in summer; and low-velocity runs, pools, and eddies in winter (FWS 2002d). Spring migrations of adult razorback sucker were associated with spawning in historic accounts, and a variety of local and long-distance movements and habitat-use patterns have been documented (FWS 2002d). Young require nursery environments with quiet, warm, shallow water such as tributary mouths, backwaters or inundated floodplain habitats in rivers, and coves or shorelines in reservoirs (FWS 2002d).

There would be no effects on razorback sucker from construction of any of the ULS features because there has been no occurrence of this species found within the effect area of influence. Depletion effects are addressed through the amended Duchesne River Biological Opinion and RIP, and are not considered part of this biological assessment. Construction, operation and maintenance of the ULS of the Bonneville Unit of the CUP will have no affect on Razorback sucker because of the ongoing actions and District participation in the RIP.

F.5 June Sucker (Endangered)

F.5.1 Background

This section provides a history of consultation and summarizes the conclusions of previous consultation on June sucker.

Reclamation was informed by the Utah Division of Wildlife Resources in mid-February 1979 of the tentative taxonomic verification of the "June" sucker, a small population of an endemic fish unique to Utah Lake. The taxonomy of the fish was still uncertain and Utah Division of Wildlife Resources was requested to develop a proposal for further work. The evaluation of specific project impacts on reproductive success of this species in the Provo River and development of a mitigation plan was deferred until completion of the study. Unknowns relative to spawning habits and other requirements for this species precluded making conclusions concerning project impacts.

In 1982, the FWS published a notice in the Federal Register that it would review the status of the June sucker and requested information related to the species.

Reclamation coordinated with the FWS, the Utah Division of Wildlife Resources, and the District in 1983. In addition to three inter-agency meetings, several technical meetings were held with agency specialists. As a result of this coordination, Reclamation contracted with the Utah Division of Wildlife Resources to study the in-stream flow needs of the June sucker as a basis for determining project impacts and mitigation. The study was completed in 1986 (Radant et al 1987).

Reclamation re-opened Section 7 consultation with the FWS in 1985 because of proposed modifications to the M&I System and the proposed listing of the June sucker as an endangered species. Reclamation completed an environmental assessment of the impact of the M&I System on the proposed endangered June sucker. The assessment concluded there were no adverse impacts, was sent to the FWS as part of the official request for endangered species consultation.

On April 30, 1986, June sucker was officially listed as endangered. The FWS informed Reclamation that it would withhold its determination on the effects of the M&I System on that species pending further analysis of data gathered by Reclamation and Utah Division of Wildlife Resources.

On October 8, 1986, Reclamation submitted a supplement to the biological assessment, which again concluded no effect on the June sucker.

On December 11, 1986, the FWS concurred with Reclamation, issuing its own determination of no effect, but requesting that enhancement opportunities be considered. As quoted from the memorandum to Reclamation's Regional Director from the FWS Endangered Species Office Field Supervisor: "*The rather significant reduction in spring discharges could have negative impacts on the June sucker which are not apparent with our current level of knowledge. Therefore, it is important that the alterations associated with the project be monitored to* *assure that our current conclusions are in fact correct and borne out through observation before and with the project in place."*

Late in 1986, the Utah Division of Wildlife Resources completed a study started in 1983 on in-stream flow needs of the June sucker (Radant et al 1987).

From the 1990 Diamond Fork Final Supplement to the 1984 Final EIS, the following excerpt is quoted: "*with the recommended plan and alternative A there would be fewer impacts to terrestrial and aquatic resources than those described in the Final EIS. Therefore, there would be no adverse impacts on ... June sucker... On January 21, 1987, the Service concurred in the "no effect" determination for alternative A*" (this was the Proposed Action).

From the 1993 Final Environmental Assessment for the Olmsted Diversion and Intake Structure Replacement Project, Bonneville Unit, Central Utah Project, the following is quoted: *"there are no special concern, threatened, or endangered fish species present in the project influence area. Migration blockage on the lower Provo River, and no change in river flows would result in no effect to the June sucker, which inhabits Utah lake or the lower Provo River. The federally-listed endangered June sucker, which occurs in Utah Lake, migrates into the Provo River to spawn in June, followed by several months of juvenile rearing. The diversion and falls at the Columbia Lane Bridge (located approximately 10.7 miles downstream of the diversion dam construction area) restrict this species' distribution in the Provo River to reaches well downstream of the project area (UDOT and FHWA, 1988; American Fisheries Society, 1989). Use of best management practices would minimize siltation and turbidity. Construction activities would occur during noncritical months for the June sucker. At the June 15, 1993, meeting with the FWS, they agreed that the Proposed Project would have no affect on June sucker."*

In a letter dated December 10, 1993, the FWS concurred in the assessment conclusion that there would be no effect on listed species.

The 1994 Biological Opinion for the Provo River Project stated that *"it is the Service's biological opinion that the Project, as operated, is likely to jeopardize the continued existence of the June sucker . . . and is likely to destroy or adversely modify designated critical habitat."* The Biological Opinion also stated that "*while additional, non-Federal water development in the Provo River basin will probably not occur, several State, local, and private activities are likely to occur in the future. The most obvious is the ongoing urbanization of areas historically utilized for agriculture. The conversion of farmlands to residential areas allows for encroachment of residential areas adjacent to critical habitat areas (thereby reducing future June sucker recovery options)... and will necessitate transferring of water rights to new urban interests... Urbanization and water conversions will, therefore, increase the likelihood of jeopardy to the June sucker and adverse modification of critical habitat."*

The RPA for June sucker was "*primarily based upon the establishment and protection of flows in the Provo River to ensure annual river flushing, support adult spawning activities, and maintain high quality egg and larval habitat conditions."* The RPA called for a range of research flows and associated studies over a three year period (1995-97) and "*at the end of the 3-year study, when data are available to determine June sucker flow needs, Reclamation will reinitiate consultation for the Project . . . This new consultation, using the study results, will define the size of the permanent block of water to be acquired and delivered by Reclamation for June sucker needs."*

The Central Utah Project Completion Act (CUPCA) was passed in 1992 as part of Public Law 102-575. The CUPCA legislation transferred responsibilities for the Bonneville Unit of the CUP from Reclamation to the District, however, Reclamation still has a responsibility for providing water for the June sucker under the 1994 Biological Opinion on the Provo River Project.

The following summarizes the RPAs identified in the FWS Biological Opinion on the Effects of Operation of the Provo River Project:

1. Reclamation will identify, acquire, and permanently store a block of water to augment Provo River flows during June sucker spawning and rearing activities, the volume of which will be determined from 1995-1997 studies as identified in the Biological Opinion.

2. Reclamation will ensure that Provo River Water Users Association's operation of Deer Creek Reservoir, especially during periods of importation of Weber and Duchesne River water to Utah Lake, are provided as necessary to ensure activities leading up to or during importation do not adversely alter the timing, magnitude, and/or duration of June sucker research flows.

3. Establish a permanent water quality monitoring station within critical habitat. This station would be monitored by Reclamation personnel immediately prior to and during June sucker occupation of the Provo River to determine if suitable water quality exists for adult and larval June sucker riverine needs. As necessary to protect June sucker, adjustments in flow releases would subsequently be accomplished by Reclamation to enhance water quality and quantity conditions.

4. Reclamation will actively cooperate with the FWS and other members of the Provo River Resource Team, or a subteam thereof, to successfully implement the above activities. The Team would meet at least twice a year to specifically discuss June sucker needs, water year scenarios, options to assist recovery efforts, and activities to implement this RPA. Reclamation and the FWS would share co-lead for ensuring timely Team meetings, discussions, and actions.

Conservation measures for June sucker in the FWS Biological Opinion on the Effects of Operation of the Provo River Project included the following:

1. Reclamation should provide technical support and participation in the Utah Lake Fish Management Team (Team). This Team is currently reviewing native/nonnative fish interaction habitat alteration issues in Utah Lake and its tributary inflow areas and will be developing management recommendations that will have impact on future fish management, Utah Lake levels, and Provo River flow decisions.

2. Reclamation should work to minimize Utah Lake water level fluctuations that occur partially as a result of Reclamation's historic projects. Water surface elevation stabilization to historic conditions would enhance vegetation colonization, thereby creating critical in-lake nursery rearing habitat for young June sucker.

3. Review, with Utah Division of Wildlife Resources, fish management in Reclamation's Provo River drainage facilities to ensure introduced species compatibility with native fish populations. Reclamation also should investigate fish entrainment occurrence at Deer Creek and Jordanelle Reservoirs and develop plans to reduce incidental movement of nonnative species, both forage and sportfish species, into occupied endangered species habitat.

After reviewing the 1996 Biological Assessment for the Wasatch County Water Efficiency Project and Daniels Replacement Project, the FWS concurred with the finding of a "no effect" on June sucker in a letter dated July 11, 1996 and stated that a biological opinion would not be required for the project.

From the 1999 Diamond Fork System Final Supplement to 1990 Final Supplement to the 1984 Final EIS for the Bonneville Unit of the CUP (CUWCD 1999a), the Biological Opinion on June sucker states that "*after reviewing* *the current status of June sucker, the environmental baseline for the action area, the effects of the Bonneville Unit, and the cumulative effects, it is the Service's biological opinion that the Bonneville Unit, as proposed, is not likely to jeopardize the continued existence of the June sucker, and is not likely to destroy or adversely modify designated critical habitat. The finding of "not likely to jeopardize" is based on the commitment of the joint-lead agencies to implement the conservation recommendations which have been included as part of the proposed action."* The following conservation actions were identified:

1. The JLA, in cooperation with the FWS and the June Sucker Flows Workgroup, should model reservoir operations and Provo River flows (using new approach of operational scenarios that mimic dry, moderate and wet years) over the period of record to determine how this approach meets the needs of water users and reservoir operation as well as meet flow requirements for June sucker.

2. The JLA, in cooperation with the FWS and the June Sucker Technical Workgroup, should determine the feasibility of restoring the lower Provo River to obtain past habitat characteristics and complexity. The lower Provo River historically had a complex delta system, which provided braided, slow, meandering channels. This delta system provided low velocity habitat as a refuge and rearing habitat for larval and juvenile June sucker. Re-establishment of the delta system may provide habitat needed by larval and juvenile June sucker to obtain sized needed to reduce predation by nonnative fishes.

3. The JLA, in cooperation with the FWS and the June Sucker Technical Workgroup, should determine the feasibility of the Spanish Fork River as an additional self-sustaining June sucker spawning run in Utah Lake. The June Sucker Recovery Plan identifies the need for a second spawning run for delisting of the species. Completion of the Diamond Fork System allows the opportunity of the JLA to determine habitat needs and availability and flow requirements to establish a second river for a June sucker spawning run.

The 1999 Diamond Fork System Final Supplement to the 1990 Final Supplement to the 1984 Final EIS for the Bonneville Unit of the CUP (CUWCD 1999a) included the following environmental commitments based on the FWS *Draft* Biological Opinion:

1. The JLA will identify, acquire, and permanently provide a block of water for flows in the lower Provo River through critical habitat, in perpetuity, for June sucker.

2. The District, in cooperation with the other Provo River water users, the FWS, and other members of the Provo River Flows Workgroup, will agree on operational scenarios that mimic dry, moderate and wet years. The District, with the support of the JLA and Provo River water users, will apply operational scenarios to the annual Provo River operation to benefit June sucker.

3. The JLA, in cooperation with the State of Utah and the FWS, will work toward establishment of a refugium in Red Butte Reservoir for June sucker.

4. The JLA will participate in the development of a RIP for June sucker.

5. Any future development of the Bonneville Unit of CUP will be contingent on the RIP making sufficient progress towards recovery of June sucker.

From the Final Environmental Assessment for the Olmsted Flowline Rehabilitation and Replacement Project dated June 2001, *"the Proposed Action would have a may effect, not likely to adversely affect on June sucker in* *the lower Provo River or Utah Lake. This impact would not be significant because Provo River flows would remain unchanged from baseline conditions from April through October, which includes the late May through early July spawning and incubation period for June sucker."*

In a letter dated March 9, 2001, from the FWS to Reclamation regarding the draft environmental assessment, the FWS stated they *"were unable to concur with your "no effect" determination for threatened and endangered species for the June sucker (Chasmistes liorus). Because flows will be altered during and following the Flowline Rehabilitation Project, we find a "may affect, not likely to adversely affect" determination to be warranted. Should project plans change, or if additional information on the distribution of listed or proposed species becomes available, this determination may be reconsidered."*

In April 2002, after several years of interim activity, the June Sucker RIP (JSRIP) was formally adopted by the following partners: FWS, DOI, Reclamation, District, Mitigation Commission, Utah Department of Natural Resources, Provo River Water Users Association, Provo Reservoir Water Users Company, and Outdoor and Environmental Interests (CUWCD 2002).

The JSRIP has the following two goals:

Goal 1. To recover June sucker so that it no longer requires protections under the ESA

Goal 2. To allow continued operation of existing water facilities and future development of water resources for human use

For the purpose of the JSRIP, the recovery actions identified in the June Sucker Recovery Plan (FWS 1999) were grouped into six general categories referred to as recovery elements. Recovery elements were established to organize recovery actions by the threats they are intended to address in an effort to ensure a diversified and balanced approach to the implementation of recovery actions whereby funding and effort can be applied at the appropriate level for each recovery element. The recovery elements include: (1) Nonnative and Sportfish Management, (2) Habitat Development and Maintenance, (3) Water Management and Protection to Benefit June Sucker, (4) Genetic Integrity and Augmentation, (5) Research, Monitoring and Data Management, and (6) Information and Education.

A final environmental assessment and FONSI on the JSRIP were prepared by the FWS and issued in April 2002 (FWS 2002e). The final EA analyzed the environmental consequences of federal agency participation in development and implementation of the JSRIP and determined that the recovery actions would not have a significant impact on resources of the human environment. These federal agencies include FWS, DOI, Mitigation Commission, and Reclamation. The District and Utah Division of Wildlife Resources serve as cooperating agencies. Future NEPA compliance may be necessary to cover potentially significant actions that could result from implementing the JSRIP.

In the 2003 Final Environmental Assessment for the Provo Reservoir Canal Enclosure Project (Reclamation was the Lead Agency) it is stated *"the Proposed Action will not have a negative impact on flows in the Provo River in regards to the June sucker. As a result, the Proposed Action will not violate any conditions of the 1994 Biological Opinion on the Provo River Project and will not hinder the success of the JSRIP."* It states that *"one of the threats to the June sucker identified in the FWS 1994 Biological Opinion was the change in flows in the Provo River. The FWS indicated that Reclamation will identify, acquire and permanently store a block of water for June sucker purposes. Although an amount of water was not specified in the Biological Opinion, the saved water (under Section 207 of CUPCA) from the Proposed Action would provide a significant portion, if not all, of the water needed to satisfy this block of water. The PRWUA would make the saved water available to the District who in turn would make the water available to DOI. The principle purpose for this saved water would be to satisfy the* *block of water needed for June sucker recovery. Reclamation has determined, in consultation with the FWS, that the Proposed Action may affect, but is not likely to adversely affect, the June sucker."*

In a letter from the FWS dated April 23, 2003, the FWS concurred with "not likely to adversely affect" determination for June sucker and further stated that their concurrence was based on their *"understanding that the project will contribute saved water of sufficient quantity to help fulfill flow need for June sucker in the Provo River.*

In addition to the above-stated commitment for water, Reclamation is a signatory of and participant in the JSRIP (Program). In this role, Reclamation provides funding and technical resources to ensure Program success in both the recovery of the June sucker and in meeting human water needs. The FWS anticipates that Reclamation will continue to be a committed and effective partner in Program efforts to acquire and protect sufficient flows for the recovery of the June sucker. Acquisition and protection of flows offset impacts of ongoing and future water projects such that they do not adversely impact the June sucker. This concludes the basis for our concurrence. Should project plans change, or if additional information on the distribution of listed or proposed species becomes available, this determination may be reconsidered."

F.5.2 Status of Environmental Commitments, Conservation Actions, and Reasonable and Prudent Alternatives (RPAs) Resulting from ESA Consultation for June Sucker

F.5.2.1 1994 Biological Opinion for the Provo River Project

The District took action to address the following RPAs since operation of the Provo River Project affects the delivery of Bonneville Unit water, although Reclamation continues to have responsibility for the RPAs. The following identifies the RPAs resulting from the 1994 Biological Opinion and the status of actions to meet the RPAs.

1. Reclamation will identify, acquire, and permanently store a block of water to augment Provo River flows during June sucker spawning and rearing activities, the volume of which will be determined from 1995-1997 studies as identified in the Biological Opinion.

   Status: Flows provided during the 1995-1997 study period provided some insights into flow needs for June sucker (Keleher et al 1998), however, these studies fell short of clearly identifying the flow requirements for June sucker.

2. Reclamation will ensure that Provo River Water Users Association's operation of Deer Creek Reservoir, especially during periods of importation of Weber and Duchesne River water to Utah Lake, are provided as necessary to ensure activities leading up to or during importation do not adversely alter the timing, magnitude, and/or duration of June sucker research flows.

   Status: The RPA was issued to Reclamation as the federal agency responsible for the Provo River Project which is independent of ULS and the Bonneville Unit of the CUP.

3. Establish a permanent water quality monitoring station within critical habitat. This station would be monitored by Reclamation personnel immediately prior to and during June sucker occupation of the Provo River to determine if suitable water quality exists for adult and larval June sucker riverine needs. As necessary to protect June sucker, adjustments in flow releases would subsequently be accomplished by Reclamation to enhance water quality and quantity conditions.

Status: A permanent water quality monitoring station has been established within critical habitat. The station was first installed in the lower river below the fish weir in 1995. The station was later moved upstream to the current location near Harbor Drive because Utah Lake elevation was influencing the stage of the river at the lower site thereby making recorded flow measurements inaccurate.

The water quality station was installed and has been operated and maintained by the District. Water quality data for this site can be accessed on the District web page.

4. Reclamation will actively cooperate with the FWS and other members of the Provo River Resource Team, or a subteam thereof, to successfully implement the above activities. The Team would meet at least twice a year to specifically discuss June sucker needs, water year scenarios, options to assist recovery efforts, and activities to implement this RPA. Reclamation and the FWS would share co-lead for ensuring timely Team meetings, discussions, and actions.

   Status: The Provo River Flow Workgroup (Provo River Resource Team) has been functioning to coordinate flows each year since 1995. Workgroup members typically meet weekly leading up to and during the runoff period. The workgroup includes a diverse group of agency representatives, county and city representatives, and the river commissioner. Each year factors such as forecasted runoff and reservoir elevations are considered in determining the flow scenario. Since 1999 efforts have been made to implement a flow scenario that was developed by the District which mimics historic natural flow patterns depending on annual hydrologic conditions while providing target flow patterns and flexibility for reservoir managers.

F.5.2.2 1999 Biological Opinion for the Diamond Fork Final Supplement to 1990 Final Supplement to the 1984 Final EIS for the Bonneville Unit of the CUP

The following identifies the conservation actions from the 1999 Biological Opinion and the status of meeting the conservation actions.

1. The JLA, in cooperation with the FWS and the June Sucker Flows Workgroup (Workgroup), should model reservoir operations and Provo River flows (using new approach of operational scenarios that mimic dry, moderate and wet years) over the period of record to determine how this approach meets the needs of water users and reservoir operation as well as meet flow requirements for June sucker.

   Status: The flow approach developed by the District was incorporated into the modeling effort for the lower Provo River as part of the ULS planning effort. The results of the analysis incorporate water that would be supplied under the ULS and are included in the hydrology and impact analysis documented in the EIS.

   Because of their limited numbers and logistical constraints, it has been difficult to collect sufficient information on June sucker reproductive biology to determine precisely what flows are required to attract adults to the river and provide suitable conditions for spawning, incubation of eggs, and nursery of young-of-year. As a result of this lack of information, the District has proposed that the best way to ensure that adequate flows are provided is to mimic the conditions in which the species evolved, or what occurred naturally. This was attempted with previous flow recommendations that targeted providing a percentage of the flows occurring at the Hailstone gauge to the lower Provo River. Water management agencies had difficulties in providing flows in this manner (i.e., managing reservoir releases in winter to deliver a percentage of an unknown flow during the spring runoff and logistical difficulties associated with large diurnal changes in flow), which has led to the development of the following approach. This approach has been used as the basis for flow deliveries that have been implemented since the 1999 runoff season.

For the period of record (1950-1995) the quantity of water imported from the Duchesne River and Weber River drainages was deducted from the water measured at the Hailstone gauge on the Provo River to determine historic "natural" runoff patterns. Runoff patterns (April though July) showed considerable variation from year to year for the period of record.

- Runoff volumes ranged from as low as 23,961 acre-feet in 1977 to a high of 199,345 acre-feet in 1986.
- The maximum peak magnitude, based on daily averages, ranged from 345 cfs in 1977 to 2,820 cfs in 1983.
- Minimum flows during the runoff ranged from as low as 1.4 cfs in 1990 to 219 cfs in 1986.
- The date of the runoff peak ranged from April 10 through June 15.

In spite of the variation in the natural runoff pattern, two trends were apparent: 1) the duration of the runoff was longer, and 2) the peak in the hydrograph was higher and tended to occur later in wetter years. Based on these trends, and in an attempt to mimic historic conditions, this approach was developed for providing target flows for the June sucker spawning and nursery period.

The date of the hydrograph peak occurrence was split into three equal categories: early, mid, and late runoff. The date of the median occurrence of each of these categories was used to determine peak dates for the proposed approach. The early peak was determined to be May 15, the mid-runoff peak was determined to be May 26 and the late peak was determined to be June 7.

Peak magnitudes were split into three equal categories: low, moderate, and high magnitudes. The median peak magnitudes were roughly 1,100 cfs for low, 1,500 cfs for moderate, and 2,100 cfs for high magnitudes. Because of existing demands on a limited water supply and channel capacity limitations as a result of floodplain encroachment, one half of the median values were used as targets for the proposed approach. Hence, the target low magnitude peak is 550cfs, the target moderate magnitude peak is 750 cfs, and the target high magnitude peak is 1,050 cfs.

To determine a target for the duration of the runoff, the number of days that flows at the Hailstone gauge exceeded 219 cfs (the maximum minimum flow for a year in the period of record) was tallied for each year. The period of record was split into three equal groups: low duration, moderate duration and high duration runoff years. The average number of days that flows exceeded 219 cfs for each of these groups was used to target runoff duration. The low duration runoff averaged 46 days, the moderate duration runoff averaged 72 days, and the high duration runoff averaged 97 days.

Based on the trends in the historic data and using the analyses mentioned above, three hydrograph scenarios were produced using a 3-parameter Lorentzian Model (based on a 75 cfs base flow, peak date, magnitude, and runoff duration. For a dry (low flow) year, flows to the lower Provo River should peak around May 15 at 550 cfs with a runoff duration of 46 days (approximately April 23 to June 7) (see Figure F-1). For a moderate year, flows should peak around May 26 at 750 cfs with a runoff duration of 72 days (April 21 to July 1) (see Figure F-2). For a wet (high flow) year, flows should peak on June 7 at 1,050 cfs with a runoff duration of 97 days (April 20 to July 25) (see Figure F-3). The quantity of water required to provide the three scenarios (including a minimum 75 cfs base flow from April 1 to July 31) is 34,610 acre-feet for a dry year, 51,457 acre-feet for a moderate year, and 75,819 acre-feet for a wet year.

Implementing this approach is coordinated through the Provo River Flows Workgroup (Workgroup). Determinations of which hydrograph scenario to follow are based on available June sucker water supply, reservoir status, forecasted runoff, anticipated demands to the system and biological considerations for the given year. As weather conditions and demands to the system change, reservoir releases are adjusted to compensate for those changes.

Daily flow values in this approach represent targets for water managers. Actual flows in the lower Provo River may vary from target flows because it is difficult to maintain precise flows at such distances below control structures, and because of unforeseen changes within the system (i.e., sudden weather changes). Under this approach, beginning April 20-23 flow releases increase from base flow in the lower Provo River and reach approximately 550 cfs on May 15 (the peak date for the dry year scenario). By May 15, a decision is made based on forecast information and available reservoir space. If it appears that a dry year scenario is in store, and reservoirs can capture the remaining runoff, flows would recede in the lower Provo River targeting the return to base flow conditions around June 7. Flows would drop from the peak to base flow conditions sooner than June 7 if required to meet system demands. Base flow conditions should be such that water quality standards are maintained while not disturbing spawning areas or developing larval fish. These flows should provide researchers the opportunity to monitor the spawning

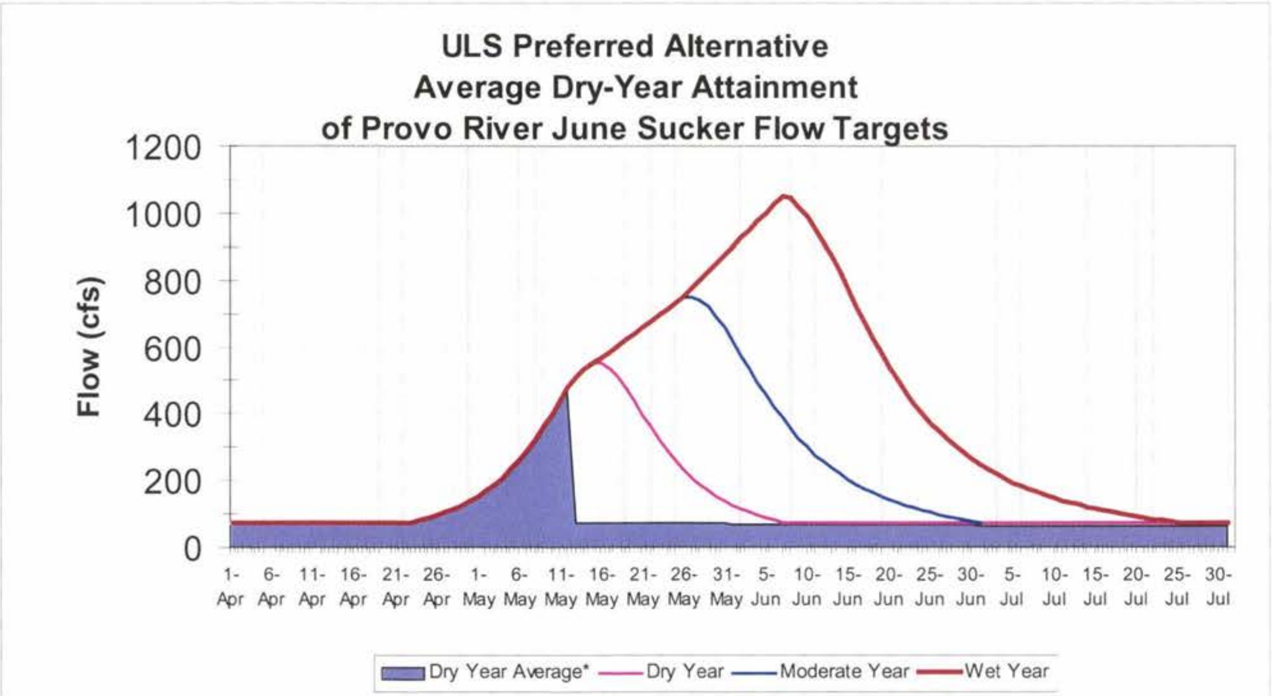


Figure F-1
ULS Proposed Action Average Dry-Year Attainment of Provo River June Sucker Flow Targets

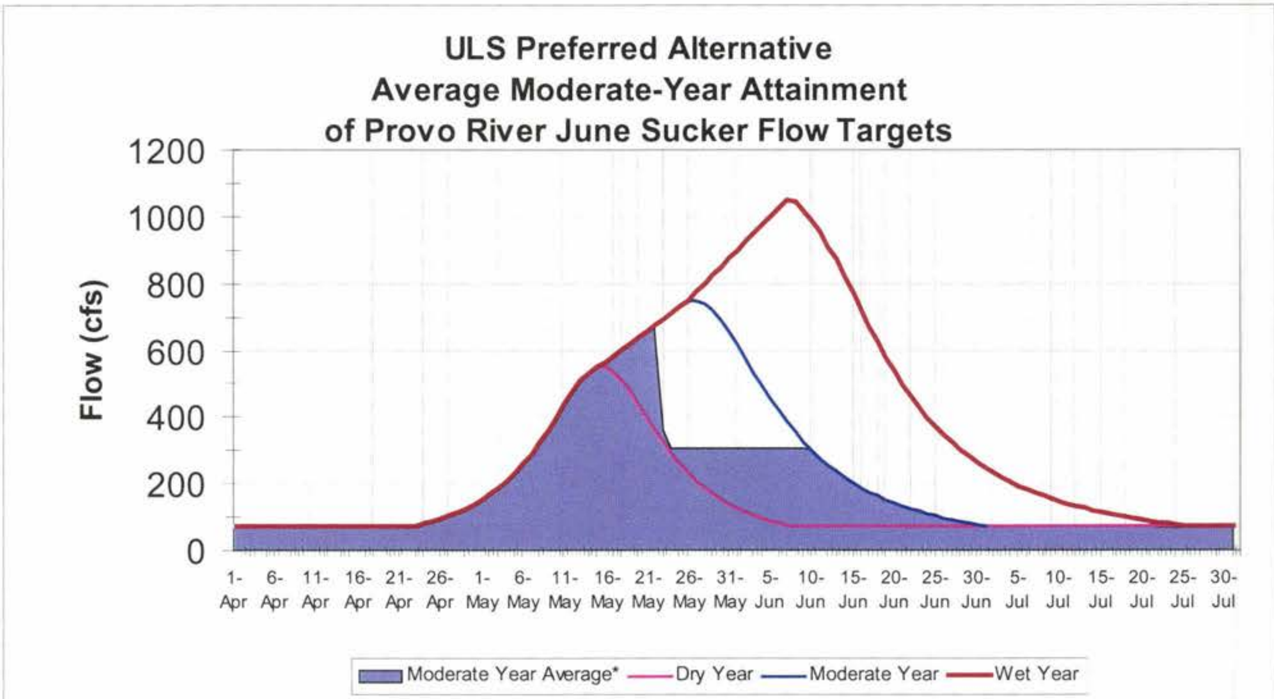


Figure F-2
ULS Proposed Action Average Moderate-Year Attainment of Provo River June Sucker Flow Targets

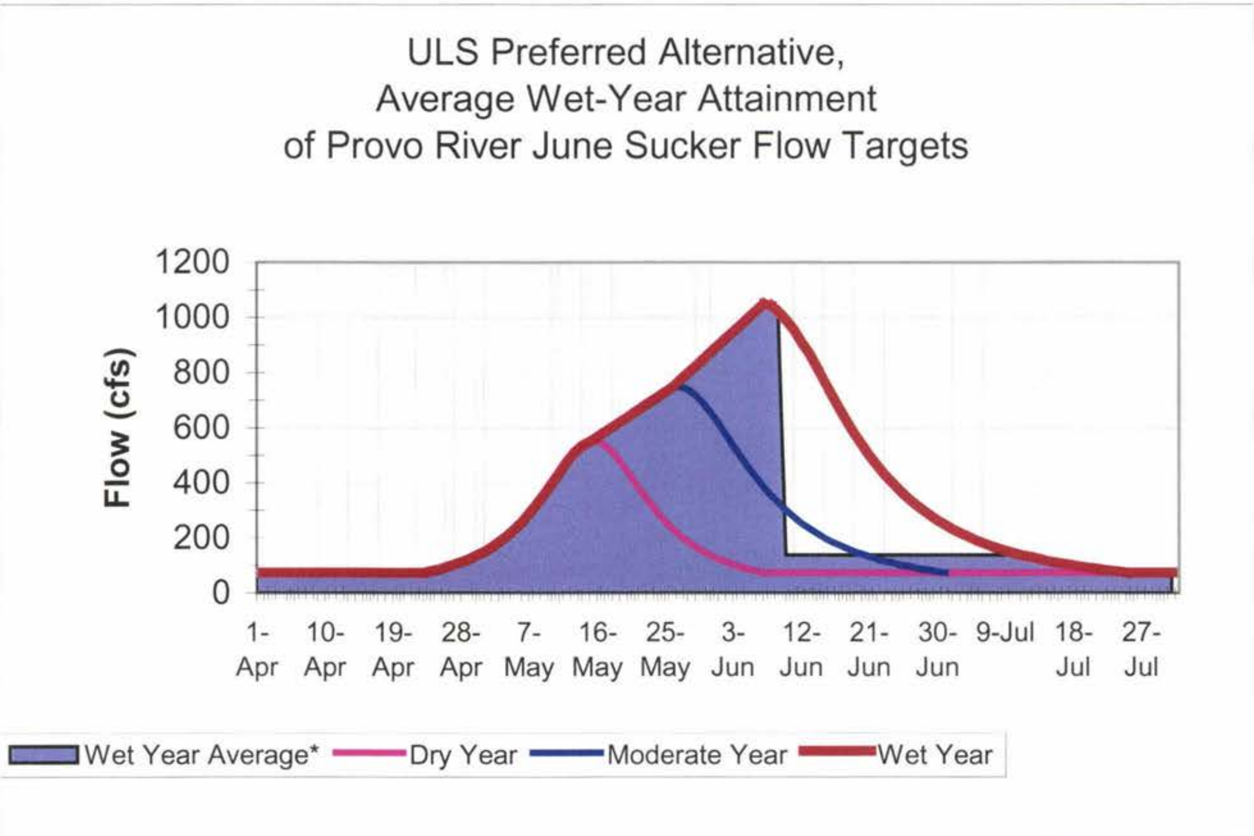


Figure F-3
ULS Proposed Action Average Wet-Year Attainment of Provo River June Sucker Flow Targets

population, but may need refinement depending on conditions in the river. If, on May 15, it appears that there is not sufficient space in reservoirs to capture the remaining runoff, flows would continue to increase targeting a peak of 750 cfs on May 26. Likewise, if the peak of 750 cfs is reached on May 26 and there is not sufficient space in reservoirs to capture remaining runoff, flows would continue to increase targeting 1,050 cfs on June 7. After May 15, however, decisions of whether to continue to increase flows would be made after frequent reviews of reservoir capacity, weather forecasts and system demands. Moderate and wet year scenarios provided are references for targeting flows in these types of years.

The benefits of this approach are: 1) it provides reservoir operators a target for planning and over-winter operations, and 2) it mimics the natural conditions in which June sucker evolved. For this approach to mimic natural conditions over the long-term, dry, moderate, and wet years should occur essentially in equal frequency.

Since 1999 the Workgroup has implemented this flow procedure to manage spring runoff in the lower Provo River in a manner that will protect and assist June sucker spawning. The flow procedure was adopted by the Workgroup as a practical improvement on prior flow management methods, but is recognized as an interim procedure in lieu of a minimum flow recommendation or other spawning flow regime sanctioned by the FWS. Such a flow recommendation must await a greater understanding of the biological and hydrologic needs of the spawning June sucker.

Each spring, the Workgroup meets with the operations staff of the District, the Provo River Commissioner and others to develop the specific flow regime consistent with the prevailing hydrologic conditions in the Provo River basin (expected runoff, reservoir capacities, available water in storage dedicated to June sucker, etc).

Table F-3 summarizes the flow decisions of the Workgroup for each year beginning in 1999 in the lower Provo River.

Table F-3
June Sucker Flows Workgroup Flow Decisions in the Lower Provo River

Water Year	April 1 to July 31 Runoff at Harbor Drive (acre-feet)[1]	Storage Water Required (acre-feet)[2]	Storage Water Percent of Runoff	Flow "Scenario" Adopted by June Sucker Flows Workgroup
1999	82,636	7,001	8.5	Wet
2000	34,252	17,634	51.5	Dry
2001	18,763	8,845	47	Dry
2002	27,514	13,960	51	Dry
2003	17,545	4,660	26.5	Dry

Notes:
[1] Data from CUWCD
[2] Data from Provo River Commissioner

Based on hydrologic conditions foreseen in early spring, 1999 was considered a "wet" year by the Workgroup and a flow regime consistent with the wet-year attainment flow procedure was followed. With the exception of an accelerated decline following the conclusion of June sucker spawning, this flow regime closely tracked the "wet" scenario shown in Figure F-3. This modification was adopted to conserve storage water that had been acquired by the Federal government pursuant to the 1994 Biological Opinion on the Provo River Project (see Section F.5.2.1). Comparatively little storage water (8.5 percent) was required to augment abundant natural runoff to achieve the "wet" condition scenario.

Water year 2000 was the first of a series of "dry" years that have persisted up to the present. Drought conditions prevailed throughout Utah during 2000, requiring comparatively more storage water (51.5 percent) to maintain the flow conditions recommended by the Workgroup. The Workgroup coordinated efforts of the District to manage flow conditions to match a "dry" scenario, again, with the exception of an accelerated decline following spawning to conserve storage water for future spawning.

Continued severe drought and growing concerns for the adequacy of available storage water dedicated to June sucker spawning caused the Workgroup to adopt a very conservative flow management policy for 2001 and 2002. Conditions prevented meeting even the "dry" year flow procedure. In these two years, storage water releases for June sucker spawning made up half the flows in the lower river (Table F-3).

In addition, in 2002 the Workgroup accommodated a High Flow Study in the Provo River performed by the Mitigation Commission in support of ULS planning. This caused a marked deviation from the flow procedure with short-term flow peaks up to 800 cfs. However, this flow regime had the benefit of providing the scouring flow conditions in the lower river recommended to improve channel substrates for spawning.

In 2003, the persistence of severe drought and concern for available storage water for June sucker spawning caused the Workgroup to adopt a "minimal" flow condition for the lower river. A peak of just 150-cfs for 5 days was deemed prudent given the prevailing conditions. Due to this restriction, only 26 percent of flows in the lower river during June and July were maintained by water released to assist June sucker spawning.

In all years since 1999, June suckers have spawned successfully in the Provo River. While not likely acceptable for long-term management, even the minimal flow conditions of 2003 apparently provided the environmental cues necessary to initiate and sustain June sucker spawning. During the first five years of its implementation, this flow procedure appears to meet acceptable flow requirements for spawning June sucker in compliance with the 1999 Biological Opinion.

The period 1950 through 1999 was used to model the impacts of ULS on achieving the flow approach identified above. In this period, 17 years were considered dry years, 17 were considered moderate and 16 were considered wet years. Modeling efforts indicate that the above flow approach could be met 10 of the 50 years under baseline conditions. Of the 10 years that the approach is met, 7 are categorized as moderate and 3 are categorized as wet. Under baseline conditions modeling results indicate that the dry year scenario is not met. For those years when the above flow approach is not achieved under baseline conditions, modeling results indicate average deficiencies of 24,731 acre-feet in dry years, 30,681 acre-feet in moderate years, and 39,314 acre-feet in wet years.

Under the ULS Proposed Action, 12,165 acre-feet would be secured by the JLA for June sucker flows on an annual basis. Modeling efforts indicate that the flow approach could be met 17 of the 50 years under ULS operation. Of these 17 years, 2 are in the dry year category, 9 are in the moderate year category, and 6 are in the wet year category. For those years when the flow approach is not achieved under ULS operation, average deficiencies would be significantly reduced from baseline conditions. The average deficiency in dry years is 12,002 acre-feet (see Figure F-1), in moderate years is 21,244 acre-feet (see Figure F-2) and in wet years is 32,175 acre-feet (see Figure F-3).

Table F-4 shows the Department of the Interior's water acquired for June sucker spawning in the Provo River from 1995 through 2004. The water volumes varied between years because some of it was acquired on a temporary basis from year to year, and some was acquired on a permanent basis. The 12,165 acre-feet secured by the JLA will provide a permanent supply of water for June sucker spawning and rearing flows.

Table F-4
Department of the Interior Water Availability and Use for June Sucker Spawning in the Provo River
1995 to 2004
(acre-feet)

Page 1 of 2

Year	New Water Available	Total Water Available (Remainder + New Water)[a]	Water Used	Remaining Water
1994	1,600	1,600	1,600	0
1995	5,000	5,000	760	4,240
1996	5,000	9,240	2,857	6,383

Table F-4
Department of the Interior Water Availability and Use for June Sucker Spawning in the Provo River
1995 to 2004
(acre-feet)

Year	New Water Available	Total Water Available (Remainder + New Water)[a]	Water Used	Remaining Water
1997	5,000	11,383	3,208	8,175
1998	6,800	14,975	0	14,974
1999	5,000	19,975	7,001	12,974
2000	11,300 [b]	24,274	17,634	6,640
2001	9,672 [c]	16,312	8,845	7,467
2002	9,672 [c]	17,139	13,960	3,179
2003	10,672 [d]	13,851	4,660	9,191
2004	12,172 [e]	21,363	--	--

Notes:
[a] Start of each new year
[b] 5,000 acre-feet (CUP) + 5,800 acre-feet (Conjunctive Use) + 500 acre-feet (Lindon)
[c] Includes 1,004 acre-feet Timpanogos Canal purchase + 223 Timpanogos Canal shares purchased by Mitigation Commission and credited by CUWCD in 2001
[d] Includes "American Fork Section 207" (1,000 acre-feet)
[e] Includes Highland Secondary (1,000 acre-feet) + 500 Jordan Valley Water Conservancy District (first water from demonstration garden Section 207)

2. The JLA, in cooperation with the FWS and the June Sucker Technical Workgroup, should determine the feasibility of restoring the lower Provo River to obtain past habitat characteristics and complexity. The lower Provo River historically had a complex delta system, which provided braided, slow, meandering channels. This delta system provided low velocity habitat as a refuge and rearing habitat for larval and juvenile June sucker. Reestablishment of the delta system may provide habitat needed by larval and juvenile June sucker to obtain sized needed to reduce predation by nonnative fishes.

   Status: A feasibility study for enhancing lower Provo River habitat was conducted under the JSRIP. A local environmental consulting firm was contracted to complete the study and a report was finalized and approved by the JSRIP in June 2002 (see BIO-WEST 2002).

3. The JLA, in cooperation with the FWS and the June Sucker Technical Workgroup, should determine the feasibility of the Spanish Fork River as an additional self-sustaining June sucker spawning run in Utah Lake. The June sucker Recovery Plan identifies the need for a second spawning run for delisting of the species. Completion of the Diamond Fork System allows the opportunity of the JLA to determine habitat needs and availability and flow requirements to establish a second river for a June sucker spawning run.

   Status: A study to examine the feasibility of establishing an additional spawning location for June sucker was conducted under the JSRIP (see Stamp et al 2002. Feasibility Analysis of Establishing an Additional

Spawning Location to Benefit the Endangered June sucker. Submitted to the JSRIP Program Director). Based on field evaluations of all Utah Lake tributaries the American Fork River, Hobble Creek, and the Spanish Fork River were advanced for further consideration and more detailed analyses. Based on a number of factors presented in the report including the availability of high quality habitat for early life stages in Provo Bay and a comparison of relative cost/benefit of improvement measures needed, JSRIP committees decided to pursue the development of a spawning run on Hobble Creek and funded a study to develop habitat enhancement concepts for lower Hobble Creek (see Stamp et al 2003).

F.5.2.3 1999 Diamond Fork Final Supplement to 1990 Final EIS for the Bonneville Unit of the CUP

The following identifies the environmental commitments made for June sucker in the 1999 Diamond Fork Final Supplement to the 1990 Final EIS (1999 FS-FEIS) (CUWCD 1999a) and the status of meeting the environmental commitments. The environmental commitments in the 1999 FS-FEIS were based on the draft biological opinion provided by the FWS. The RPAs in the draft biological opinion were more extensive than those included in the final biological opinion.

1. The JLA will identify, acquire, and permanently provide a block of water for flows in the lower Provo River through critical habitat, in perpetuity, for June sucker.

   Status: The JLA have acquired water though willing sellers and CUPCA Section 207 conservation projects. Some of this water is available on a temporary basis and some is a permanent supply. Through implementation of the ULS, the JLA have identified a permanent block of water to be supplied for June sucker spawning and nursery flows that totals 12,165 acre-feet per year.

2. The District, in cooperation with the other Provo River water users, the FWS, and other members of the Provo River Flows Workgroup, will agree on operational scenarios that mimic dry, moderate and wet years. The District, with the support of the JLA and Provo River water users, will apply operational scenarios to the annual Provo River operation to benefit June sucker.

   Status: Operational scenarios to mimic dry, moderate and wet years have been developed by the District and coordinated through the Provo River Flows Workgroup (formed in 1995 to replace the Provo River Resource Team) since 1999. Successful spawning has been documented each year and as a result of stocking efforts from hatchery and refuge sources, numbers of spawning June sucker collected in the Provo River have increased. Fertilized eggs have been collected from stream-side spawning efforts to support brood stock development for future augmentation efforts.

3. The JLA, in cooperation with the State of Utah and the FWS, will work toward establishment of a refugium in Red Butte Reservoir for June sucker.

   Status: The Final Environmental Assessment for the Property Transfer and Improvements of Red Butte Dam and Reservoir (SWCA 2003) and the Draft Preliminary Design and Cost Estimate for Rehabilitation of Red Butte Dam and Appurtenances (September 2002) were reviewed by the District's Board of Trustees at their October 2003 meeting where they accepted title to the facility and approved completing the necessary rehabilitation.

   With the District's Board of Trustees accepting title and approving the completion of the necessary rehabilitation, the reservoir will be maintained and operated as a June sucker refuge facility until it is determined by the FWS that it is no longer needed for June sucker recovery purposes. The District, through coordination with the JSRIP, the Utah Division of Wildlife Resources, and the FWS, will develop a management plan for Red Butte Reservoir (JSRIP Project No. IV.04.03 – Prepare a Long-term Management Plan for Red Butte Reservoir) with the goal of implementing an adaptive management approach to provide conditions to promote June sucker spawning, recruitment, survival and growth while providing benefits to other species such as Bonneville cutthroat trout.

It is interesting to note that between 1994 and 2001 Utah Division of Wildlife Resources stocked 9,437 June sucker into Utah Lake and Provo River. Of these, 255 (2.7 percent) individuals have been recaptured, mostly through capture of spawning adults in Provo River. Individuals stocked from Red Butte Reservoir comprise 58 percent of the recaptures, but only 17 percent of the total number of stocked fish (Utah Division of Wildlife Resources Statement of Work submitted to JSRIP for 2004 Workplan).

4. The JLA will participate in the development of a RIP for June sucker.

   Status: The JSRIP was formally adopted in April 2002. The District was pivotal in developing the JSRIP by chairing both the Drafting Committee for the formal Program Document, and the Organizing Committee. The District contracted a local consulting firm to assist in an Environmental Assessment for federal participation in the Program. The District's Staff Biologist was honored at the signing ceremony with an award of appreciation from the FWS for "significant contributions to the recovery of the endangered June sucker and outstanding leadership of the JSRIP."

   The District, DOI and Mitigation Commission continue to lead the recovery effort for June sucker. District representatives have served as chair of the Administration Committee, chair of the Technical Committee and as Local Recovery Coordinator for the JSRIP. The District has established an account specifically to fund recovery activities and along with the JLA has contributed significant funds on an annual basis to the account.

   The JLA have committed funds and in-kind services annually to the implementation of recovery actions under the JSRIP.

5. Any future development of the Bonneville Unit of the CUP will be contingent on the RIP making sufficient progress towards recovery of June sucker.

   Status: "Sufficient progress" can only be determined by the FWS. The JLA have continued to move forward within their authorities to provide conditions to promote the recovery of the June sucker and have coordinated with partners to the JSRIP in funding and implementing other actions. However, it seems unlikely that full recovery of June sucker can be achieved without addressing and making efforts to control the threats posed by nonnative fish in Utah Lake.

F.5.3 Life History

The June sucker (*Chasmistes liorus*) is an endangered fish species endemic to Utah Lake and the lower Provo River. Once a locally abundant species, it was listed as endangered by the FWS in 1986, with 4.9 miles of the lower Provo River, from the Tanner Race diversion to Utah Lake, designated as Critical Habitat (51 FR 10857).

The number of adult June sucker remaining in Utah Lake is estimated each spring based on the number spawning in the Provo River (FWS 1995c). From 1979 to 1985, the number of spawners never exceeded 500 fish, and 1985 was the last year in which aggregations of 30 to 50 June sucker spawners were observed in the Provo River. During the 1990s, collections of June sucker spawners in the Provo River have been less than 100 fish, and occasionally were less than 50 fish. Recent estimates placed the wild population size at approximately 300 individuals (Keleher et al 1998). Recruitment to the adult population is thought to be poor as a result of predation by white bass and other introduced predators. Aging of various groups of June sucker collected in the 1980s and 1990s found few fish less than 10 years of age, suggesting recruitment and survival of juveniles is inadequate (FWS 1999).

The Provo River, the largest tributary of Utah Lake, historically has been the major spawning tributary for June sucker, but other tributaries were likely used prior to changes that made them unavailable or unsuitable for the species. Carter (1969) notes that early explorers and indigenous Native Americans also keyed fishing activities on the lower Spanish Fork River, Hobble Creek, and the mouth of Peteetneet Creek. All three of these streams have considerably reduced flows from pre-irrigation times. Radant and Sakaguchi (1980) noted adult June sucker in spawning condition near the mouth of the Spanish Fork River, but later studies failed to find either spawning suckers or suitable habitat in that stream. The Utah Division of Wildlife Resources found spawning June suckers in the lower Spanish Fork River in 2002. The lowermost irrigation diversion structure on the Spanish Fork River prevents the species from accessing potential spawning habitat (Radant and Shirley 1987). Peteetneet Creek no longer reaches Utah Lake, as it is dewatered near the High Line Canal. Flow in Hobble Creek has been significantly reduced and no longer provides suitable habitat for a large species such as the June sucker.

Various historic riverine habitat characteristics, many of which no longer exist, are presumed to be favorable to June sucker spawning success. These features include multiple, meandering channels at the inlet of tributaries to Utah Lake and riparian zones. These components are thought to create microhabitats that benefit June sucker as their ecological needs change associated with development through life history stages. Advantages of these habitats include cover from predators and slow, warm pools, which support larval growth.

Factors that have contributed to the reduction in June sucker numbers include changes that have occurred both in Utah Lake and in historical spawning tributaries. In the tributaries, these effects include water management (primarily irrigation use) that has reduced streamflows during critical spawning times, reductions in available spawning habitat caused by impassable barriers associated with irrigation diversions, introduction of exotic predators, introduction of other species (carp), loss of spawning habitat, poor water quality, reduced aquatic vegetation, and channelization or channel simplification. In Utah Lake, contributing factors include changes in chemical and physical habitat, introduction of exotic predators, and lake level management.

The life history of the June sucker involves both Utah Lake and its tributaries. One of only four "lake suckers," the mouth of the June sucker is terminal, and the lips and gill rakers of adults are adapted to feed on microscopic plankton. Adults live in Utah Lake, apparently moving about the lake considerably. Sexual maturity likely occurs at 5 to 7 years of age, but most adults are from older age classes (Scoppettone and Vinyard 1991). During June, reproductive adults move into the Provo River to spawn. During most water years spawning is limited to the lower 3 miles because of a partial passage barrier at the Fort Field diversion. However in very high water years adults have been seen above this partial barrier using the next 1.9 miles of habitat up to the Tanner Race diversion dam. Spawning typically occurs in mid- to late June, with the eggs hatching in 1.5 to 2 weeks. Adults move back into the lake shortly after spawning. A post-spawning aggregation of adult June sucker was found in Provo Bay by Radant and Shirley (1987) and recent findings based on radio-tagged June sucker confirm this (Crowl 2003). This portion of Utah Lake has higher than normal plankton densities during this period, and the fish may be responding to this food source following relatively little feeding during their stay in the Provo River.

The early life history of the species is poorly understood. Larvae apparently drift down to the lake relatively quickly after spawning (Radant and Sakaguchi 1980; Radant and Shirley 1987; Modde and Muirhead 1990). It is thought that many of the spawning tributaries originally had deltas into the lake that would have provided young suckers with food, cover, and space for growing. These habitats no longer exist. It is thought that juveniles live in or around the lake. Recent research (Crowl 1994) indicates young are very susceptible to predation by white bass, although they will seek cover if it is available. Current thinking on limiting factors for the species suggests that predation on the young, either in the dredged lower Provo River channel, or in Utah Lake, is the major factor in poor recruitment to the adult population (FWS 1995c). Lack of hiding cover in the lower Provo River and in the lake may be a contributing factor to predation. Poor water quality conditions and a large carp population appear to be factors in young sucker survival.

F.5.4 Location in Effect Area of Influence

The June sucker inhabits Utah Lake and the Provo River, and is known to spawn in the lower Provo River. Spawning is generally restricted to the lower 3.5 miles of the Provo River, below the Fort Field diversion. The Fort Field diversion presents a migration barrier in most years. During very high flow years, June sucker adults may pass this barrier and continue 1.9 miles further upstream. At this writing, the Tanner Race diversion presents an impassable barrier to migration further upstream under all flow regimes (FWS 1999).

F.5.5 Baseline Conditions

Baseline conditions in the Provo River were assumed to be full operation of the M&I System as presented in the 1979 M&I System EIS. The M&I System has been partially operating since 1996 after the Syar Tunnel in the Diamond Fork System became operational and up to 30,000 acre-feet per year of Bonneville Unit water has been allowed to flow down Sixth Water and Diamond Fork Creeks into Utah Lake for exchange to Jordanelle Reservoir. When the Diamond Fork System is completed in 2004 and begins to operate in 2005, an average of 86,100 acre-feet per year of Bonneville Unit water will be delivered to Utah Lake for exchange to Jordanelle Reservoir. Therefore, when the ULS begins to operate in 2016, the M&I System will have been fully operating for approximately 10 years, which represents the baseline conditions for the ULS.

Past and ongoing human actions have had significant, detrimental effects on habitat availability, water quality, and river flow timing, magnitude and duration. The combination of these non-CUP-associated activities has reduced June sucker populations to critically low levels. Several major actions have had and continue to have significant, detrimental effects on June sucker, including depletion of Provo River flows by priority water right holders, introductions of non-native sport fish into the Provo River and Utah Lake, habitat alteration, and other direct mortality. These past and ongoing actions have influenced the baseline conditions for June sucker in the Provo River.

Table F-5 presents a summary of the June sucker collected on the Provo River during spawning runs from 1991 through 2003. During the years from 1991 to 1996, all of the spawning June sucker collected in the Provo River were wild. Starting in 1997, June sucker originating from a hatchery and released to the Provo River and Utah Lake were collected in addition to the wild fish. Starting in 2002, June sucker raised in Red Butte Reservoir and released to the Provo River and Utah Lake were collected in the Provo River during the spawning run. June sucker spawning data from 1998 through 2003 were provided by the Utah Division of Wildlife Resources (UDNR 2003b).

Table F-5
Number of June Sucker Collected During Spawning Runs on the Provo River

Year	Wild Fish	Hatchery Fish	Red Butte Reservoir Fish	Total Fish
1991	35	0	0	35
1992	46	0	0	46
1993	38	0	0	38
1994	67	0	0	67
1995	24	0	0	24
1996	29	0	0	29
1997	13	1	0	14
1998	0	1	0	1
1999	0	1	0	1
2000	2	6	0	8
2001	2	4	0	6
2002	15	12	12	39
2003	34	23	59	116

Source:
UDNR 2003b

F.5.6 Water for June Sucker Under the ULS Proposed Action

The following water quantities and sources comprise the water that would be released under the ULS Proposed Action to the lower Provo River for June sucker spawning and rearing flows:

- 2,875 acre-feet Northern Utah County 207 project savings
- 1,000 acre-feet Upper East Union and East River Bottom canals piping
- 290 acre-feet Timpanogos Canal piping
- 8,000 acre-feet Provo Reservoir Canal seepage loss savings **or from other 207 projects** to be assigned to DOI

12,165 acre-feet total

An average annual volume of 12,165 acre-feet of water for June sucker will be provided each year, regardless of the source(s) of water in the Provo River drainage.

F.5.7 Construction Effects

None of the construction activities associated with this project alternative would affect Utah Lake or June sucker critical habitat in the lower Provo River.

F.5.8 Operation Effects

F.5.8.1 Methods

The Instream Flow Incremental Methodology (IFIM) was used in this study to assess the effects of flow manipulation in the Provo River on fish habitat (Radant et al 1987; Olsen et al 2003). IFIM is composed of a suite of analytical procedures that describe habitat features resulting from a specific flow scenario (Bovee et al 1998). One of these procedures is the microhabitat model component of the IFIM known as the Physical Habitat Simulation (PHABSIM). In this study, the PHABSIM component of the IFIM was used to predict the amount of fish habitat for spawning June sucker and other fish species under a range of possible flows in the Provo River. The major premise of the PHABSIM procedure is that the suitability of a species' habitat can be described by measuring selected physical variables in a stream. To address this assumption, extensive research was conducted for June sucker and other aquatic species in the Provo River to measure their requirements for depth, velocity and substrate (Radant et al 1987). Once these values were determined, the biological data was linked with the hydraulic properties of the river (depth and velocity at hundreds of individual points within a two-dimensional mesh developed by a detailed hydraulic model) to estimate the relationship between habitat availability and flow within study reaches.

Selected habitat parameters for the PHABSIM analysis were measured at two locations in the Provo River to evaluate June sucker habitat availability. Since June sucker only have access to habitat in the Provo River below Tanner Race Diversion for spawning, potential habitat was evaluated based on study sites taken at two locations (Site 1 and Site 2c) in the approximately 5 miles of the Provo River below the Tanner Race Diversion. The study station at Site 1 was situated downstream of the Fort Field Diversion. The study station at Site 2c was located between the Fort Field Diversion and Tanner Race Diversion.

During habitat modeling for the Provo River, fish species with similar habitat requirements were grouped together into eight distinct habitat niches (Olsen et al 2003). In this analysis, habitat requirements for the spawning life stage of June sucker was best represented by the moderate/mid-depth habitat niche, and the larval/young-of-year life stages were assigned to the backwater/edge and slow/shallow niches (Olsen et al 2003). Although fish habitat changes were predicted for many fish species in the Provo River, only habitat niche results related to the spawning, larval, and young-of-year life stages of June sucker are presented herein because of the regulatory status of this species. Predicted changes in habitat within these three habitat niches were used to indicate a potential change in June sucker spawning and/or rearing habitat in both reaches from Utah Lake to the Tanner Race Diversion.

Two modeling approaches were used during this study to estimate habitat availability for June sucker. In the first approach, a PHABSIM model was run for the spawning life stage of June sucker that included habitat suitability for depth, velocity, and substrate. Assumptions of the IFIM model are habitat-based and do not consider the presence and influence of non-native fish in the habitat. In the second approach, habitat niche modeling was conducted based only on depth and velocity habitat suitability criteria (Olsen et al 2003). The habitat niche modeling approach was preferred for June sucker because this species has demonstrated plasticity in the types of spawning substrate they use for reproduction (Crowl, 2003).

After the integration of biological and physical habitat components, modeling projected the amount of habitat available to June sucker in terms of Weighted Usable Area (WUA). For these purposes, WUA can be defined as the total area per unit length of river that would be expected to provide usable habitat for a selected habitat niche. Habitat was modeled as WUA (ft^2) per 1,000 linear feet of stream. In this analysis, a modeled average monthly flow generated a monthly WUA value. For a record of 50 years (1950-1999), May, June (spawning) and July (larval/young of year) average monthly flows under a project alternative were used to predict a corresponding value of monthly WUA for each modeled habitat niche. An average WUA for each month over the period of record (1950-1999) was then calculated for alternative comparison. WUA was the measure of habitat used to assess potential impacts to June sucker under the project alternatives. Predicted habitat for June sucker at Site 2c was extrapolated to the reach of the Provo River between Tanner Race Diversion and Fort Field Diversion. Modeled habitat for June sucker at Site 1 was extrapolated for the reach of the Provo River between Fort Field Diversion and Utah Lake.

F.5.8.2 Effects

Changes in hydrology in Utah Lake under the Proposed Action would be within the current range of operations. It is therefore assumed that there would be no effects on adult June sucker individuals or populations in Utah Lake. Hydrologic changes that could affect June sucker would occur in the lower Provo River.

The average monthly flows in the Provo River downstream of the Murdock Diversion under the Proposed Action represent a projected increase compared to baseline conditions (Table F-6 and Table F-7). Under the Proposed Action, the reach of the Provo River between Murdock Diversion and Fort Field Diversion would receive flow increases in all months (Table F-6). Flows in this reach were used to predict habitat availability for June sucker between Tanner Race Diversion and Fort Field Diversion. The reach of the Provo River between Fort Field Diversion and Utah Lake would receive higher flows compared to baseline conditions in all months, with the highest proportional flow increases projected to occur in August and September (Table F-7). Increased flow during May, June (spawning) and July (larval/young-of-year/out migration) in both of these reaches was designed to benefit June sucker spawning and early life history. Instream flows would be targeted during summer months to support incubation and facilitate out-migration of juvenile suckers to Utah Lake.

Table F-6
Estimated Average Flow (cfs) and Percent Change in Provo River from Murdock Diversion Dam to Fort Field Diversion for the Spanish Fork Canyon-Provo Reservoir Canal Alternative Compared to Baseline Flows (average water year)

	Month											
Flow Condition	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Baseline	88	72	59	55	70	147	199	476	527	182	149	134
Proposed	129	90	77	74	86	158	251	553	563	231	196	182
% Change	47	25	31	35	23	7	26	16	7	27	32	36

Table F-7
Estimated Average Flow (cfs) and Percent Change in Provo River from Fort Field Diversion to Utah Lake for the Spanish Fork Canyon-Provo Reservoir Canal Alternative Compared to Baseline Flows (average water year)

	Month											
Flow Condition	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Baseline	32	76	56	51	64	142	168	347	374	42	4	6
Proposed	77	94	75	69	81	153	222	445	433	110	61	62
% Change	141	24	34	35	27	8	32	28	16	162	1,425	933

In the reach of the Provo River between Tanner Race Diversion and Fort Field Diversion (Site 2c), predicted spawning habitat for June sucker during May-June would be higher under the Proposed Action. In this alternative, the moderate/mid-depth habitat niche would increase 192 percent in May and 122 percent in June compared to baseline conditions (Table F-8). The Fort Field Diversion is a partial passage barrier during June sucker spawning. During very high water years, adults can utilize 1.9 miles of habitat up to the Tanner Race diversion dam. In summary, monthly average flows in May and June described under the Proposed Action would produce significant increases in the amount of June sucker spawning habitat in the reach of the Provo River between Tanner Race Diversion and Fort Field Diversion compared to baseline conditions. Furthermore, the total amount of available spawning habitat in the Provo River would slightly increase under the Proposed Action.

Table F-8
PHABSIM Predictions for Moderate/Mid-depth Habitat Niche under Proposed Action Flows in the Provo River from Tanner Race Diversion to Fort Field Diversion [a,b,d]

Flow Scenario	Month	Average Monthly Flow (cfs)	Moderate/Mid-Depth Habitat Niche: Average WUA (ft^2)	Moderate/Mid-Depth Habitat Niche: Percent Change from Baseline
Existing Condition[c]	May	332	8,639	--
	June	384	6,610	--
Baseline Condition	May	352	3,198	--
	June	381	3,409	--
Proposed Action	May	441	9,326	192
	June	429	7,565	122

Notes:
[a] WUA results were expressed as square feet per 1,000 feet of river
[b] Results from Site 1 were extrapolated to represent habitat throughout this Provo River reach
[c] Existing condition data taken from USGS Gage Provo River at Provo during 1950-1999
[d] Average monthly flow and average WUA calculated over period of record (1950-1999)

Additional habitat niche modeling in the reach of the Provo River between Tanner Race Diversion and Fort Field Diversion indicated that predicted backwater/edge and slow/shallow habitat in July would decrease under the Proposed Action compared to baseline conditions.

The 50-year average WUA values for the backwater/edge habitat niche would decrease by 61 percent under the Proposed Action compared to baseline conditions (Table F-9). Projected habitat for the slow/shallow habitat niche would decrease by 8 percent under the Proposed Action. Although the backwater/edge habitat niche was predicted to experience a large proportional decrease in predicted habitat, the actual magnitude of the decrease was relatively small (2,007 ft^2) compared to the amount of habitat available in the slow/shallow habitat niche (14,637 ft^2).

June sucker in their early life history stages would be expected to use habitat in both slow-flow niches. The total habitat decrease in both niches was predicted to be 3,226 ft^2 under the Proposed Action, with total available habitat in both of these niches decreased by approximately 20 percent compared to baseline conditions. Predicted decreases in habitat for early life stages may be offset by gains in spawning habitat for adult June sucker, particularly since available literature indicates larval June sucker drift downstream immediately after emerging (Modde and Muirhead 1990).

Table F-9
PHABSIM Predictions for Slow Flow Habitat Niches in July Under Proposed Action Flows in the Provo River from Tanner Race Diversion to Fort Field Diversion [a,b,d]

Flow Scenario	July Average Monthly Flow (cfs)	Backwater/Edge Habitat Niche		Slow/Shallow Habitat Niche	
		WUA (ft^2)	Percent Change from Baseline	WUA (ft^2)	Percent Change from Baseline
Existing[d]	56	2,471	--	15,844	--
Baseline	57	3,311	--	15,856	--
Preferred	58	1,304	-61	14,637	-8

Notes:
[a] WUA results were expressed as square feet per 1,000 feet of river
[b] Results from Site 1 were extrapolated to represent habitat throughout this Provo River reach
[c] Existing condition data taken from USGS Gage Provo River at Provo during 1950-1999
[d] Average monthly flow and average WUA calculated over period of record (1950-1999)

In the lower Provo River from Fort Field Diversion to Utah Lake (Site 1), simulated habitat during May-June (spawning niche) would be higher under the Proposed Action, with the moderate/mid-depth habitat niche increasing 96 to 181 percent compared to baseline conditions (Table F-10). Habitat in this niche was projected to increase 181 percent in May and 96 percent in June. Under the Proposed Action, the increased flows would produce significant increases in June sucker spawning habitat in the reach of the Provo River between Fort Field Diversion and Utah Lake.

Table F-10
PHABSIM Predictions for Moderate/Mid-depth Habitat Niche under Proposed Action Flows in the Provo River from Fort Field Diversion to Utah Lake [a,b,d]

Flow Scenario	Month	Average Monthly Flow (cfs)	Moderate/Mid-Depth Habitat Niche	
			Average WUA (ft^2)	Percent Change from Baseline
Existing Condition[c]	May	332	16,253	--
	June	384	13,164	--
Baseline Condition	May	347	6,570	--
	June	374	7,011	--
Proposed Action	May	445	18,467	181
	June	433	13,763	96

Notes:
[a] WUA results were expressed as square feet per 1,000 feet of river
[b] Results from Site 1 were extrapolated to represent habitat throughout this Provo River reach
[c] Existing condition data taken from USGS Gage Provo River at Provo during 1950-1999
[d] Average monthly flow and average WUA calculated over period of record (1950-1999)

In general, hydrologic changes in July under the Proposed Action would have potential positive effects on the early life history stages of June sucker. Projected flow increases during July of 68 cfs would aid the dispersal of June sucker larvae as they drift downstream to Utah Lake. Habitat modeling of the backwater/edge and slow/shallow habitat niches in July from 1950 to 1999 indicated another benefit to early life stages of June sucker. Additional flow to this reach under the Proposed Action resulted in modeled average monthly flows for July that never declined to zero. Under baseline conditions, 31 of 50 modeled July average monthly flows would be zero. Based on historical flows and habitat modeling during the month of July, a significant benefit to the early life history stages of June sucker would be achieved under the Proposed Action because water would be available in the Provo River downstream of Fort Field Diversion every year.

Habitat niche modeling over the entire period of record indicated that backwater/edge and slow/shallow habitat niches showed negligible changes in the Proposed Action compared to baseline conditions (Table F-11). Average WUA values for these niches would change less than two percent over the entire time period. Although 50-year averages of flow and available habitat in July would experience minor changes between baseline conditions and the Proposed Action, a significant benefit to the early life history stages of June sucker would be achieved under the Proposed Action because water would be available in the Provo River downstream of Fort Field Diversion every year.

Table F-11
PHABSIM Predictions for Slow Flow Habitat Niches in July Under Proposed Action Flows in the Provo River from Fort Field Diversion to Utah Lake [a,b,d]

Flow Scenario	July Average Monthly Flow (cfs)	Backwater/Edge Habitat Niche WUA (ft^2)	Backwater/Edge Habitat Niche Percent Change from Baseline	Slow/Shallow Habitat Niche WUA (ft^2)	Slow/Shallow Habitat Niche Percent Change from Baseline
Existing[d]	56	9,757	--	16,764	--
Baseline	57	9,647	--	16,885	--
Preferred	58	9,638	No Change	17,079	1

Notes:
[a] WUA results were expressed as square feet per 1,000 feet of river
[b] Results from Site 1 were extrapolated to represent habitat throughout this Provo River reach
[c] Existing condition data taken from USGS Gage Provo River at Provo during 1950-1999
[d] Average monthly flow and average WUA calculated over period of record (1950-1999)

Based on modeling results for all three habitat niches used by June sucker in the Provo River, total available habitat under the Proposed Action would significantly increase compared to baseline conditions. Habitat niche modeling in both reaches of the Provo River indicated that the moderate/mid-depth habitat niche would experience significant increases under the Proposed Action, although predicted habitat increases in the moderate/mid-depth habitat niche could cause some indirect negative effects on June sucker by improving habitat suitability for predatory fish species, such as brown trout, white bass and walleye. In contrast to moderate flow habitats, slow water habitats were projected to decrease significantly under the Proposed Action in the reach between Tanner Race Diversion and Fort Field Diversion, and less significantly in the reach between Fort Field Diversion and Utah Lake compared to baseline conditions. In both reaches of the Provo River, the small magnitude of projected habitat decreases for early life stages would be offset by large predicted habitat gains for spawning June sucker. July flow increases in both reaches of the Provo River would provide a benefit to young-of-year June sucker by restoring the hydrograph to a more natural condition.

The Utah Division of Wildlife Resources issued a final management plan for the Provo River in August 2003 (UDNR 2003a). The management plan for the lower 4.9 miles of the Provo River is focused on special fish species – June sucker. The management plan identifies six objectives: 1) to provide a recreational sport fishery that meets public demands; 2) meet goals and objectives established in conservation agreements developed for sensitive species through implementation of identified conservation actions; 3) implement or assist in the actions required for recovery of June sucker; 4) obtain population, distribution, and/or life history information for native fish, amphibians, reptiles, and mollusks that occur in this hydrological unit with emphasis on sensitive species communities; 5) Identify and enhance aquatic habitats cooperatively through watershed improvement projects; and 6) coordinate actions taken in Objectives 1 through 5 in order to avoid conflicts. This management plan does not address the problem of predatory fishes in Utah Lake and the lower Provo River, and it does not address the effect of predatory fishes on June sucker recruitment and how the Division of Wildlife Resources would correct this problem to achieve recovery of the June sucker.

Brown trout, walleye, and white bass occur in the two Provo River reaches being managed for June sucker, and these and other non-native species are likely predators on June sucker larvae. Objective 3 of the management plan includes monitoring effectiveness of any non-native control methods implemented in the Provo River. The summary of actions needed to meet Objective 3 for June sucker recovery is taken from the June Sucker (*Chasmistes liorus*) Recovery Plan (FWS 1999). The non-native control action is to investigate feasibility of mechanically controlling non-native fish predators within the Provo River. If this action is determined to be feasible, then mechanical means would be used to control non-native fish predators in the Provo River. A second task identified as a needed action is to assist in providing flows that minimize non-native fish use of the Provo River. A third task identified as a needed action is to monitor effectiveness of non-native control methods in the Provo River.

Continued operation of the Bonneville Unit of the CUP is dependent upon the JSRIP making sufficient progress toward recovery of the June sucker. The JLA have no authority over the control of non-native fish in the Provo River and actions that would control predation by non-native fish on June sucker larvae. The authority for control of non-native fish lies with the Utah Division of Wildlife Resources, which is a partner to the JSRIP through the Utah Department of Natural Resources.

The JLA are actively involved in the JSRIP and they have dedicated budgets and programs to accomplish the actions listed in recovery plan. The JLA are actively working with other partners in the JSRIP to provide flows and habitat conditions to help achieve June sucker recovery. The flows that would be provided under the ULS are only part of the actions needed to achieve species recovery, and other inter-related actions include non-native fish control and habitat restoration and enhancement. The JSRIP's role is to ensure a diversified and balanced approach to recovery. The flows are one component of the actions needed to recover June sucker.

F.5.9 Conclusion

In conclusion, construction and operation of the Proposed Action may affect, but is not likely to adversely affect the June sucker.

F.6 Bald eagle (Threatened)

F.6.1 Life History

The FWS recently reclassified the bald eagle (*Haliaeetus leucocephalus*) as threatened throughout most of the country, including the state of Utah (FWS 1994a). Bald eagles have ranged historically throughout North America except for extreme northern and southern latitudes (FWS 1994a). They nest on both coasts from Florida to Baja California in the south and from Labrador to the western Aleutian Islands and Alaska in the north. At the time Europeans first arrived in North America, there were an estimated quarter- to half-million bald eagles (Gerrard and Bortolotti 1988). Populations began to decline in the mid-to late-1800s as the result of declines in prey populations, loss of nesting habitat, and shooting. These factors continued to reduce populations until the 1940s when the Bald Eagle Protection Act (16 U.S.C. 668) was passed. Shortly after World War II, the pesticide dichloro-diphenyl-trichloroethane (DDT) became popular for controlling mosquitoes along coastal and other wetland areas (Carson 1962). In the late 1960s, researchers determined that dichlorophenyl-dichloroethane (DDE), the principal metabolite of DDT, accumulated in the fatty tissues of eagles following ingestion of contaminated prey and impaired calcium production during egg-shell formation, thus inducing egg-shell thinning and reproductive failure. As a result, eagles south of the 40th parallel were listed as endangered under ESA in 1973 (FWS 1994a). The protection afforded under ESA, together with a 1972 ban on the use of DDT in the United States and the implementation of regional recovery plans, has resulted in a dramatic increase in the North American bald eagle population in recent years. Numbers of nesting pairs in the lower 48 states rose from 417 in 1963 to more than 4,000 in 1993 (FWS 1994a). In Utah, however, breeding habitat has always been limited, and Henny and Anthony (1989) noted that nesting by bald eagles was not documented in Utah until 1984, when one pair was discovered in the southeastern part of the state. However, Henny and Anthony's report conflicts with Henshaw (1875), who considered the bald eagle to be a permanent breeding species around Utah Lake. Currently, there are three known nesting territories in Utah in the southeastern part of the state. Two of these territories were active in 1994 (Bunnell 1994).

Wintering eagle populations in Utah are substantial, with 1,263 recorded in 1985 at scattered locations during the National Wildlife Federation's midwinter survey (Henny and Anthony 1989). Counts conducted by the Utah Division of Wildlife Resources also indicate a general increase in wintering eagles (Bunnell 1994). Individuals are seen commonly in small numbers within the effect area of influence from October through March (Smith and Murphy 1973, Reclamation 1988). During this period, eagles are frequently observed around Utah Lake, Mona Reservoir, and lower Diamond Fork Creek, as well as in scattered wetlands throughout central Utah (Reclamation 1988). Night roosts are located sparsely throughout the area, including timbered canyons and in groves of trees within the valley. They are often occupied by several to many eagles at once. Known roosting sites are located at Utah Lake, Mona Reservoir, and within cottonwood stands along lower Diamond Fork Creek near Palmyra Campground. Bald eagles frequently use trees around Utah Lake as daytime perches. The primary food sources for this species are fish, rabbits, waterfowl, and carrion (Smith and Greenwood 1983). There is also a bald eagle nesting territory near the Great Salt Lake in northern Utah.

The bald eagle is the only sea eagle occurring regularly on the North American Continent (American Ornithologists' Union 1983). It is primarily a bird of aquatic ecosystems (Marshall and Nickerson 1976) and frequents estuaries, large lakes, reservoirs, major rivers, and some seacoast habitats. Suitable habitat must have an adequate food base (which consists of fish), perching areas, and nesting sites that meet specific requirements for the species (FWS 1994a).

Bald eagles generally nest in large, dominant live trees with open branchwork. Preferred nesting sites are usually located in stands with less than 40 percent canopy cover with some foliage shading the nest. They often select the largest tree in a stand on which to build a stick platform nest. The nesting period extends from January to September, with peak activity from March to June. Clutch size ranges from one to three eggs with two eggs being most common. Eagles become sexually mature at 4 to 5 years and are monogamous. Wintering eagles often congregate at traditional sites that are generally close to open water and that provide large trees for perching and night roosts.

F.6.2 Location in Effect Area of Influence

No nesting pairs of bald eagle have been found in the effect area of influence. Bald eagle occasionally forage in the lower part of Diamond Fork Creek on an infrequent basis.

F.6.3 Construction Effects

Construction of the Proposed Action would have no direct or indirect effect nesting bald eagles. Nesting territories within Utah occur in the southeastern and northern part of the state outside of the effect area of influence. ULS construction would have no effect on wintering bald eagles.

F.6.4 Operation Effects

Operation of the project would have no effect on bald eagle breeding habitat, as the species does not nest in the effect area of influence. Important winter roost sites and foraging habitat that could be affected by operation of the project occur in Sixth Water Creek, and Diamond Fork Creek below Three Forks. The CUPCA-required minimum streamflows during fall and winter in Sixth Water and Diamond Fork Creek below Three Forks, plus the reduction of unnaturally high irrigation flows in these creeks during spring and summer, would benefit the bald eagles in the following ways. The more stabilized flow regime in Sixth Water and Diamond Fork Creeks would result in nearly a twofold increase in trout biomass, thus creating more prey for the eagles. The decrease in sustained high flows in these two streams would reduce turbidity and make it easier for the eagles to locate fish. The Proposed Action's restoration of a more natural peak flow in May is designed to maintain and restore Diamond Fork Creek's riparian corridor of cottonwood trees used by the eagles as roosting sites.

F.6.5 Conclusion

In conclusion, construction and operation of the Proposed Action may affect, but is not likely to adversely affect the bald eagle.

F.7 Canada lynx (Threatened)

F.7.1 Life History

The FWS listed the Canada lynx (*Lynx canadensis*) as a threatened species in March 2000. In the western U.S., lynx habitat occurs in spruce/fir forests at higher elevations. Downed logs and windfalls provide cover for denning sites, escape, and protection from severe weather. The lynx range in the contiguous United States includes 16 states-Oregon, Idaho, Washington, Montana, Wyoming, Utah, Colorado, Maine, New Hampshire, Vermont, New York, Michigan, Wisconsin, and Minnesota. Lynx infrequently dispersed into Nevada, North Dakota, South Dakota, Iowa, Indiana, Ohio, and Virginia (FWS March 2000). Lynx are believed to currently remain in small populations in only three states-Montana, Washington, and Maine (ENN 1999).

Mid-successional forest stages provide habitat for the lynx's primary prey, the snowshoe hare (*Lepus americanus*). Snowshoe hare are known to be sedentary animals, living in a limited home range. The area where they live depends on the availability of food. This limited range, normally less than 25 acres, allows hare to become well-acquainted with the habitat characteristics. They prefer a habitat of mid-successional forest (20 to 40 years old) dispersed among dense brushy cover. Snowshoe hare remain in thickets during the day; at night, they forage around the thickets and forest edges. During summer months, snowshoe hare consume mostly green succulent vegetation such as grasses, ferns, clovers and forbs; dozens of different herbs; and tender twigs. During winter, snowshoe hare usually eat bark, twigs, buds and evergreen leaves of woody plants (Kolbe nd). Palatable deciduous species include maple, birch, rose, hazel and willow, whereas jack pine, white pine, larch, and cedar are favored conifers (Canadian Wildlife Service nd). These plant community types do not occur in the project impact area of influence.

The FWS has inadequate information to determine whether resident lynx populations occurred historically or currently within New York, Vermont, Michigan, Wisconsin, Idaho, Utah, and Oregon (FWS March 2000). It has been 68 years since a lynx was last officially spotted in Utah (ENN 1999). The official State status of the lynx in Utah is Sensitive; information is inadequate to determine whether a resident population existed historically or currently (FWS March 2000). There are records of lynx occurrence in the Uinta Mountain Range. A few records also exist from the Wasatch Range and the Manti La Sal. The last verified records of lynx from Utah were in 1977 for physical remains and 1982 for tracks. The lynx has been protected from harvest in Utah since 1974 (Forest Service et al 2000).

There are only 10 verified records of lynx in Utah since 1916. Nearly all of the reports are from the Uinta Mountain Range along the Wyoming border (McKay 1991). Four of the records correlate to cyclic population highs in the 1960s and 1970s. Although sightings of the Canada lynx in Utah over the past twenty years are exceedingly rare, the Forest Service recently announced that Canada lynx hair was found in the Manti-La Sal National Forest south of the impact area of influence during 2002 (UDNR 2003c). Recent DNA results documented the presence of a lynx in Utah. There is no evidence of lynx reproduction in Utah. The FWS considers that any lynx occurring in Utah are dispersers from other populations rather than residents, because most of the few existing records correspond to cyclic population highs, there is no evidence of reproduction, and boreal forest habitat in Utah is remote and far from source lynx populations (FWS 2003).

F.7.2 Location in Effect Area of Influence

The Proposed Action would be constructed and operated in an area that ranges from 2 to 8 miles west of the Canada lynx key linkage route through the Wasatch and Uinta ranges. The primary features that would be constructed and operated in proximity to the lynx key linkage route would be the Sixth Water Power Facility and the Sixth Water Transmission Line. The Sixth Water Power Facility would be located at the existing Sixth Water Flow Control Structure along Sixth Water Creek about 4 miles from the lynx key linkage route and about 10 miles southwest of the closest historical sighting. The Sixth Water Transmission Line upgrade would run parallel to and about 2 miles west of the lynx key linkage route for about 4 miles, and then would run southwest away from the lynx key linkage route. The upgraded transmission line would be about 9 miles southwest of the closest historical sighting.

F.7.3 Construction Effects

Construction of the Proposed Action would have no effect on the key linkage route, lynx habitat, or lynx since there is no documented historical use of the area by lynx and there are no known lynx populations or individuals in the effect area of influence.

The effect area of influence contains no primary or secondary snowshoe hare habitat. The plant community types preferred by snowshoe hare for cover, reproduction, and food do not occur in the vegetation types that would be disturbed by the project construction. The project elevations are lower than those described for snowshoe hare and potential lynx habitat in Utah. The project construction would not affect snowshoe hare habitat.

F.7.4 Operation Effects

Operation of the Proposed Action would have no effect on the key linkage route, lynx habitat, or lynx since there is no documented historical use of the area by lynx and there are no known lynx populations or individuals in the effect area of influence. The operation activities would involve vehicle transportation over existing National Forest System roads to and from the Sixth Water Power Facility and along the Sixth Water Transmission Line. The facility elevations are lower than those described for snowshoe hare and potential lynx habitat in Utah. The project operation would not affect snowshoe hare habitat.

F.7.5 Conclusion

In conclusion, construction and operation of the Proposed Action may affect, but is not likely to adversely affect the Canada lynx.

F.8 Ute ladies'-tresses (Threatened)

F.8.1 Background

This orchid, *Spiranthes diluvialis*, was Federally listed as a threatened plant species through the ESA on January 17, 1992. The major reason for listing was due to habitat loss and modification and that it has a low reproductive rate. Since its listing, considerable efforts have been put forth by agencies (including the District), universities, and public entities to gather information on the biology, habitat requirements and distribution of the Ute ladies'-tresses. A Draft Recovery Plan for this species was developed by the FWS in 1995. The District produced a status update on Ute ladies'-tresses in 1996. Based upon this report, the District requested that the FWS initiate action to delist *S. diluvialis*. The data contained in the status update report suggests that the FWS erred in the listing of this orchid and that the body of knowledge regarding the population size was at the time of listing unknown and therefore a major error occurred with the species listing. Since listing, additional populations have been located in Utah. Populations have also been documented in Washington, western Montana, Idaho, Wyoming, Colorado and western Nebraska. The orchid also historically occurred in eastern Nevada.

The FWS 1994 Biological Opinion on the PRP concurred with Reclamation's finding that there was no effect on Ute ladies' tresses, but provided conservation recommendations for the species. These were:

1. Areas potentially impacted by water and land management activities should be surveyed for the orchid prior to initiating management changes. Particular attention should be given to areas where hydrologic changes are likely to occur.

2. Management planning and implementation should be coordinated with the orchid Recovery Team to ensure compatibility with Recovery Plan goals and guidelines. Orchid recovery is dependent upon watershed and stream management that maintains, restores, or enhances natural stream dynamics, including movement of streams within their floodplains. Therefore, proposed management activities within affected watersheds should be reviewed for their compatibility with these goals. Activities also should be evaluated for their potential to create or exacerbate problems with noxious plant species and recreational use in potential orchid habitat.

The FWS issued a biological opinion for the Diamond Fork System of the Bonneville Unit of the CUP on August 24, 1999. They concluded that the project "is not likely to jeopardize the continued existence of the Ute ladies'-tresses orchid." This finding was based on the commitment of the JLA to implement the conservation recommendations, which were included as a part of the proposed action.

The Record of Decision for the Diamond Fork System (October 13, 1999) included the following mitigation and monitoring commitments for the Ute ladies'-tresses:

1. A commitment is made to continue monitoring during the construction period prior to project operation to establish a credible baseline.

2. Data collection following project implementation should include measurements of actual stream elevations relative to ULT colony locations. This will allow the Service to verify the model and its results. If there are significant discrepancies, the model should be modified and additionally, a new impact assessment completed. Additionally, the JLA should perform aerial mapping at a resolution sufficient to record stream channel geomorphology, vegetation community, and orchid colony locations in several-year intervals to help better understand changes and evaluate their significance in relation to restoration and conservation goals.

3. Changes in vegetation communities in occupied or potentially suitable orchid habitat should be measured along Diamond Fork Creek and Spanish Fork Canyon.

4. The natural variation in Ute ladies'-tresses orchid demography, population vigor, and habitat should be characterized under baseline conditions. The natural variation in Ute ladies'-tresses orchid demography, population vigor, and habitat should be characterized following implementation of proposed operation flows.

5. The Three Forks colony should be monitored to better understand the process of loss of viability and eventual extirpation of colonies. Monitoring should focus on the rate of loss, identifying which parameters are best to measure to determine if loss is occurring, etc.

6. Conservation measures in addition to altering flows and rescue/transplant should be considered, such as vegetation manipulation, providing supplemental water to colonies, and mechanical reconfiguration of portions of the stream channel or floodplain surfaces, if monitoring data show streamflow hydrology is adversely affecting the Ute ladies'-tresses orchid population.

7. If pollination is determined to be a limiting factor to long-term orchid viability and successful colonization of new habitats, then the JLA will consider actions to enhance pollinator habitat or numbers as appropriate.

8. A methodology should be developed that would monitor changes in Ute ladies'-tresses orchid habitat quality, and the methodology should be used to establish habitat quality parameters of the population.

9. Population viability parameters and "red-flag" conditions should be established for the habitat quality parameters.

10. The accuracy of the predicted effects analysis should be measured.

11. Timing for performing the most accurate canyon-wide Ute ladies'-tresses orchid counts should be evaluated.

12. The relationship between river hydrology, depth to soil water, soil moisture, soil characteristics and Ute ladies'-tresses orchid colonies should be correlated.

The District has continually made efforts to survey for and avoid impacts to the Ute ladies-tresses to the extent practicable and has been involved in contributing toward the completion of a status review report for this orchid. As a conservation measure for the Uinta Basin Replacement Project Section 203 Alternative, the District committed to contributing toward completion of an agency and public review draft status report of the Ute ladies'-tresses orchid. The primary intent of the status review report is to compile information necessary to evaluate eligibility of the orchid for delisting, or failing to find that delisting is warranted, identification and prioritization of actions necessary to accomplish recovery. A draft status review report was distributed in November 2002. This report is in the process of being finalized by the FWS.

F.8.2 Life History

Spiranthes diluvialis (Ute ladies'-tresses) belongs to a large diverse genus of orchids with over 300 species distributed throughout the temperate regions of the world (Cronquist et al 1977; Williams and Williams 1983; Dressler 1990). General characteristics of the genus include their terrestrial habit, clustered tuberous roots, basal leaves (rosettes) and tubular creamy-white colored flowers that are spirally arranged in a congested terminal spike (Williams and Williams 1983; Welsh et al 1993). The species' common name (ladies'- tresses), in use for over 200 years, refers to the spiral arrangement of the flowers on the inflorescence that resembles braided hair (Cronquist et al 1977).

The Ute ladies'-tresses is a perennial terrestrial orchid usually 8- to 20-inches tall with fleshy, tuberous roots. It has long, narrow basal leaves (up to 1.5-inches long by 0.6-inch wide) which are reduced to bractlets upward on the stem. The tubular creamy white flowers are 0.3- to 0.6-inch long and arranged spirally on the stem. Some flowering stalks have only a few flowers while others may be packed with flowers. The orchid usually blooms between late July and the end of August. However, it has been observed blooming in early July and found in flower as late as early October (FWS 1995a; Welsh et al 1993).

Marcus E. Jones originally collected *Spiranthes diluvialis* in Salt Lake City, Utah in 1880. Over a century later, Charles J. Sheviak (1984) described the species after much deliberation over herbarium specimens and field studies of the species in its native habitat. He based his determination on the major morphological and cytological characters of specimens that were collected in Utah and Golden, Colorado, the collection site of the first western plants of the species that were sent to him for verification. Sheviak concluded that *S. diluvialis* (2n=74) probably originated from the hybridization of *S. magnicamporum* (2n=30) and *S. romanzoffiana* (2n=44) during the Pleistocene when the climate was much cooler and wetter. As aridity increased, *S. diluvialis* became restricted to isolated wetlands in the west. Arft and Ranker's (1993) electrophoretic research corroborates Sheviak's findings *that S. magnicamporum* and *S. romanzoffiana* are *S. diluvialis'* putative parents. Sheviak (1984) reported that *S. diluvialis* has morphological characteristics that are intermediate between those of both probable parents. Sheviak (1984) maintains and Arft (1995a) agrees that *S. diluvialis* be recognized as a distinct species. However, Welsh et al (1993) treats the species as a variety of S. romanzoffiana in their treatment of the Utah Flora.

The small size of orchid seeds promotes their dispersal by wind and water (Stoutamire 1992). However, because they are so small, orchid seeds are almost impossible to trace in the soil. Little is known about the fate of terrestrial orchid seeds from the time of dispersal until seedlings emerge above ground (Rasmussen and Whigham 1993). However, it is known that terrestrial orchids generally require the presence of a fungus in the soil before they germinate in the field (Wells 1981). Apparently, terrestrial orchid seeds germinate only after they have been penetrated by fungal hyphae. Like other terrestrial orchids, germination of the Ute ladies'-tresses in its natural habitat may be dependent upon the association with a mycorrhizal fungus. Germination in the lab is extremely difficult due to the orchid's fungal dependence. Germination information on this species is lacking.

Seeds of *S. diluvialis* have never been successfully germinated in the laboratory and seed viability has not been tested. Attempts by Therese Meyer, Red Butte Garden's Endangered Plant Horticulturist, and Jim Coyner, Utah Orchid Society, to propagate the orchid by tissue culture also have been unsuccessful, thus far (Coyner and Hreha, 1995). Red Butte Garden maintains a collection of *S. diluvialis* in cultivation that was rescued from the Steineker Dam borrow pit near Vernal, Utah in 1993 as a seed source for future germination and tissue culture research.

The life history and underground phenology of *S. diluvialis* remains a mystery to orchid biologists (FWS, 1995). According to Wells (1981) who has worked on other species of the genus, especially *S. spiralis*, following germination, juvenile orchids remain underground as a colorless mycorrhizome, devoid of chlorophyll, and dependent on the fungus for nutrition. At this time, the mycorrhizome is subject to drought, waterlogging, mechanical damage and predation. The time underground varies from species to species (usually greater than one year and perhaps as long as 15 years). The mycorrhizome is eventually replaced by a root tuber that is infected by the fungus that transfers water and nutrients from the soil to the plant. After the first green leaf is produced, the plant becomes autotrophic and starts producing its own food.

Little is known about the mycorrhizome stage of the orchid life cycle because it is hard to find in the soil. Wells (1981) also reported that the plant remains green throughout the winter as a rosette (visible above ground) which usually has between four and eight leaves. In the spring, the rosette starts to grow, an inflorescence is formed, it flowers and by mid-June it dies. Underground the tuber that supported the rosette and inflorescence also starts to shrivel up and die. By September, a new rosette and inflorescence forms from a new tuber. Many terrestrial orchids renew their vegetative parts every year by producing new tubers. The tubers have no roots but they are covered with fungal mycelia that absorb water and nutrients from the soil. Although *S. diluvialis'* flowering phenology is different (early July through September) from that described by Wells (1981) for *S. spiralis, .S. diluvialis* and *S. spiralis* may have similar life cycles (Coyner 1991; FWS 1995b).

Germination and establishment biology is important for conservation of orchid species (Mehrhoff 1989b). Knowledge of orchid phenology is necessary for the effective management of the orchid's habitat (Wells 1981). There have been no definitive studies to track the life cycle of *S. diluvialis* in the field. Most of the available life history information comes from field observations by orchid researchers in Colorado and Utah.

Several authors have reported variation in annual flowering frequencies for terrestrial orchids (Curtis and Greene 1953; Wells 1967; Tamm 1972). Tamm (1972) attributes these variations in flowering frequencies to land use changes, fluctuating weather conditions, changes in plant competition within the orchid's habitat and variations in mycorrhizal activity. Wells (1967) reported that *S. spiralis* plants may pass at least one season or more underground and produce a flower the next season. He suggests that mycorrhizae may play an important role in the nutrition of the mature plant during dormancy as well as the seedling during germination. Additionally, there may be a high resource cost to the plant due to flowering and fruiting. Sipes (1995) observed that plants that flowered and produced fruits in 1991 did not flower in 1992. There is a possibility that removal of photosynthetic tissue by grazing cattle and herbivory by voles during one growing season may limit resource allocation for floral development in the next.

Mehrhoff (1989a) found 20 percent dormancy in his populations of terrestrial orchids. He observed that plants were absent for at least one season and for as long as three seasons. No plants reappeared after being absent for more than 3 years. The Ute ladies'-tresses orchid seems to exist vegetatively underground for many years.

Plant size may influence flowering potential in terrestrial orchids. Mehrhoff (1989a) reported that large orchid plants tend to flower while small plants remain vegetative or die. Mehrhoff (1989a) observed that flowering individuals were always the largest in the population while sterile or vegetative plants were always the smallest.

Mehrhoff (1989a) concluded that increased adult mortality and recruitment failure contributed to orchid population decline. Wells (1981) reported three causes of orchid mortality: 1) trampling by cattle hooves, 2) destruction of the orchid tubers by beetle larvae, and 3) competition by dense tussocks of grass (*Bromus* sp.). Cattle in some areas heavily graze *S. diluvialis*, voles eat the stems and it can be out-competed for light by the succession of associated vegetation. However, the effects of these activities on orchid mortality and population decline have not been fully determined for this species. Arft (1995a) has studied some effects of vole activity in *S. diluvialis* plots maintained by the Boulder, Colorado Open Space Program.

Spiranthes diluvialis is primarily pollinated by bumblebees *(Bombus sp.)* while a few are pollinated by *Anthophora* (sp.) bees (Sipes and Tepedino 1994, 1995, 1996). Dominant pollinators may fluctuate from year to year and from site to site. Bees work from the bottom to the top of the inflorescence (Cronquist et al 1977; Sipes 1995). Sipes (1995) determined that *S. diluvialis* is self-compatible and according to Sipes and Tepedino (1994, 1995), *S. diluvialis* offers only nectar, no pollen, as a reward to pollinators. Reproductive success is probably closely tied to the presence of other pollen producing species associated with *S. diluvialis,* offering a more diverse reward thus attracting more pollinators. Therefore, pollen-producing species within the *S. diluvialis* habitat are essential to the preservation of this rare orchid. Pollination is necessary to maintain the genetic diversity of the species (Sipes 1995).

Spiranthes diluvialis produces several hundred to tens of thousands of seeds per fruit. A single individual can produce as many as 100,000 seeds in a season (Sipes and Tepedino 1994; Sipes 1995). Arft (1995b) stressed the importance of fruit set in the perpetuation of the species. *S. diluvialis* has average to relatively high fruit set compared to other species of orchids (Sipes and Tepedino 1994). Many researchers working in Colorado and Utah have reported flowering and fruiting data for *S. diluvialis* (Stone 1993; Arft 1995b; Sipes 1995; Sipes and Tepedino 1994, 1995, 1996).

During the 1992 field season, Sipes found greater fruit set in *S. diluvialis* flowers at the bottom of the flowering stalk compared to those towards the top of the flowering stalk. This pattern in fruit and seed set may reflect the bees' pollination pattern; they start at the bottom and work their way to the top of the inflorescence. Sipes (1995) concluded that fruit set fluctuated from site to site and from year to year. Flowering phenology may affect fruit set. Frost damaged flowers and fruits were observed on plants that flowered late in the season. A reduction in potential pollinators was also observed late in the season. *S. diluvialis'* reproductive success may vary from flowering season to season due to resource availability and pollinator density.

An understanding of seed bank dynamics is necessary to assess population demographics (Kalisz and McPeek 1992). Information concerning the seed bank of this species is scarce. The seeds of *S. diluvialis* are relatively short lived, as are those of most orchids (Sipes 1995). Orchid seeds are extremely difficult to locate in the field due to their small size. Pollination is necessary to maintain the genetic diversity of the seed bank that needs to be renewed annually.

Some epiphytic, as well as, terrestrial orchids appear to tolerate stressful conditions very well. Some terrestrial orchids tolerate a degree of water shortage that would be damaging to other species. The habitats of epiphytic orchids are often deficient in nutrients (Dressler 1990). While orchids are usually not the first plants to appear after vegetation is cut or burned, some orchids do show definite weedy tendencies. Several species of *Spiranthes* are scarce and very localized in undisturbed habitats but have multiplied greatly in disturbed areas (Sheviak 1974). *S. diluvialis* exhibits many r-selected characteristics or strategies (i.e., numerous small seeds, which are short-lived and dispersed over a wide area in temporary or unpredictable habitats resulting in fluctuating populations). *S. diluvialis* exhibits characteristics usually associated with r-selected species, which is unusual because most orchids tend not to exhibit these traits (Dressler, 1990). In cultivation, the orchid appears not to be very competitive and quickly is replaced by other more aggressive species that are found growing with it (Meyer 1994).

The orchid has been found between 1370-2085 m in various mesic habitats including wet meadows, riparian areas, especially along meandering streambeds, abandoned oxbows and point bars, marshes and raised bogs. Spiranthes grows most often in sandy/silty loam soils that are wet 1.5- 2.0 feet below the surface. Usually, the orchids grow in full sunlight with other riparian species. In Utah, the associated species include: horsetail (*Equisetum* spp.), the grasses (*Agrostis stolonifera* and *Poa pratensis*), sedges and rushes (*Carex* sp., *Eleocharis* sp., *Juncus arcticus* and *Scirpus* sp.), and forbs (*Melilotus officinalis, Castilleja exilis, Aster hesperius* and *Solidago occidentalis*). The following trees and shrubs: *Alnus incana, Betula occidentalis, Elaeagnus angustifolia, Shepherdia argentea, Salix exigua, S. lutea and Populus angustifolia* also have been observed in the habitat (UNHP 1994, Welsh et al 1993).

At the time of listing in 1992, *S. diluvialis* populations were located in three regions of the western United States: the eastern region (east of the Continental Divide in Colorado), the central region (Eastern Utah), and the western region (Great Basin of Western Utah and Eastern Nevada). Habitat types where populations were located were similarly described as riparian meadow habitat, differences to this are noted for each region. Totaled populations numbered 15, 5 of which (33 percent) were presumed extirpated, as listed below.

Two populations were reported in the eastern region: 1) Boulder Creek population in Boulder, Colorado; and 2) Clear Creek population in Golden and Wheat Ridge, Colorado. Habitat types in the eastern region were primarily relict tall grass meadows.

Six populations were identified within the central region: 1) Browns Park population along Green River in Daggett County; 2) Dinosaur National Monument population along Cub Creek in Uintah County; 3) Whiterocks population along Uinta and Whiterocks Rivers in Duchesne and Uintah Counties; 4) Duchesne population along Duchesne River in Duchesne County; 5) Capitol Reef National Park population along the Fremont River in Wayne County; and 6) Deer Creek population along Deer Creek in Garfield County. Major habitat types in the central region were understory meadows of riparian woodlands.
Seven populations were identified within the western region: 1) Ogden population in Weber County, Utah, assumed extirpated; 2) Jordan River population along Jordan River in Salt Lake County, Utah, assumed extirpated; 3) Red Butte Canyon population near Salt Lake City, Utah, assumed extirpated; 4) Callao population in Willow Springs, near Tooele, Utah, assumed extirpated; 5) Panaca population along Meadow Valley Wash near Panaca, Lincoln County, Nevada, assumed extirpated; and Utah Lake populations (6 and 7), both then viable populations adjacent to Utah Lake in Utah County, Utah. Habitat types in the western region included lake and spring-side mesic and wet meadows.

Since the species was listed, the known range of the species has expanded. Two populations were identified in Wyoming in Goshen and Converse Counties, in the central and southeastern portions of the state. In Wyoming, the species occurs typically on sandy to coarse-sandy, sub-irrigated benches along streams, commonly restricted to a narrow zone between cattails and adjacent upland vegetation. Fertig (1995) of the Wyoming Natural Diversity Database estimated that at the time the state population of *S. diluvialis* at approximately 150 individuals.

Additionally, Bonnie Heidel (1995) of the Montana Natural Heritage Program identified a population of *S. diluvialis* in Piedmont Swamp, a 500-acre wetland in the Jefferson River Valley, located southwest of Whitehall, in Jefferson County. The swamp has no inlets, and is fed by groundwater recharge. In 1994, 71 flowering individuals were identified, and in 1995, 26 flowering individuals were located at this site.

In recent years according to Ben Franklin, Botanist at the Utah Natural Heritage Program, new Utah locations for *S. diluvialis* have been found around Utah Lake near American Fork in Utah County and in Heber Valley in Wasatch County. Additionally, the distribution of *S. diluvialis* has been extended to three new states in the west: 1) in Idaho along the Snake River below Paradise Dam in Swan Valley, 2) in Okanogan, Washington on the east side of the Cascades, and 3) near the Niobrara River in Nebraska. (Per. Comm. Ben Franklin 1999; Per. Comm. Dr. Lucy Jordan, FWS, 1999).

The range of *S. diluvialis* has expanded in the last few years, following funding for searches, to include seven states (Colorado, Idaho, Montana, Nebraska, Nevada, Washington, and Wyoming) besides Utah. Range-wide, the total population is estimated at more than 60,000+ flowering individuals with one population in Utah (Diamond Fork Canyon) numbering at least 16,000 in 1998 (FWS 1999). This figure is conservative, in that it does not take into account vegetative or dormant (below-ground) individuals.

F.8.3 Location in Effect Area of Influence

The area of potential effect is along the Spanish Fork River from the confluence with Diamond Fork Creek downstream to the Castilla gaging station. There are a total of seven known occurrences along this reach of river. Five of the known occurrences are on island gravel bars and low floodplains adjacent to the main channel. These are located within approximately 0.5 mile of the confluence. Additionally, there are two known occurrences of ULT located between the Covered Bridge Canyon residential area access bridge, and the Castilla gaging station. These colonies are located in or around an old oxbow near the Cold Springs gaging station and are believed to be supported by secondary hydrology and seepage not associated with river flows.

F.8.3.1 Surveys

All known occurrences of ULT, and potential habitats that could potentially be affected by construction and/or operation of the Proposed Action were surveyed. These surveys were restricted to areas within the area of project influence that are riparian/wet meadow habitats that had the potential for supporting ULT. There is low potential for negative impact on this species.

F.8.4 Construction Effects

The proposed project short-term effects on ULT would be those resulting from construction activities. Short-term effects would be identified if construction from the Proposed Action were to directly disturb occupied or potential ULT habitat.

The area analyzed consisted of the Spanish Fork River from the confluence with Diamond Fork Creek, downstream to the Castilla gaging station.

There are no planned construction activities in known or potential ULT habitat. There is no potential to affect ULT habitat or individual plants.

F.8.5 Operation Effects

The analysis of potential operation effects involved using two flow comparisons at two cross sections on the Spanish Fork River between the confluence with Diamond Fork Creek and the Spanish Fork Diversion Dam. One comparison was made between the ULS baseline condition and the ULS Proposed Action flows. The other comparison was made between the historic condition and the ULS Proposed Action flows. The analysis was focused on changes in Spanish Fork River flows during the ULT flowering season (July – September) which could affect ULT individuals or habitat.

F.8.5.1 Evaluation Criteria. It is recognized that the FWS has sole authority to determine significance of effect threatened and endangered species ("effect" or "no effect"). For this analysis, three categories of "potential for effect" were developed - High, Moderate and Low. It is suggested that a habitat described as having a "High potential for effect", be considered as a “may effect" on the population, for purposes of this document. An occupied habitat was placed into one of the three categories for "potential for effect" according to the following criteria:

LOW POTENTIAL

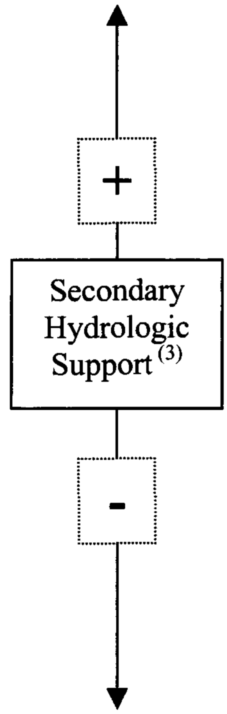
- Low to Moderate drying or wetting [1] in the first two critical depths during growing season
- Secondary Hydrologic Support
- Knowledge of Site Characteristics [2]

MODERATE POTENTIAL

- Moderate to High drying [1] in the first two critical depths during growing season
- Secondary Hydrologic Support
- Knowledge of Site Characteristics [2]

HIGH POTENTIAL

- High drying [1] in three or four critical depths
- No Secondary Hydrologic Support
- Knowledge of Site Characteristics [2]



[1] **Drying/Wetting:**
The proposed project would result in flow changes. Flow changes in a riverine system will result in a change in the amount of time a particular elevation would be inundated. A drying is a negative change in the percent of time a particular elevation is inundated; a wetting is a positive change in the percent of time an elevation is inundated.

[2] **Site Characteristics:**

- Geomorphology - oxbows, bars, floodplains etc.
- Microtopography
- Piezometer readings within a colony
- Manmade structures - berms, dikes, culverts

[3] **Secondary Hydrologic Support - (May increase or decrease the categorical placement):**

- Site location in relation to river geometry
- Head source
- Proximity to bank
- Spring or seeps present

These criteria are based upon the specific habitat and hydrologic data collected for the occupied habitats along the area of potential effect.

F.8.5.2 Effects. The effects analysis was performed by simulating the changes in Spanish Fork River flow using a HEC-RAS analysis of two Spanish Fork River cross sections (CUWCD 1999b). The historic, baseline and Proposed Action flows (see Table F-12) were evaluated in the HEC-RAS analysis. Historic condition flows represent the Spanish Fork River flows prior to the 1999 Diamond Fork FS-FEIS and 1999 Biological Assessment, and are representative of flows that will continue until the ULS would begin to operate in 2016. The ULS baseline flows represent how the Spanish Fork River would flow if the 1999 Diamond Fork Interim Proposed Action was the last development stage of the Bonneville Unit. The District would not discharge flows to the Spanish Fork River as described for the Interim Proposed Action in the 1999 Diamond Fork FS-FEIS and 1999 Biological Assessment, however, this is the baseline condition for NEPA compliance purposes under the ULS EIS. The Proposed Action flows in the Spanish Fork River would begin to occur in 2016. Surface water hydrology model simulations used in the 1999 Diamond Fork FS-FEIS and 1999 Biological Assessment were based on hydrology developed for the period 1930 through 1973. The surface water hydrology model simulation for the ULS EIS and this Biological Assessment are based on an updated period of hydrology from 1950 through 1999. The HEC-RAS results, which include river flow and stage, water velocity and backwater elevation at each cross section, indicate that there would be no Spanish Fork River stage differences between the Proposed Action and historic condition flows at both cross sections during the ULT flowering period from July through September. The HEC-RAS results for the differences between baseline conditions and the Proposed Action indicate that reduced flows during the ULT flowering months would result in lower Spanish Fork River stages at the two cross sections ranging from 0.1 to 0.7 feet. This simulated change in river stage would not be expected to change the hydrology around the Spanish Fork River ULT colonies because they are situated above the direct influence of these river stages and are supported by secondary hydrology (drainage from off-channel ponds or springs and seeps). One of the Spanish Fork River ULT colonies may be supported by subsurface flow draining through the alluvium, and if the potential lower river stage were to decrease the moisture in the side channel, then the ULT colony likely would emerge further down the side channel where the moisture conditions would be most favorable. However, these potential effects are not expected to occur since the "baseline flows" were calculated for a 50-year period, i.e. worst case scenario, because in the 1999 FS-FEIS, it was not known how long the Diamond Fork System would operate before a final plan would be prepared for utilizing the Bonneville Unit water. The ULS construction is scheduled to occur through 2015, and interim operation of the Diamond Fork System to convey water to Utah Lake is unknown during the ULS construction period and will depend on the actual hydrology during that period.

Table F-12
Estimated Average Spanish Fork River Flow (cfs) and Percent Change From Historic and Baseline Diamond Fork Creek to Spanish Fork Diversion Dam Under the Proposed Action

	Month											
	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Historic	93	70	68	67	82	113	247	465	405	363	283	178
Baseline	158	191	201	215	248	285	425	740	645	546	457	258
Preferred	134	130	124	125	138	171	296	578	452	356	305	180
Percent Change Preferred from Historic	+44	+86	+82	+87	+68	+51	+20	+24	+12	-2	+8	+1
Percent Change Preferred from Baseline	-15	-32	-38	-42	-44	-40	-30	-22	-30	-35	-33	-30

As shown in Table F-12, the Proposed Action flows in Spanish Fork River would be decreased from baseline conditions and generally increased from historic conditions during the ULT flowering period. The river flows shown in Table F-12 for the Proposed Action are derived from data and analysis included in the Draft Surface Water Hydrology Technical Report for the Utah Lake Drainage Basin Water Delivery System (CUWCD 2004). The Proposed Action river stage decreases would range 0.1 to 0.7 feet from baseline conditions and would not change from historic conditions. A total of 29 plants in two colonies along this reach of the Spanish Fork River would not be affected by the Proposed Action. Extrapolating to all the known colonies along this reach, a total of

528 plants in 10 colonies would not be affected (Table F-13). All ten colonies receive secondary hydrologic support and do not appear to be directly influenced by river stages, except at extremely high flows beyond the flows that would occur under Proposed Action.

Table F-13
Estimated Number of Flowering Plants in the Spanish Fork River (Diamond Fork Creek to Castilla Gaging Station)

Potential for Effect	Individuals	
	Numbers	Percent
High	0	0%
Moderate	0	0%
Low	528	100%
Total	**528**	**100%**

F.8.6 Conclusion

In conclusion, construction and operation of the Proposed Action may affect, but is not likely to adversely affect the Ute-ladies' tresses orchid.

F.9 Western Yellow-billed Cuckoo (Candidate)

F.9.1 Life History

The Yellow-billed cuckoo (*Coccyzus americanus occidentalis*) is often located in open woods and thickets, but usually considered a riparian obligate and are usually found in large tracts of cottonwood/willow habitats with dense sub-canopies (below 33 feet). It feeds mostly on hairy caterpillars, however, its diet can include insects such as cicadas, beetles, grasshoppers, crickets, and may include berries, frogs, and lizards. Nest sites for yellow-billed cuckoos are usually located in riparian thickets. The cuckoo nesting characteristics are a nest of twigs, lined with leaves, grasses, mosses, rootlets, placed in the horizontal limb of a tree or bush 3- to 20-feet high. These birds are heard more than they are seen and are quite shy. The cuckoo stays in the dense canopy of trees or tangles of undergrowth.

F.9.2 Location in Effect Area of Influence

The Spanish Fork – Santaquin Pipeline corridor would pass within one-half mile of a recorded cuckoo nest site at the Brigham Young University Agricultural Station and within one mile of a site in Santaquin City.

There are narrow patches of riparian habitat scattered along the Mapleton Lateral, but these are not considered to be high quality cuckoo nesting habitat because of the absence of mature cottonwood overstory in most of the areas and because of their small size and narrow profile. No cuckoo nest sites have been recorded in the construction corridor based on records research and field surveys.

There are historic records of yellow-billed cuckoo occurrences within one mile of the proposed Spanish Fork – Provo Reservoir Canal Pipeline corridor through Provo City, including records on the Brigham Young University campus and the Provo City cemetery.

F.9.3 Construction Effects

The construction standard operating procedures would prevent construction from affecting any potential nesting sites within the Spanish Fork-Santaquin pipelines. Construction activities would not remove riparian habitat in the nesting area. It is highly unlikely that pipeline construction would cause adverse effects on yellow-billed cuckoo populations throughout any pipeline corridor. The construction of the Mapleton – Springville Lateral Pipeline would not affect any known yellow-billed cuckoo populations or suitable habitat. Additionally, the degree of current human presence and activity in these areas, and especially along the proposed pipeline corridor through Provo City would make additional disturbance from pipeline construction immaterial. Pipeline construction would not affect yellow-billed cuckoo populations.

F.9.4 Operation Effects

Operation of the Proposed Action would have no measurable effect on yellow-billed cuckoo populations. There would be no operation activities performed in any known cuckoo nesting areas or other life-stage habitats.

F.9.5 Conclusion

In conclusion, construction and operation of the Proposed Action may affect, but is not likely to affect the yellow-billed cuckoo.

F.10 Conservation Measures and Monitoring

F.10.1 June Sucker

Conservation measures for June sucker that were identified in the recovery plan (FWS 1999) are being coordinated through the JSRIP. The District, DOI and Mitigation Commission have been participating in the JSRIP to support June sucker recovery.

Stated in the June Sucker (*Chasmistes liorus*) Recovery Plan (FWS 1999) as a criterion necessary for June sucker to be delisted is the "establishment of an additional self-sustaining spawning run of June sucker in Utah Lake" which "will require adequate protection of in-stream flows and available habitat, as well as successful recruitment to the spawning run of June sucker naturally produced in the Lake..." In 2001, the JSRIP funded a study to examine the feasibility of establishing an additional spawning location in the Utah Lake system. All tributaries draining into Utah Lake were examined preliminarily and three tributaries, American Fork, Hobble Creek, and Spanish Fork River, were carried forward for detailed analyses (Stamp, et al 2002). Based on the results of the feasibility analysis, the JSRIP decided to pursue establishing an additional spawning run in Hobble Creek, primarily because of the amount of suitable spawning habitat, the high quality of nursery habitat available where Hobble Creek enters Provo Bay, depths and velocities over spawning beds that are similar to those observed in the Provo River, and opportunities for securing necessary flows through the ULS project. Figure F-4 shows the average monthly dry-year flow in Hobble Creek under the ULS Proposed Action. 4,000 acre-feet of water would be provided each year to Hobble Creek as a firm supply (without supplement) shown in Figure F-4. This firm supply would be supplemented in dry years with Bonneville Unit water through the Mapleton-Springville Lateral Pipeline discharged to Hobble Creek to meet the target flows shown in Figure F-4. The Bonneville Unit water would flow down Hobble Creek to Utah Lake for exchange to Jordanelle Reservoir. Figure F-5 shows the average monthly flow in Hobble Creek under the ULS Proposed Action. During an average year, the natural flow during the June sucker spawning and rearing period plus the firm supply of 4,000 acre-feet would meet the target flows for June sucker in Hobble Creek. Figure F-6 shows the average wet-year flow in Hobble Creek under the ULS Proposed Action. During a wet year, the natural flow and firm supply of 4,000 acre-feet would exceed the target flows for June sucker in Hobble Creek. One shortcoming of Hobble Creek for establishing a spawning run is a disconnection between the mouth of the stream and Provo Bay that would limit access of adult June sucker and the transportation of larval June sucker to suitable rearing habitat. In 2002, the JSRIP funded a study to investigate and develop habitat enhancement concepts for lower Hobble Creek. A final report of this study's findings has been submitted to the JSRIP Technical Committee (Stamp et al 2003). Flows that would be provided through the ULS would be one necessary component toward meeting the delisting criterion referenced above. To fully meet this criterion, the JSRIP is pursuing habitat enhancement opportunities and developing concepts for nonnative fish control.

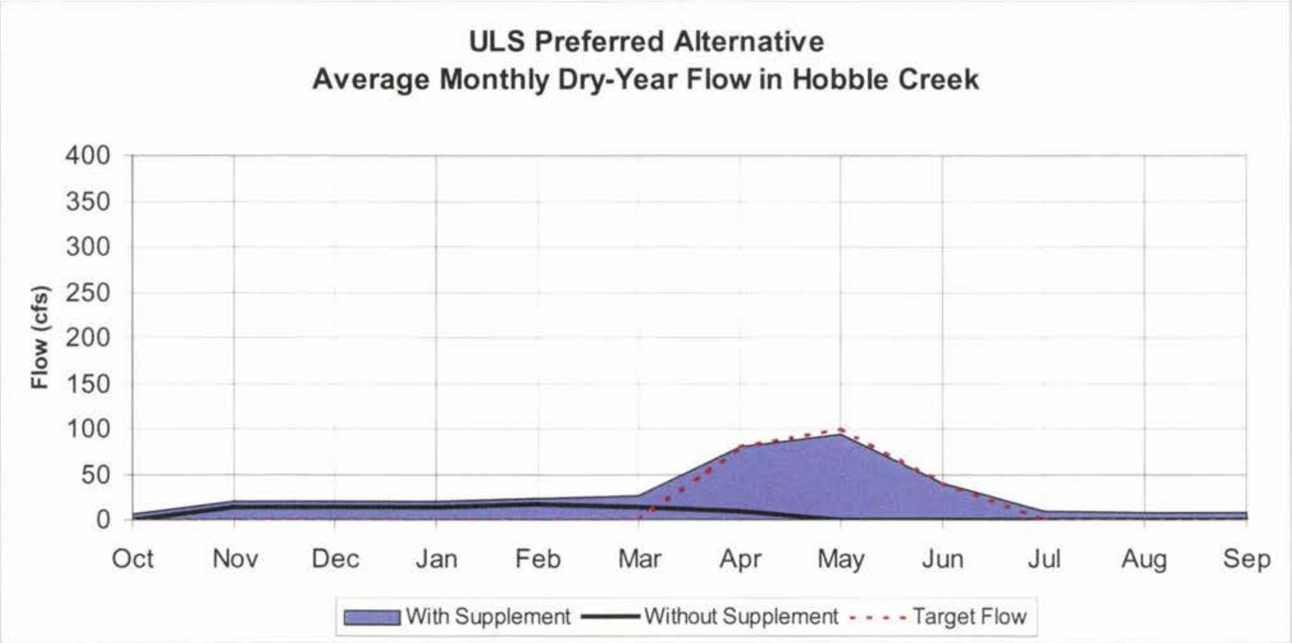


Figure F-4
ULS Proposed Action Average Monthly Dry-Year Flow in Hobble Creek

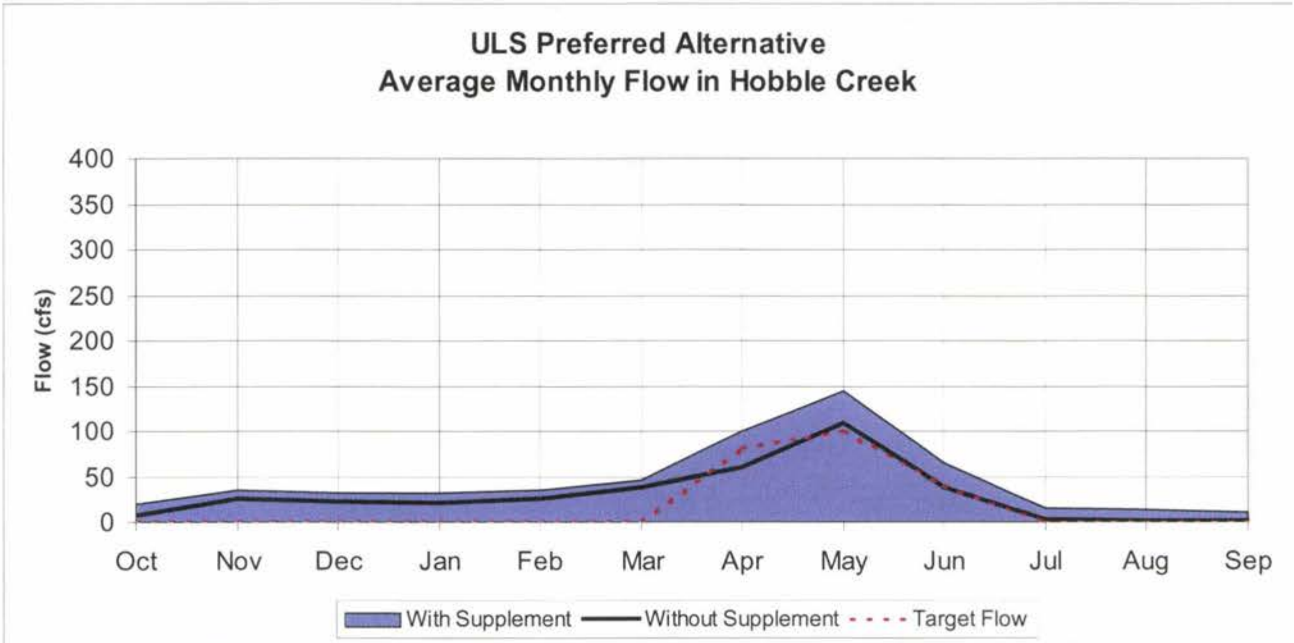


Figure F-5
ULS Proposed Action Average Monthly Flow in Hobble Creek

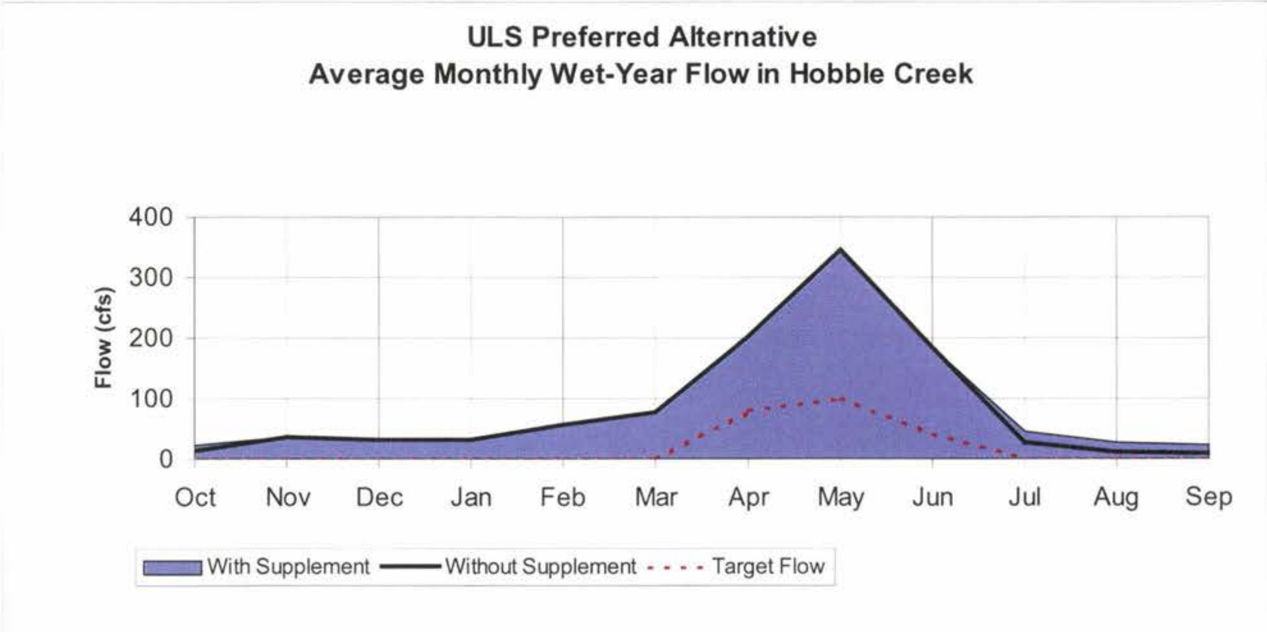


Figure F-6
ULS Proposed Action Average Monthly Wet-Year Flow in Hobble Creek

F.10.2 Ute ladies'-tresses Orchid

Many years of monitoring, research and presentations to academic societies have already been committed to increase the body of knowledge for the Ute ladies'-tresses orchid. It is proposed that this contribution be recognized as conservation measures already performed for this species.

The monitoring program should be carried forward for a number of years (to be determined jointly by the District, Mitigation Commission, and FWS) similar to the pre-operation study. If the changes to the ULT population in Spanish Fork Canyon exceed the variation expected from pre-operation analysis and the critical values established, management guidelines presented in the 1999 Diamond Fork System Biological Assessment may be implemented to mitigate for effects.

If post-operation monitoring results in measured parameters exceeding pre-set critical values, the Diamond Fork System operation has the flexibility to supplement flows in Spanish Fork River. Additionally, a rescue/transplant program could be initiated.

Additional conservation measures would increase the knowledge for this species and meet the following two specific objectives.

- Understand ULT population demography by precisely mapping the existing locations of ULT colonies within the effect area of influence and locations of suitable habitat.
- Document any habitat movement and river course changes and physical changes in ULT habitat on existing maps.

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United States Department of the Interior

FISH AND WILDLIFE SERVICE
UTAH FIELD OFFICE
2369 WEST ORTON CIRCLE, SUITE 50
WEST VALLEY CITY, UTAH 84119

In Reply Refer To
FWS/R6
ES/UT
04-1190

July 23, 2004

Mark A. Brietenbach, P.E.
Project Manager
Central Utah Water Conservancy District
355 West University Parkway
Orem, Utah 84058-7303

RE: Updated Species List for Utah Lake System, Bonneville Unit, Central Utah Project

Dear Mr. Brietenbach:

Based on information provided in your letter of November 20, 2003, below is a list of endangered (E), threatened (T), and candidate (C) species that may occur in the area of influence of your proposed action.

Common Name	Scientific Name	Status
Clay Phacelia	*Phacelia argillacea*	E
Deseret Milkvetch	*Astragalus desereticus*	T
Utah Valvata Snail[6]	*Valvata utahensis*	E
June Sucker[4]	*Chasmistes liorus*	E
Canada Lynx	*Lynx canadensis*	T
Bald Eagle[3]	*Haliaeetus leucocephalus*	T
Bonytail[4,10]	*Gila elegans*	E
Colorado Pikeminnow[4,10]	*Ptychocheilus lucius*	E
Humpback Chub[4,10]	*Gila cypha*	E
Razorback Sucker[4,10]	*Xyrauchen texanus*	E

[3] Wintering populations (only four known nesting pairs in Utah).
[4] Critical habitat designated in this county.
[6] Historical range.
[10] Water depletions from *any* portion of the occupied drainage basin are considered to adversely affect or adversely modify the critical habitat of the endangered fish species, and must be evaluated with regard to the criteria described in the pertinent fish recovery programs.

The proposed action should be reviewed and a determination made if the action will affect any listed species or their critical habitat. If it is determined by the Federal agency, with the written concurrence of the Service, that the action is not likely to adversely affect listed species or critical habitat, the consultation process is complete, and no further action is necessary.

Formal consultation (50 CFR 402.14) is required if the Federal agency determines that an action is "likely to adversely affect" a listed species or will result in jeopardy or adverse modification of critical habitat (50 CFR 402.02). Federal agencies should also confer with the Service on any action which is likely to jeopardize the continued existence of any proposed species or result in the destruction or adverse modification of proposed critical habitat (50 CFR 402.10). A written request for formal consultation or conference should be submitted to the Service with a completed biological assessment and any other relevant information (50 CFR 402.12).

Only a Federal agency can enter into formal Endangered Species Act (ESA) section 7 consultation with the Service. A Federal agency may designate a non-Federal representative to conduct informal consultation or prepare a biological assessment by giving written notice to the Service of such a designation. The ultimate responsibility for compliance with ESA section 7, however, remains with the Federal agency.

Your attention is also directed to section 7(d) of the ESA, as amended, which underscores the requirement that the Federal agency or the applicant shall not make any irreversible or irretrievable commitment of resources during the consultation period which, in effect, would deny the formulation or implementation of reasonable and prudent alternatives regarding their actions on any endangered or threatened species.

Please note that the peregrine falcon which occurs in all counties of Utah was removed from the federal list of endangered and threatened species per Final Rule of August 25, 1999 (64 FR 46542). Protection is still provided for this species under authority of the Migratory Bird Treaty Act (16 U.S.C. 703-712) which makes it unlawful to take, kill, or possess migratory birds, their parts, nests, or eggs. When taking of migratory birds is determined by the applicant to be the only alternative, application for federal and state permits must be made through the appropriate authorities. For take of raptors, their nests, or eggs, Migratory Bird Permits must be obtained through the Service's Migratory Bird Permit Office in Denver at (303) 236-8171.

We recommend use of the *Utah Field Office Guidelines for Raptor Protection from Human and Land Use Disturbances* which were developed in part to provide consistent application of raptor protection measures statewide and provide full compliance with environmental laws regarding raptor protection. Raptor surveys and mitigation measures are provided in the Raptor Guidelines as recommendations to ensure that proposed projects will avoid adverse impacts to raptors, including the peregrine falcon.

The following is a list of species that may occur within the project area and are managed under Conservation Agreements/Strategies. Conservation Agreements are voluntary cooperative plans among resource agencies that identify threats to a species and implement conservation measures to proactively conserve and protect species in decline. Threats that warrant a species listing as a sensitive species by state and federal agencies and as threatened or endangered under the ESA should be significantly reduced or eliminated through implementation of the Conservation Agreement. Project plans should be designed to meet the goals and objectives of these Conservation Agreements.

Common Name	Scientific Name
Bonneville Cutthroat Trout	*Oncorhynchus clarki utah*
Spotted Frog	*Rana luteiventris*

If we can be of further assistance or if you have any questions, please feel free to contact Marianne Crawford of our office at (801)975-3330 extension 134.

Sincerely,

Henry R. Maddux
Utah Field Supervisor

United States Department of the Interior
FISH AND WILDLIFE SERVICE
UTAH FIELD OFFICE
2369 WEST ORTON CIRCLE, SUITE 50
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In Reply Refer To
FWSR6
ES/UT
04-0735

September 8, 2004

Mr. Mark Breitenbach, Project Manager
Central Utah Water Conservancy District
355 West University Parkway
Orem, Utah 84058-7303

RE: Section 7 Consultation on the Utah Lake Drainage Basin Water Delivery System

Dear Mr. Breitenbach:

We have reviewed the draft final Biological Assessment (BA) on the Spanish Fork Canyon - Provo Reservoir Canal (Proposed Action) for the Utah Lake System (ULS) Environmental Impact Statement. The BA is intended to address effects of the Proposed Action on threatened and endangered species according to Section 7(a)(2) of the Endangered Species Act (ESA).

The ULS is the last of the six original systems of the Bonneville Unit of the Central Utah Project (CUP) that would develop central Utah's water resources for municipal and industrial (M&I) supply, irrigation, fish and wildlife and recreation. The ULS evolved from and will replace the Irrigation and Drainage System, which was first identified in the Bonneville Unit Final Environmental Impact Statement in 1973. The other five Bonneville Unit systems are complete and operating or under construction. The ULS, as proposed, will deliver the remaining uncommitted Bonneville Unit water in Strawberry Reservoir as an M&I and supplemental irrigation water supply to the Wasatch Front communities. The Central Utah Water Conservancy District (District), U.S. Department of Interior - Central Utah Project Completion Act Office (DOI-CUPCA) and Utah Reclamation Mitigation and Conservation Commission (Mitigation Commission) are joint-lead agencies (JLA) for purposes of compliance with National Environmental Policy Act (NEPA) and ESA.

The Proposed Action on which this consultation is based would deliver 30,000 acre-feet of Bonneville Unit ULS M&I and secondary water to southern Utah County and 30,000 acre-feet of M&I water to Salt Lake County. Table 1, taken from the biological assessment, summarizes the features of the Proposed Action which would include construction of five new pipelines: 1) from the mouth of Diamond Fork Canyon to the mouth of Spanish Fork Canyon; 2) from the Spanish Fork Canyon Pipeline to Santaquin in southern Utah county; 3)from Santaquin to Mona

Reservoir; 4) from the Spanish Fork Pipeline to Hobble Creek along the Mapleton-Springville Lateral canal alignment; and 5) from the Spanish Fork Canyon Pipeline to the Provo Reservoir Canal.

Table 1. Features of Utah Lake Drainage Basin Water Delivery System
Spanish Fork Canyon - Provo Reservoir Canal Alternative (Proposed Action)

Feature	Description
Water Supply and Delivery	• 30,000 af of Bonneville Unit ULS water to southern Utah county starting in 2016 for secondary M&I use • 30,000 af of Bonneville Unit ULS water to Salt Lake county starting in 2016 for secondary M&I use • 1,590 af of Bonneville Unit CUP M&I water previously contracted to cities in southern Utah county • DOI acquisition of about 57,000 af of District secondary water rights in Utah Lake • 10,200 af conveyance of SVP water to southern Utah county through ULS pipelines • 12,037 af to promote June sucker spawning and rearing in lower Hobble Creek • 16,000 af for in-stream flows in lower Provo River • 12,165 af to enhance June sucker spawning and rearing in lower Provo River
Spanish Fork Canyon Pipeline	7.0-mile steel pipeline 84-inches diameter
Sixth Water Power Facility and Transmission Line	45-MW generator with upgrade of 15.5 miles of existing overhead transmission lines
Upper Diamond Fork Power Facility	5-MW generator with existing underground cable through Tanner Ridge Tunnel to Sixth Water Transmission Line
Spanish Fork-Santaquin Pipeline	17.5-mile steel pipeline ranging from 60- to 36-inches diameter
Santaquin-Mona Reservoir Pipeline	7.7-mile steel pipeline 24-inches diameter (pipeline would be constructed; separate NEPA & ESA compliance would be required on operation and water supply for potential future conservation pool in Mona Reservoir for June sucker refugia
Mapleton-Springville Lateral Pipeline	5.7-mile pipeline ranging from 48- to 30-inches diameter from terminus of Spanish Fork Can yon Pipeline to Hobble Creek
Spanish Fork-Provo Reservoir Canal Pipeline	19.7-mile steel pipeline ranging from 60- to 48-inches diameter

The Proposed Action operation would include the following:

- 30,000 acre-feet of ULS M&I water would be conveyed to Salt Lake County through a combination of existing facilities (Jordan Aqueduct and Provo Reservoir Canal conveyance facilities) to water treatment plants for treatment and culinary supply. This water would be delivered through the Spanish Fork - Provo Reservoir Canal Pipeline to the enclosed Provo Reservoir Canal during the summer months and conveyed to Salt Lake County. During the winter months, the ULS M&I water would be delivered through the Spanish Fork -Provo Reservoir Canal Pipeline to the Jordan Aqueduct and conveyed to Salt Lake County.

- An annual average of 16,273 acre-feet of Bonneville Unit water from Strawberry Reservoir would be released for in-stream flows in Sixth Water Creek and Diamond Fork Creek and flow down the Spanish Fork River to Utah Lake mainly during the winter months. This water would be subsequently exchanged from Utah Lake to Jordanelle Reservoir. The release of this water would meet the 60-cfs winter and 80-cfs summer minimum flows required in Diamond Fork Creek at Monks Hollow.

- As the ULS facilities are completed, but not later than 2030, 30,000 acre-feet of ULS M&I water would be delivered through new pipelines in southern Utah County under a contract with South Utah Valley Municipal Water Association (SUVMWA).

- Up to 10,200 acre-feet of Strawberry Valley Project (SVP) water owned by the cities comprising SUVMWA would be conveyed to cities in southern Utah County.

- Of the 1,590 acre-feet already contracted to SUVMWA, 590 acre-feet of Bonneville Unit would continue to be used by SUVMWA member cities as secondary M&I water.

- Hydroelectric power would be generated from the M&I water conveyance and contracted to the Western Area Power Administration.

- An annual average of 16,000 acre-feet of water would be delivered to the lower Provo River to assist meeting the in-stream flows towards meeting the 75-cfs target flow and subsequent exchange from Utah Lake to Jordanelle Reservoir. This water would be conveyed through the Spanish Fork - Provo Reservoir Canal Pipeline and discharged to the Provo River at the pipeline crossing. A minimum 75-cfs flow normally occurs in the river between the Olmsted and Murdock diversions during the summer months when releases are made from Deer Creel Reservoir.

- Under the Deer Creek Reservoir-Jordanelle Reservoir operating agreement, an average annual 12,165 acre-feet of water would be provided as flows for June sucker spawning and rearing in the lower Provo River to meet JSRIP goals annually.

- Approximately 3,300 acre-feet of lower Provo River water rights already purchased by the Mitigation Commission would flow undiverted to Utah Lake, thereby increasing the summertime flow in the lower Provo River.

- Discharge from the Mapleton-Springville Lateral pipeline into Hobble Creek would consist of 4,000 acre-feet annually to promote June sucker spawning and rearing in lower Hobble Creek, and an annual average of 8,037 acre-feet available throughout the year to provide in-stream maintenance flows. The annual average of 8,037 acre-feet would range from 0 to 32,136 acre-feet depending on the hydrologic year. This water would be part of the exchange from Utah Lake to Jordanelle Reservoir.

As part of this Section 7 Consultation with the JLA, the US Fish and Wildlife Service (Service) concurs with the consultation history as presented in Section 1.5 of the BA which includes previously completed, ongoing, and future environmental commitments of various CUP projects. For clarity in the consultation history, it should be noted that the Bureau of Reclamation (Reclamation) was the lead agency for CUP until legislation for the Central Utah Project Completion Act of 1992 (CUPCA) was enacted. Subsequently, the Cental Utah Water Conservancy District became the lead agency in construction and administration of CUP projects, the Mitigation Commission was given the authority to design, fund and implement projects to offset the impacts to fish, wildlife and related recreation caused by CUP; and DOI-CUPCA was directed to administer funds for CUPCA. As such, with the enactment of CUPCA, the District, the Mitigation Commission and DOI-CUPCA became lead agencies for CUP projects, past and future, and assumed responsibility for ongoing and future environmental commitments including compliance with ESA. Therefore, reference to past CUP projects and commitments implies responsibility by the JLA except where Reclamation has been issued specific Reasonable and Prudent Actions (RPA's) for which it is responsible or retained specific authorities and responsibilities.

Consultation History

The following describes relevant consultation history to ULS and specifically the June Sucker and Ute ladies'-tresses. The June sucker, *Chasmistes liorus*, was listed as endangered under the Endangered Species Act (ESA) on April 30, 1986. Ute ladies'-tresses, *Spiranthes diluvialis*, was listed as a threatened plant species on January 17, 1992.

The first consultation involving the June Sucker was concluded on a December 11, 1986 with a concurrence letter on the supplement to the Biological Assessment for the M&I System of the Bonneville Unit which included construction of Jordanelle Dam and associated water development. The Service concurred with Reclamation on its determination of 'no effect' on June sucker. As stated in the letter, this concurrence was based on modeling of flow and habitat relationships that concluded no negative impact to habitat. It was noted in the letter that the level of knowledge on the ecological requirements of June sucker at the time could have been insufficient to identify negative impacts that could result from the significant reduction in spring discharges in the Provo River expected from the M&I System. The Service further suggested that construction of a fish weir would allow monitoring of the project to assure that conclusions were correct.

In 1994 the Service issued the Biological Opinion for the Provo River Project (PRP) that stated the PRP, as operated, was likely to jeopardize the continued existence of June sucker and adversely modify designated critical habitat. The Service also concurred with Reclamation's finding that there was no effect on Ute ladies'- tresses, but provided conservation recommendations for that species. The RPA for June sucker was primarily based on the establishment and protection of flows in the Provo River. The RPA called for a range of research flows and associated studies over a three year period (1995-1997) and at the end of the 3-year study when data was available, determine June sucker flow needs and define the size of the permanent block of water to be acquired and delivered by Reclamation for June sucker needs. The following summarizes the RPA's in the 1994 Biological Opinion for the Provo River Project and the Conservation Recommendations for June sucker and Ute ladies'-tresses:

RPA's

9. Reclamation will identify, acquire, and permanently store a block of water to augment Provo River flows during June sucker spawning and rearing activities, the volume of which will be determined from the 1995-1997 studies identified in the Biological Opinion.

10. Reclamation will ensure that Provo Water Users Association's operation of Deer Creek Reservoir, especially during periods of importation of Weber and Duchesne River water to Utah Lake, are provided as necessary to ensure activities leading up to or during importation do not adversely alter the timing, magnitude, and/or duration of June sucker research flow.

11. A permanent water quality monitoring station will be established within critical habitat. This station would be monitored by Reclamation personnel immediately prior to and during June sucker occupation of the Provo River to determine if suitable water quality exists for adult and larval June sucker riverine needs. As necessary to protect June sucker, adjustment in flow releases would subsequently be accomplished by Reclamation to enhance water quality and quantity conditions

12. Reclamation will actively cooperate with the FWS and other members of the Provo River Resource Team or a subteam thereof to successfully implement the above activities. The Team would meet at least twice a year to specifically discuss June sucker needs, water year scenarios, options to assist recovery efforts and activities to implement the RPA. Reclamation and FWS would share co-lead for ensuring timely Team meetings, discussions and actions.

Conservation Measures for Ute ladies'-tresses:

1. Areas potentially impacted by water and land management activities should be surveyed for the orchid prior to initiating management changes. Particular attention should be given to areas where hydrologic changes are likely to occur.

2. Management planning and implementation should be coordinated with the orchid Recovery Team to ensure compatibility with Recovery Plan goals and guidelines. Orchid recovery is dependent upon watershed and stream management that maintains, restores, or enhances natural stream dynamics, including movement of streams within their floodplains. Therefore, proposed management activities within affected watersheds should be reviewed for their compatibility with these goals. Activities also should be evaluated for their potential to create or exacerbate problems with noxious plant species and recreational use in potential orchid habitat.

Conservation Measures for June sucker:

1. Reclamation should provide technical support and participation in the Utah Lake Fish Management Team (Team). This Team is currently reviewing native/nonnative fish interaction habitat alteration issues in Utah Lake and its tributary inflow areas and will be developing management recommendations that will have impact on future fish management, Utah Lake levels, and Provo River flow decisions.

2. Reclamation should work to minimize Utah Lake water level fluctuations that occur partially as a result of Reclamation's historic projects. Water surface elevation stabilization to historic conditions would enhance vegetation colonization, thereby creating critical in-lake nursery rearing habitat for young June sucker.

3. Reclamation should review, with UDWR, fish management in Reclamation's Provo River drainage facilities to ensure introduced species compatibility with native fish populations. Reclamation also should investigate fish entrainment occurrence at Deer Creek and Jordanelle Reservoirs and develop plans to reduce incidental movement of nonnative species, both forage and sportfish species, into occupied endangered species habitat.

Since the 1994 Biological Opinion for the Provo River Project, the District and Reclamation have addressed the RPA's defined in the document. The status of these actions are as follows:

- Flow studies were conducted from 1995-1997 that provided some insights into flow needs for June sucker (Keleher et al. 1998).

- Reclamation has ensured that Provo River Water Users Associations's operation of Deer Creek Reservoir is independent of ULS and the Bonneville Unit of the CUP. During periods of Weber and Duchesne River water importation to Utah Lake, delivery will be provided as necessary to ensure activities leading up to or during importation do not adversely alter the timing magnitude, and/or duration of flow.

- A permanent water quality monitoring station has been established within critical habitat.
- The Provo River Flow Workgroup meets at least twice each year to coordinate flows and discuss June sucker needs, water year scenarios, and options to assist recovery efforts.

In 1999 the Service issued a Biological Opinion to the JLA on the 1999 Diamond Fork Supplement (1999 FS-FEIS) to the 1990 Supplement to the 1984 Final EIS for the Bonneville Unit of the CUP. The Biological Opinion stated that the project would not jeopardize the continued existence of the June sucker or Ute ladies'-tresses based on the commitment by the Joint Lead Agencies to implement the following conservation measures as part of the proposed action:

1. The JLA will identify, acquire and permanently provide a block of water for flows in the lower Provo river through critical habitat in perpetuity for June sucker.
2. The District in cooperation with the other Provo River water users, FWS, and other members of the Provo River Flow Workgroup, will agree on operational scenarios that mimic dry, moderate and wet years. The District, with the support of the JLA and Provo River water users, will apply operational scenarios to the annual Provo River operation to benefit June sucker.
3. The JLA, in cooperation with the State of Utah and the FWS, will work toward establishment of a refugium in Red Butte Reservoir for June sucker.
4. The JLA will participate in the development of a Recovery Implementation Program (RIP) for June Sucker.
5. Any future development of the Bonneville Unit of CUP will be contingent on the RIP making sufficient progress towards recovery of June sucker.
6. A commitment is made to continue monitoring ULT during the construction period prior to project operation to establish a credible baseline.
7. Data collection following project implementation should include measurements of actual stream elevations relative to ULT colony locations. This will allow the Service to verify the model and its results. If there are significant discrepancies, the model should be modified and additionally, a new impact assessment completed. Additionally, the JLA should perform aerial mapping at a resolution sufficient to record stream channel geomorphology, vegetation community, and orchid colony locations in several-year intervals to help better understand changes and evaluate their significance in relation to restoration and conservation goals.

8. Changes in vegetation communities in occupied or potentially suitable orchid habitat should be measured along Diamond Fork Creek and Spanish Fork Canyon.

9. The natural variation in Ute ladies'-tresses orchid demography, population vigor, and habitat should be characterized under baseline conditions.

10. The natural variation in Ute ladies'-tresses orchid demography, population vigor, and habitat should be characterized following implementation of proposed operation flows.

11. The Three Forks colony should be monitored to better understand the process of loss of viability and eventual extirpation of colonies. Monitoring should focus on the rate of loss, identifying which parameters are best to measure to determine if loss is occurring, etc.

12. Conservation measures in addition to altering flows and rescue/transplant should be considered, such as vegetation manipulation, providing supplemental water to colonies, and mechanical reconfiguration of portions of the stream channel or floodplain surfaces, if monitoring data show streamflow hydrology is adversely affecting the Ute ladies'-tresses orchid population.

13. If pollination is determined to be a limiting factor to long-term orchid viability and successful colonization of new habitats, then the JLA will consider actions to enhance pollinator habitat or numbers as appropriate.

14. A methodology should be developed that would monitor changes in Ute ladies'-tresses orchid habitat quality, and the methodology should be used to establish habitat quality parameters of the population.

15. Population viability parameters and "red-flag" conditions should be established for the habitat quality parameters.

16. The accuracy of the predicted effects analysis should be measured.

17. Timing for performing the most accurate canyon-wide Ute ladies'-tresses orchid counts should be evaluated.

18. The relationship between river hydrology, depth to soil water, soil moisture, soil characteristics and Ute ladies'-tresses orchid colonies should be correlated.

The status of these conservation measures included as part of Diamond Fork proposed action is as follows:

- The JLA acquired water through willing sellers and CUPCA Section 207 conservation projects. Some of this water is available on a temporary basis and some is a permanent supply.

- Operational scenarios to mimic dry, moderate and wet years have been developed by the District and coordinated through the Provo River Flows Workgroup since 1999. The flows have been operated in accordance with these operating scenarios.

- The District is acquiring title to the Red Butte Dam and Reservoir and is completing the necessary rehabilitation. This facility will then continue to be used as a refugium for June sucker.

- The JSRIP was formally adopted in April 2002. The District was pivotal in developing the JSRIP by chairing both the Drafting Committee for the formal Program Document, and the Organizing Committee. An Environmental Assessment and FONSI was prepared for federal participation in the Program. The JLA have maintained active participation in the JSRIP, and have committed funds and in-kind services.

- The JLA have continued to move forward within their authorities to provide conditions to promote the recovery of the June sucker and have coordinated with partners to the JSRIP in funding and implementing other actions.

- The District has been monitoring Ute ladies'-tresses during the construction period.

- The monitoring has included measuring demography, population vigor, and habitat characterization under baseline conditions.

The remaining conservation measures for Ute ladies'-tresses will be initiated during 2004 when Diamond Fork System construction is completed and the Diamond Fork System is commencing interim operation as described in the 1999 Final Supplement.

In addition to the above conservation measures, additional conservation recommendations were included in the 1999 Diamond Fork BO for June sucker as follows:

1. The JLA, in cooperation with the FWS and the June Sucker Flow Workgroup, should model reservoir operations and Provo River flows (using a new approach of operational scenarios that mimic dry, moderate and wet years) over the period of record to determine how this approach meets the needs of water users and reservoir operation as well as meet flow requirements for June sucker.

2. The JLA, in cooperation with the FWS and the June Sucker Technical Workgroup, should determine the feasibility of restoring the lower Provo River to obtain past habitat characteristics and complexity. The lower Provo River historically had a complex delta system, which provided braided, slow, meandering channels. This delta system provided low velocity habitat as a refuge and rearing habitat for larval and juvenile June sucker.

Re-establishment of the delta system may provide habitat needed by larval and juvenile June sucker to obtain size needed to reduce predation by nonnative fishes.

3. The JLA, in cooperation with the FWS and the June Sucker Technical Workgroup, should determine the feasibility of the Spanish Fork River as an additional self-sustaining June sucker spawning run in Utah Lake. The June Sucker Recovery Plan identifies the need for a second spawning run for delisting of the species. Completion of the Diamond Fork System allows the opportunity for the JLA to determine habitat needs and availability and flow requirements to establish a second river for a June sucker spawning run.

The status of these conservation recommendations is as follows:

- A flow approach developed by the District was incorporated into the modeling effort for the lower Provo River as part of the ULS planning effort. The results of the analysis incorporate water that would be supplied under the ULS and are included in the hydrology and impact analysis documented in the EIS.

- A feasibility study for enhancing lower Provo River habitat was conducted under the JSRIP (Bio-West 2002).

- A study to examine the feasibility of establishing an additional spawning location for June sucker was conducted under the JSRIP (Stamp et al. 2002). JSRIP committees decided to pursue the development of a spawning run on Hobble Creek and funded a study to develop habitat enhancement concepts for lower Hobble Creek (Stamp et al. 2003).

Potential Impacts of the ULS Proposed Action

June sucker

Features of the Proposed Action that could potentially affect June sucker include:

1) Hydrologic changes in the lower Provo River

2) Impacts to juvenile habitat

3) Improvement of habitat for nonnatives

4) Changes in spawning habitat

5) Increase in phosphorous loading

6) Hydrologic changes in the Spanish Fork river

Hydrologic changes from the project would effect June sucker in the lower Provo River. Based on modeling results presented, including all three habitat niches used by June sucker in the Provo River, total available habitat under the Proposed Action would significantly increase compared to baseline conditions (CUWCD 2004). Modeling in both reaches of the Provo River indicated that the moderate/mid-depth habitat niche would experience significant increases under the Proposed Action, although predicted habitat increases in the moderate/mid-depth habitat niche could cause some indirect negative effects on June sucker by improving habitat suitability for predatory fish species, such as brown trout, white bass and walleye. Slow water habitats are projected to decrease significantly under the Proposed Action in the reach between Tanner Race Diversion and Fort Field Diversion, and less significantly in the reach between Fort Field Diversion and Utah Lake compared to baseline conditions. In both reaches of the Provo River, the small magnitude of projected habitat decreases for early life stages would be offset by large predicted habitat gains for spawning June sucker. However the improved spawning habitat may not be accessible from the lake except for years of extremely high water. July flow increases in both reaches of the Provo River would provide a benefit to young-of-year June sucker (CUWCD 2004).

Phosphorous loading is not addressed in the BA however it has potential impacts to Utah Lake and consequently to June sucker. Phosphorous is a pollution indicator and currently exceeds recommended levels in both Utah Lake and the Provo River (URMCC 2004). Elevated phosphorous levels stimulate plant and algae production and increase.

Spanish Fork River downstream of the Highway 6/Highway 89 junction will experience significant permanent detrimental impacts due to further dewatering in the summer and additional water flows in the winter. Significant restoration may not be possible unless new summer water supplies are found.

The June Sucker Recovery Plan (USFWS 1999) identifies the need to establish and maintain spawning stocks in other viable tributaries to Utah Lake. A study conducted in 2001 (Bio-West, Inc. 2002b) examined the potential of all tributaries entering Utah Lake to serve as additional spawning locations. Hobble Creek is currently being targeted as an additional spawning area. However other tributaries, such as Spanish Fork River and American Fork River, may prove important for June sucker recovery if attempts on Hobble Creek are unsuccessful, and/or if it is determined that additional spawning habitat may assist in achieving recovery.

Conservation Measures and Monitoring for June sucker:

> Conservation measures for June sucker that were identified in the recovery plan (FWS 1999) are being coordinated through the JSRIP. The JLA have been participating in the SJRIP to support June sucker recovery.

Overall the Service anticipates net benefits will accrue to the June sucker from the Proposed Action as a result of several important operations. These include:

1. Delivery of up to 16,000 acre-feet of water through the Spanish Fork- Provo Reservoir

Canal to the lower Provo River to be used towards meeting a 75 cfs target flow.

2. Delivery of an average annual 12,165 acre-feet under the Deer Creek-Jordanelle Reservoir operating agreement as flows for June sucker spawning and rearing.

3. Delivery of 3,300 acre-feet of lower Provo River water rights purchased by the Mitigation Commission undiverted to Utah Lake, increasing summertime flow in the lower Provo River

4. Delivery of approximately 12,037 acre-feet of water through the Mapleton-Springville Lateral pipeline for discharge into Hobble Creek. Approximate 4,000 acre-feet would be available for June Sucker spawning and rearing. The remaining 8,037 would be available throughout the year for instream flows.

Ute ladies'-tresses

Features of the Proposed Action that could potentially impact ULT include:

1) Hydrology changes along the occupied reach of the Spanish Fork River

2) Increase in noxious and invasive or native competitive plant species in occupied or potential suitable habitat resulting from changes in hydrology

There are 10 colonies of ULT along the Spanish Fork River between the Diamond Fork Creek confluence and the Castilla gaging station. Three of the colonies are located at the confluence of Diamond Fork Creek. The remainder are scattered downstream.

The effects of the interim flow regime on ULT were evaluated in the 1999 Diamond Fork Biological Opinion. However, the interim flow regime (baseline flows for ULS) in Spanish Fork River differs somewhat from that presented in the 1999 FS-FEIS because the hydrologic period used is different and because the exchange water delivered during the interim period will be primarily delivered in the winter rather than evenly throughout the year.

For ULS impact analysis on ULT, a HEC-RAS analysis was conducted at two Spanish Fork River crossings. The historic, baseline, and Proposed Action flows were evaluated. Historic flows are the conditions in the Spanish Fork River prior to the 1999 FS-FEIS. Baseline conditions represent the interim flow regime for the period commencing with completion of the Diamond Fork System and terminating upon completion of ULS. The Proposed Action flows represent flows when ULS is completed and operational. Table F-12, page F-45 of the ULS Biological Assessment presents and compares the three flow scenarios.

During the interim period, flows during the irrigation season will not change substantially from what has occurred historically because delivery of SVP water will continue to be discharged at the mouth of Diamond Fork Creek. Winter flows will change, however, as varying amounts of exchange water (depending upon contracts and water year) will be delivered during the winter months. When ULS is completed, CUP project water, including the exchange water, will be delivered primarily in the Diamond Fork and Spanish Fork pipelines unless additional flows are needed to facilitate Diamond Fork Creek restoration or complete exchange water requirements. SVP water will continue to be released at the mouth of Diamond Fork Creek into the Spanish Fork River. Therefore, flows in the Spanish Fork River once ULS becomes operational will more nearly resemble historical flows.

Conservation Measures and Monitoring for Ute ladies'-tresses:

> The FWS acknowledges as a conservation measure the contribution of the many years of monitoring, research, and presentations to academic societies that have been committed by the JLA to increase the body of knowledge for Ute ladies'-tresses.
>
> The monitoring program should be carried forward for a number of years (to be determined jointly by the District, Mitigatoin Commission, and FWS) similar to the pre-operation study in Diamond Fork. If the changes to the ULT population in Spanish Fork Canyon exceed the variation expected from pre-operation analysis and the critical values established, management guidelines presented in the 1999 Diamond Fork Biological Opinion may be implemented to compensate for impacts.
>
> If post-operation monitoring results in measured parameters exceeding pre-set critical values, the Diamond Fork System operatiaon has the flexibility to supplement flows in Spanish Fork River. Other measures, such as a rescue/transplant program, could be initiated.
>
> Additional conservation measures would increase the knowledge of this species and meet the following two specific objectives:
>
> - Understand ULT population demography by precisely mapping the existing locations of ULT colonies with the effect area of influence and locations of suitable habitat.
> - Document any habitat movement and river course changes and physical changes in ULT habitat on existing maps and GIS.

The 1999 Diamond Fork BO concurred with the conclusion that the interim operation (ULS baseline) would have low potential for impacts to ULT in the occupied reach of the Spanish Fork River. The ULS HEC-RAS analysis indicates that the Proposed Action river stage decreases would range from 0.1 to 0.7 feet from baseline conditions and would not be substantially different from historic conditions. Therefore, there would be low potential for effect for the ULS Proposed Action.

Other Species

No impacts, construction or operational, to bonytail, Colorado pikeminnow, razorback sucker and humpback chub are expected and water depletion impacts are covered under the USFWS Final Biological Opinion, July 29, 1998 for the Duchesne River Basin, Utah. In addition, based on the information presented in the EIS and BA no impacts are expected to occur to Utah valvata, clay phacelia, bald eagle, Canada lynx, deseret milkvetch or the western yellow-billed cuckoo.

Conclusion

In conclusion the Service concurs with the determination in the BA that the Proposed Action will have no effect on the endangered bonytail, Colorado pikeminnow, razorback sucker, humpback chub, Utah valvata, and clay phacelia, the threatened bald eagle, Canada lynx, and deseret milkvetch, and the candidate western yellow-billed cuckoo. In addition, the Service concurs with the determination in the BA that the Proposed Action may affect but is not likely to adversely affect the endangered June sucker, designated critical habitat, and the threatened Ute ladies'-tresses. This concurrence is based on the implementation of the four operations described on pages 11 and 12 of this letter as part of the Proposed Action and a continued commitment to implement the Conservation Measures and Conservation Recommendations included in the 1999 Diamond Fork BO, the 1994 PRP BO, and this ULS BO. Should project plans change, or if additional information on the distribution of listed or proposed species becomes available, this determination may be reconsidered.

Only a Federal agency can enter into formal Endangered Species Act section 7 consultation with the Service. A Federal agency may designate a non-Federal representative to conduct informal consultation or prepare a biological assessment by giving written notice to the Service of such a designation. The ultimate responsibility for compliance with ESA section 7, however, remains with the Federal agency.

We appreciate your interest in conserving endangered species. If further assistance is needed or you have any questions, please contact Marianne Crawford or Lucy Jordan, Fish and Wildlife Biologists, at (801) 975-3330 extension 134 and 143 respectively.

Sincerely,

H R. Maddux

Henry R. Maddux
Utah Field Supervisor

cc: URMCC (Attn: Mike Weland)
DOI - CUP Completion Act Office (Attn: Ron Johnston)

14

United States Department of the Interior

FISH AND WILDLIFE SERVICE

UTAH FIELD OFFICE
2369 WEST ORTON CIRCLE, SUITE 50
WEST VALLEY CITY, UTAH 84119

In Reply Refer To
FWS/R6
ES/UT
04-1148

July 16, 2004

Mr. Mark Breitenbach, Project Manager
Central Utah Water Conservancy District
355 West University Parkway
Orem, Utah 84058-7303

RE: Utah Lake Drainage Basin Water Delivery System Compliance with CUP Completion Act Section 205(a)(3), Prevention of Environmental Contaminants

Dear Mr. Breitenbach:

The U.S. Fish and Wildlife Service (Service) has reviewed the Surface Water Quality Technical Report (Report) dated March 2004, prepared as part of planning and NEPA compliance for the Utah Lake Drainage Basin Water Delivery System (ULS). Our review primarily focused on the Spanish Fork Canyon-Provo Reservoir Canal Alternative (Preferred Alternative). We find the Report sufficient for purposes of compliance with the requirements of the CUP Completion Act Section 205(a)(3), which requires that for project approval "a plan has been developed with and approved by the United States Fish and Wildlife Service to prevent any harmful contamination of waters due to concentrations of selenium or other such toxicants, if the Service determines that development of the particular system may result in such contamination." Further, we concur with the conclusion of the Report that the ULS, as presently described and planned, will not result in harmful contamination of waters due to selenium or other such toxicants.

We are aware that the Central Utah Project Bonneville Unit, including the ULS, is one of many contributors to water quality problems in Utah Lake, particularly with regard to phosphorus and total dissolved solids. We encourage, and expect, that the Central Utah Water Conservancy District and the other joint lead agencies (Department of Interior CUP Completion Act Office and Utah Reclamation Mitigation and Conservation Commission) will participate in the State of Utah's process for establishing TMDL's for Utah Lake and take appropriate efforts to help meet standards established through that process.

If you need further assistance, please contact Bruce Waddell, Environmental Contaminants Specialist, at the letterhead address or (801) 975-3330 ext. 125, or email: bruce_waddell@fws.gov.

Sincerely,

for Henry R. Maddux
Utah Field Supervisor

cc: DOI CUP Completion Act Office (Attn: Ron Johnston)
URMCC (Attn: Mike Weland)

United States Department of the Interior
FISH AND WILDLIFE SERVICE
UTAH FIELD OFFICE
2369 WEST ORTON CIRCLE, SUITE 50
WEST VALLEY CITY, UTAH 84119

September 16, 2004

In Reply Refer To
FWS/R6
ES/UT

Mr. Don A. Christiansen, General Manager
Central Utah Water Conservancy District
355 West University Parkway
Orem, Utah 84058-7303

Dear Mr. Christiansen:

This is the U.S. Fish and Wildlife Service's (Service) Planning Aid Memorandum for the Utah Lake Drainage Basin Water Delivery System (ULS). This document has been prepared in cooperation with the Utah Division of Wildlife Resources (UDWR). By letter dated September 15, 2004, (attached in Appendix C) UDWR concurs with this Planning Aid Memorandum. We are issuing this memorandum under the authority of the Fish and Wildlife Coordination Act (48 Stat. 401; as amended, 16 U.S.C. 661 et seq.). This document includes site specific analyses of two action alternatives and a no action alternative as presented in the ULS Draft Environmental Impact Statement (DEIS) (Volume 1 & 2) dated March 2004.

BACKGROUND

The ULS will complete the Bonneville Unit of the Central Utah Project (CUP). The project will allow CUP water developed in the Uinta Basin and stored in Strawberry Reservoir to be delivered for municipal, industrial, agricultural, and environmental uses along the Wasatch Front. Specifically, the project would make available approximately 30,000 acre-feet of water to southern Utah County and 30,000 acre-feet to Salt Lake County as well as contributing to minimum flows necessary for conservation and recovery of June sucker, an endangered fish species. The project would consist of pipelines in Spanish Fork Canyon, to Hobble Creek, to the Provo River, and to Santaquin. These pipelines would be mostly located along road rights of way or in existing canals in urban areas.

AUTHORITY FOR PROJECT

The CUP was authorized for construction as a participating project under the Colorado River Storage Project Act of 1956 (43 United States Code [USC] 620). The Bonneville Unit was one of several authorized units under the original CUP authorization. For planning and coordination purposes the Bonneville Unit was initially divided into six systems according to location and function. These systems are 1) the Starvation Collection System, 2) the Strawberry Collection System, 3) the Ute Indian Tribal Development, 4) the Diamond Fork Power System, re-authorized by the Central Utah Project Completion Act (CUPCA) as the Diamond Fork System, 5) the Municipal and Industrial System (M&I System), and 6) the Irrigation and Drainage System (I&D System). The I&D System was re-authorized by CUPCA and replaced by the Spanish Fork

Canyon-Nephi Irrigation System (SFN System) in 1995 when Sevier and Millard counties in the lower Sevier River Basin chose to withdraw from the District and were removed from the Bonneville Unit irrigation water service area. Planning on the SFN System was discontinued in 1998. Pursuant to Section 202(a)(1) of CUPCA, as amended, a new planning process was initiated in 2000 on the ULS. The ULS is a replacement system for the I&D System. The ULS is now proposed to deliver the remaining uncommitted Bonneville Unit water in Strawberry Reservoir as a municipal and industrial water supply to Wasatch Front communities.

PURPOSE AND NEED

As joint-lead agencies the Central Utah Water Conservancy District (District), U.S. Department of Interior's Central Utah Project Completion Act Office (DOI), and the Utah Reclamation Mitigation and Conservation Commission (Mitigation Commission) initially developed the purpose and need statement following a September 2000 public meeting and after requests for project water were received and analyzed. The purpose and need statement and results of the water needs analysis were presented at a public meeting on October 17, 2001, where additional public comment was solicited. The purpose and need statement was modified to include project power because the CUPCA Amendment (PL 107-366) enacted in December 2002 authorized the appropriation of funds to construct power facilities.

The joint-lead agencies finalized a purpose and need statement to guide them through the planning process and development of the DEIS. The statement defines the underlying needs to which the selected plan and any alternatives must respond, and the attendant purposes of the ULS.

Needs

To complete the Bonneville Unit by delivering 101,900 acre-feet on an average annual basis from Strawberry Reservoir to the Wasatch Front Area and project water from other sources to meet some of the M&I demands in the Wasatch Front Area, to implement water conservation measures, to address all remaining environmental commitments associated with the Bonneville Unit, and to maximize current and future M&I water supplies associated with the Bonneville Unit.

Purposes

1. To protect water quality of surface and underground water resources that may be affected by Bonneville Unit completion
2. To provide creative methods, facilities and incentives to implement water conservation measures, reuse and conjunctive use of water resources
3. To participate in the implementation of the June Sucker Recovery Implementation Program
4. To provide previously committed in-stream flows within the Bonneville Unit area and statutorily mandated in-stream flows, and assist in improving fish, wildlife and related recreational resources
5. To provide for the United States to acquire adequate District water rights in Utah Lake to implement the ULS and other water rights as authorized by CUPCA
6. To continue to provide Bonneville Unit water in accordance with existing contracts
7. To develop project power

BASELINE CONDITIONS

Baseline conditions include: 1) past and present impacts of all Federal, state and private actions and other human activities in the effect area of influence; 2) the anticipated effects of all proposed Federal projects in the effect area of influence that have already undergone formal or early Section 7 consultation; and 3) the impact of state or private actions contemporaneous with the consultation process.

Baseline conditions in the Provo River were assumed to be full operation of the M&I System. Baseline conditions in the Spanish Fork River were assumed to be the same as the Interim Operation of the Diamond Fork System Proposed Action, which releases 86,100 acre-feet of water into the mouth of Diamond Fork Creek and is conveyed via the Spanish Fork River to Utah Lake throughout the year.

Chapter 3 of the ULS DEIS details baseline conditions for Surface Water Quality, Aquatic Resources, Wetland Resources, Wildlife Resources and Habitats, Threatened and Endangered Species, Recreational Resources, and Sensitive Species. The following section provides a brief summary of baseline conditions for these resource categories.

Surface Water Quality

Utah Lake

Utah Lake serves primarily as an irrigation water supply source for lands in northern Utah and Salt Lake counties. The water quality is generally adequate for most irrigation uses, but is not suitable for direct use in potable water systems. Although Utah lake water quality periodically exceeds State water quality standards for several parameters, the two issues of primary concern with respect to the ULS alternatives are total phosphorus and total dissolved solids (TDS). Total average historic phosphorus load to Utah Lake is estimated at 291.6 tons per year and average simulated baseline phosphorus load to Utah Lake would be 294.8 tons per year resulting from the Bonneville Unit water conveyed through the Spanish Fork River and depletions on the Provo River. Limited TDS sampling conducted on 9 days in the 1990 to 1999 period found one day where the TDS concentration exceeded the agricultural use criterion of 1,200 mg/L.

Provo River

Baseline conditions for dissolved oxygen, water temperature, TDS, pH, nitrate plus nitrite, ammonia, and selenium were all within state water quality standards or pollution indicator levels on a monthly basis and in the normal range for streams in northern Utah for sampling conducted beginning in 1990. Baseline total phosphorus concentrations exceeded the Utah pollution indicator for stream and rivers in May and September, likely because of spring and fall turnover conditions occurring in Deer Creek Reservoir.

Hobble Creek

Baseline conditions for dissolved oxygen, water temperature, TDS, pH, nitrate plus nitrite, ammonia, and selenium were all within state water quality standards or pollution indicator levels on a monthly basis and in the normal range for streams in northern Utah for sampling conducted beginning in 1990. Baseline water temperatures exceeded the Utah water quality standard for coldwater game fisheries in July, and baseline total phosphorus concentrations exceeded the Utah pollution indicator for streams and rivers in May.

Spanish Fork River
Baseline conditions for dissolved oxygen, water temperature, TDS, pH, nitrate plus nitrite, ammonia, and selenium were all within state water quality standards or pollution indicator levels on a monthly basis and in the normal range for streams in northern Utah for sampling conducted beginning in 1990. Historic baseline total phosphorus concentrations in the upper Spanish Fork River exceed the Utah pollution indicator for streams and rivers from May through October. Historic baseline total phosphorus concentrations in the lower Spanish Fork River exceeded the Utah pollution indicator for streams and rivers from January through October.

Aquatic Resources

Habitat
The Provo River has been channelized and levied along the majority of its course from Deer Creek Dam to its confluence with Utah Lake. Channelization has occurred in the canyon bound section of the Provo River to accommodate highway, railroad, and trail construction. In the lower section of the river, channelization has occurred to accommodate residential and commercial development in historic floodplain areas. Flows in the lower Provo River vary by season and are dependent on releases from Deer Creek Dam, operations of the nine diversions, and the inputs of tributaries in this stretch of river.

Hobble Creek has an average annual discharge of approximately 40 cfs. Flows in Hobble Creek vary by season and are affected by six diversions in the Wasatch Front area. As the creek flows west toward Utah Lake, agricultural land and industrial areas are more predominant and there is less streamside vegetation. Historic data showed that water temperature occasionally exceeded State of Utah water quality standards for water temperature. Data indicated that total dissolved solids and dissolved oxygen did not exceed State of Utah water quality standards in Hobble Creek. Water temperature exceedances generally occurred at a station at the lower end of Hobble Creek near Utah Lake.

From the Diamond Fork Creek Confluence to Lakeshore Diversion, the Spanish Fork River habitat condition is impacted by human disturbance. Upper reaches of the river have been confined by railroad and road grades and lower reaches of the river have impacts related to agricultural land practices. Due to these influences the existing habitat condition is poor for the majority of the river.

Game Fish Biomass
Total game fish biomass on the Provo River varied from 8,339 to 16,091 pounds for individual reaches of river from Deer Creek Dam to Murdock Diversion Dam, and from 714 to 5,919 pounds for the individual reaches from Murdock Diversion Dam to Utah Lake.

The baseline projection of total biomass of trout in the Hobble Creek reach above Kolob Park in Springville, Utah was estimated at 56 pounds. In the lower section of Hobble Creek below Kolob Park, the baseline projection of trout total biomass from Kolob Park to Utah Lake was estimated at 132 pounds.

Total game fish biomass for the Spanish Fork River was estimated for four reaches between the Diamond Fork Creek confluence to Lakeshore Diversion. Total game fish biomass ranged from 2,888 to 7,623 pounds.

Macroinvertebrates

Table 3-33 from the DEIS lists macroinvertebrates known to occur in varying numbers and diversity throughout the impact area of influence. The Provo River supports areas of high and low populations, but generally low diversity. Hobble Creek is estimated to have fair to good macroinvertebrate population levels. The Spanish Fork River does not provide suitable habitat for large populations of macroinvertebrates. Information was not available to evaluate macroinvertebrate populations and communities in Utah Lake.

Table 3-33
Known Macroinvertebrates in Impact Area of Influence

Family	Related Taxon	Common Name
Baetidae, Cinygmula	Ephemeroptera	Mayflies
Chironomid	Diptera	Midges
Simuliidae	Diptera	black flies
Optioservus, Elmidae	Coleoptera	Beetles
Hydropsyche, Hydroptilidae	Trichoptera	Caddisflies
–	Plecoptera (Order)	Stoneflies
Orthocladiinae	Diptera (Order)	True flies
–	Isopoda (Order)	isopods, aquatic sow bugs
–	Amphipoda (Order)	Amphipods, scuds
Tubificidae	Oligochaeta (Subclass)	Earthworms
Planariidae	Turbellaria (Class)	flat worms
Hydracarina	Acari (Subclass)	water mites
–	Copepoda (Order)	Copepods
–	Ostracoda (Order)	seed shrimp

Wetland Resources

Construction Impact Area of Influence

Wetland areas within the Spanish Fork-Santaquin Pipeline corridor consist of narrow strips (8-12 feet wide) of mixed riparian forest/scrub-shrub vegetation located between pipeline mileposts 0.5 to 0.6, 2.2 to 2.4, 2.8 to 3.0, and 4.6 to 4.8. Wetlands within the Mapleton-Springville Lateral Pipeline corridor are similar riparian strips adjacent to the existing canal and are located between pipeline mileposts 1.8 to 2.3 and 3.8 to 4.6 and 4.8 to 5.1. Wetlands in the Spanish Fork Canyon Pipeline corridor are a narrow strip of wet meadow at pipeline milepost 1.5 and the Cold Spring Pond from pipeline milepost 2.8 to 3.0.

Table 3-36 from the DEIS summarizes the areas of wetland community types found in the construction impact area of influence.

Table 3-36
Approximate Area of Wetland Community Types in the ULS Construction Impact Area of Influence (acres)

Wetland Community Type	Area
Palustrine Wet Meadow	0.4
Riparian Forest	0.5
Riparian Scrub-shrub	1.1
Aquatic Bed/Open Water	3.7
Total	**5.7**

Wildlife Resources and Habitats

Wildlife game species in the project area include big game, large mammalian predators, furbearers, upland gamebirds, and waterfowl. Non-game species in the project areas include small predatory mammals, mammalian prey species, bat species, raptors, passerines, shorebirds, wading birds, and reptiles.

Affected habitat in the project area includes Aspen/Conifer, Oak Woodland, Pinyon/Juniper, Mountain Brush, Sagebrush/Grass, Wetlands, Agricultural Lands, Previously Disturbed Lands, and Big Game Winter Range.

Additional information on wildlife species and habitat types within the project area can be found in the Wildlife and Habitat Resources section of Chapter 3 of the ULS DEIS.

Threatened and Endangered Species

June Sucker

The June sucker (*Chamistes liorus*) is listed as endangered under the Federal Endangered Species Act (ESA). The species was listed under the ESA with critical habitat on April 30, 1986 (51 FR 10857). The lower 4.9 miles of the main channel of the Provo River, from the Tanner Race diversion downstream to Utah Lake, were designated as critical habitat. At the time of its listing, the population was fewer than 1,000 individuals (51 FR 10857), but more recent estimates of adult spawning populations have been closer to 300 individuals (Keleher et al. 1998). Its National Heritage Status in Utah is unranked.

Factors that have contributed to the reduction in June sucker numbers include changes that have occurred both in Utah Lake and in historical spawning tributaries. In the tributaries, these effects include water management (primarily irrigation use) that has reduced streamflows during critical spawning times, reductions in available spawning habitat caused by impassable barriers associated with irrigation diversions, introduction of exotic predators, introduction of other species (e.g., common carp), loss of spawning habitat, poor water quality, reduced aquatic vegetation, and channelization or channel simplification. In Utah Lake, contributing factors include changes in chemical and physical habitat, introduction of exotic predators, and lake level management.

Ute ladies'-tresses

Ute ladies'-tresses is a perennial orchid found along riparian edges, gravel bars, old oxbows and moist to wet meadows along perennial freshwater streams and springs at elevations ranging from approximately 4,300 to 7,000 feet in Utah (USFWS 1992, Stone 1993).

It is an early to mid successional species that is well adapted to low floodplain terraces along alluvial streams where scouring and sediment deposition are natural processes. It has been found in irrigated and sub-irrigated pastures that are mowed or moderately grazed. In general, the orchid occurs in relatively open grass and forb-dominated habitats, and seems intolerant of dense shade. The plants bloom from late July through August (sometimes September), setting seed in the early fall. A colony is defined as any location where flowering plants have been found in a similarly delineated habitat on that geomorphic surface. Therefore, a colony may be comprised of one or more individuals on a sandbar (large or small) or on a large flood plain delineated by topographical changes in slope or elevation.

There are a total of ten known occurrences along the Spanish Fork River from the confluence with Diamond Fork Creek down to the Castilla gaging station, just upstream of the Spanish Fork Diversion Dam. Five of the known occurrences are on island gravel bars and low floodplains adjacent to the main channel. These are located within approximately 0.5 miles of the confluence with Diamond Fork Creek. There are two known occurrences between the Covered Bridge Canyon residential area access bridge and the Castilla gaging station. These colonies are located in or around an old oxbow near the Cold Springs gaging station and are believed to be supported by secondary hydrology and seepage not associated with river flows.

Recreational Resources - Angler Days

Public access is limited to two reaches of USA-owned land along the Spanish Fork River. Based on the estimated fish biomass in these publicly accessible reaches of the Spanish Fork River, 6,992 angler-days of use occur annually. Any angler use of other reaches is by trespass or permission of the landowner. Based on the estimated fish biomass in these other reaches, another 34,240 angler-days of use annually would be possible if public access were available. The total annual predicted baseline fishing use of the Spanish Fork River reaches would be 41,232 angler-days if public access were available.

Public access is not available along the reach of Hobble Creek from Mapleton-Springville Lateral Discharge to Utah Lake. Any use that occurs is by trespass or permission of the landowner. Based on the estimated fish biomass in this stretch a total of 476 angler days of use annually would be possible if public access were available.

Public access is available along the lower Provo River except for portions of three reaches. Based on the estimated fish biomass in the lower Provo River from Deer Creek Dam Outlet to the Utah Division of Wildlife Resources weir near Utah Lake, 127,958 angler-days of use occurs annually in the publicly accessible reaches. Based on the estimated fish biomass in the Provo River reaches not publicly available for fishing, another 3,526 angler-days of use annually would be possible if public access were available. The total annual predicted baseline fishing use of the lower Provo River reaches would be 131,484 angler-days if public access were available.

Sensitive Species

Table 3-57 lists Utah State species of concern and Uinta National Forest sensitive species that may be impacted by construction or operation of ULS project features (UDNR 2003b; Larson 2004, USFS 2003a).

Table 3-57
Utah State Wildlife Species of Concern and Uinta National Forest Sensitive Species Potentially Present in the Impact Area of Influence

Common Name	Scientific Name	Group	Utah Status[1]
Fisher	*Martes pennanti*	Wildlife	*
Spotted Bat	*Euderma maculatum*	Wildlife	WSC*
Western Red Bat	*Lasiurus blossevillii*	Wildlife	WSC
Townsend's (Western) Big-Eared Bat	*Corynorhinus townsendii pallescens*	Wildlife	WSC *
Peregrine Falcon	*Falco peregrinus*	Wildlife	*
American White Pelican	*Pelecanus erythrorhynchos*	Wildlife	WSC
Northern Goshawk	*Accipiter gentilis*	Wildlife	CS
Short-eared Owl	*Asio flammeus*	Wildlife	WSC
Black Swift	*Cypseloides niger*	Wildlife	WSC
Bobolink	*Dolichonyx oryzivorus*	Wildlife	WSC
Long-billed Curlew	*Numenius americanus*	Wildlife	WSC
Ferruginous Hawk	*Buteo regalis*	Wildlife	WSC
Flammulated Owl	*Otus flammeolus*	Wildlife	*
Three-toed Woodpecker	*Picoides tridactylus*	Wildlife	WSC *
Smooth Greensnake	*Opheodrys vernalis*	Wildlife	WSC
Bonneville Cutthroat Trout	*Oncorhynchus clarki utah*	Aquatic	CS*
Colorado River Cutthroat Trout	*Oncorhynchus clarki pleuriticus*	Aquatic	CS*
Least Chub	*Iotichthys phlegethontis*	Aquatic	CS
Bluehead Sucker	*Catostomus discobolus*	Aquatic	WSC
Flannelmouth Sucker	*Catostomus latipinnis*	Aquatic	WSC
Leatherside Chub	*Gila copei*	Aquatic	WSC
Columbia Spotted Frog	*Rana luteiventris*	Aquatic	CS*
Western Toad	*Bufo boreas*	Aquatic	WSC
Utah Physa	*Physella utahensis*	Aquatic	WSC
California Floater	*Anodonta californiensis*	Aquatic	WSC
Barneby Woody Aster	*Aster kingii var barnebyana*	Plant	*
Dainty Moonwort	*Botrychium crenulatum Wagner*	Plant	*
Garrett's Bladderpod	*Lesquerella garretti*	Plant	*
Rockcress Draba	*Draba globulosa Payson*	Plant	*
Wasatch Jamesia	*Jamesia americana var. macrocalyx*	Plant	*

[1] CS = Conservation Species, WSC = Wildlife Species of Concern, * = Uinta National Forest Sensitive Species.

PROPOSED ACTION AND ALTERNATIVES

A Proposed Action, one other action alternative, and a No Action alternative under consideration are described in the following sections. The DEIS includes a more complete description of features and operation, including features and flows for environmental purposes.

Spanish Fork Canyon-Provo Reservoir Canal Alternative (Proposed Action)
The Spanish Fork Canyon–Provo Reservoir Canal Alternative has an average transbasin diversion of 101,900 acre-feet, which consists of a delivery of:

- 30,000 acre-feet of M&I water for secondary use to southern Utah County and
- 30,000 acre-feet of M&I water to Salt Lake County water treatment plants;
- 1,590 acre-feet of M&I water already contracted to southern Utah County cities, and
- 40,310 acre-feet of M&I water to Utah Lake for exchange to Jordanelle Reservoir.

The 30,000 acre-feet (less the water returned to DOI under the Section 207 Program) of M&I water utilized in southern Utah County would be used in the cities' secondary water systems. Use of this water as a potable supply in the future would require additional NEPA compliance. Under this alternative the DOI would acquire all of the District's secondary water rights in Utah Lake. These rights would amount to approximately 57,073 acre-feet. The acquired water rights would be used to exchange water to Jordanelle Reservoir.

The Spanish Fork Canyon–Provo Reservoir Canal Alternative would include the following features:

1) Sixth Water Hydropower Plant and Transmission Facilities,
2) Upper Diamond Fork Hydropower Plant and Underground Transmission Facilities,
3) Spanish Fork Canyon Pipeline,
4) Spanish Fork–Santaquin Pipeline,
5) Santaquin–Mona Reservoir Pipeline,
6) Mapleton–Springville Lateral Pipeline, and
7) Spanish Fork–Provo Reservoir Canal Pipeline.

These features would deliver ULS M&I secondary water to southern Utah County cities, deliver water to Hobble Creek to provide June sucker spawning flows, and supplemental flow during other times of the year, deliver water for supplemental flow in the lower Provo River, deliver M&I raw water to the Provo Reservoir Canal and the Jordan Aqueduct for conveyance to water treatment plants in Salt Lake County, and to generate electric power at 2 hydropower plants in the Diamond Fork System, with associated transmission facilities. The Spanish Fork Canyon Pipeline and Spanish Fork–Santaquin Pipeline would convey up to 10,200 acre-feet of Strawberry Valley Project (SVP) water shares held by South Utah Valley Municipal Water Association (SUVMWA) to member cities in southern Utah County through the new ULS pipelines, on a space-available basis.

CUPCA authorized the joint-lead agencies to acquire water rights in the Provo drainage to deliver a minimum of 75 cfs to the Provo River between Olmsted Diversion and Utah Lake. The proposed action would provide an average annual 16,000 acre-feet to assist in meeting this in-stream flow target.

Bonneville Unit Water Alternative
The Bonneville Unit Water Alternative would convey an average transbasin diversion of 101,900 acre-feet consisting of:

- 15,800 acre-feet of M&I water to southern Utah County to be used in secondary water systems;
- 1,590 acre-feet of M&I water already contracted to the southern Utah County cities; and
- 84,510 acre-feet of M&I water delivered to Utah Lake for exchange to Jordanelle Reservoir.

It would conserve water in the Provo River basin and deliver it along with acquired water to assist June sucker spawning and rearing, conserve water in a Mapleton-Springville Lateral Pipeline and convey water to support in-stream flows in Hobble Creek to assist recovery of the June sucker, and generate electric power at 2 hydropower plants in the Diamond Fork System. It would involve construction of three new pipelines and 2 new hydropower plants with associated transmission facilities. Under this alternative, DOI would acquire up to 15,000 acre-feet of the District's secondary water rights in Utah Lake to provide a firm annual yield of 15,800 acre-feet of M&I water for secondary water systems.

The Bonneville Unit Water Alternative would include the following features:

1) Sixth Water Hydropower Plant and Transmission Facilities,
2) Upper Diamond Fork Hydropower Plant and Underground Transmission Facilities,
3) Spanish Fork Canyon Pipeline,
4) Spanish Fork–Santaquin Pipeline, and
5) Mapleton–Springville Lateral Pipeline.

The Spanish Fork-Santaquin Pipeline would be constructed as a combined ULS/Section 207 feature. These features would deliver ULS M&I secondary water to southern Utah County cities, deliver Bonneville Unit water to Hobble Creek to provide June sucker flows, and generate and deliver electric power from 2 hydropower plants. Up to 10,200 acre-feet of SVP water shares held by SUVMWA would be conveyed to member cities in southern Utah County through the Spanish Fork Canyon Pipeline and Spanish Fork-Santaquin Pipeline.

The Bonneville Unit Water Alternative would not deliver an average annual 16,000 acre-feet to the lower Provo River to assist in meeting the 75 cfs target in-stream flows.

No Action Alternative
No new water conveyance features would be constructed under the No Action Alternative. The 15,800 acre-feet of available Bonneville Unit water would remain in Strawberry Reservoir to provide a firm supply for delivery of the Bonneville Unit M&I exchange water that would be made without any shortages. Some of the Bonneville Unit M&I exchange water would be routed through the Strawberry Tunnel to meet in-stream flow needs in Sixth Water and Diamond Fork creeks. The remaining Bonneville Unit M&I exchange water would be conveyed through the Syar Tunnel and Diamond Fork System and discharged into Diamond Fork Creek at the outlet near Monks Hollow or discharged from the Diamond Fork Pipeline and Spanish Fork River Flow Control Structure into Diamond Fork Creek at the mouth of Diamond Fork Canyon. The irrigation diversions on lower Spanish Fork River would be modified to bypass and measure the 86,100 acre-feet into Utah Lake, and to allow fish passage as previously agreed by the DOI and District in the 1999 Diamond Fork FS-FEIS and ROD. This alternative would conserve water in the Provo River basin and deliver it along with acquired water to assist June sucker spawning and

rearing in the lower Provo River. The DOI would not acquire any of the District's secondary water rights in Utah Lake and no water would be conveyed to Hobble Creek. The No Action Alternative would be operated the same as the Interim Proposed Action in the 1999 Diamond Fork FS-FEIS.

The No Action Alternative would not deliver an average annual 16,000 acre-feet to meet the 75 cfs target in-stream flow in the lower Provo River.

EVALUATION OF FISH AND WILDLIFE RESOURCES IMPACTS

Appendix A is a table that provides a side by side comparison of the impacts associated with the Proposed Action, the Bonneville Unit Water Alternative, and the No Action Alternative. The following section provides a brief summary of the impacts to each of the resource areas including Surface Water Quality, Aquatic Resources, Wetland Resources, Wildlife Resources and Habitat, Threatened and Endangered Species, Recreational Resources, and Sensitive Species.

Surface Water Quality

Proposed Action
The primary impacts on surface water quality would occur in Utah Lake, the Provo River, Hobble Creek and the Spanish Fork River. Total phosphorus load in Utah Lake would decrease by 3.2 tons per year from baseline conditions. Total dissolved solids concentrations in Utah Lake would increase slightly and peak at or near the water quality standard for agricultural use. Water quality conditions in the lower Provo River would improve, with increased dissolved oxygen, lower summer water temperatures, and lower total dissolved solids. Total phosphorus concentrations in the lower Provo River would remain unchanged. Water quality conditions in Hobble Creek would improve as well, with increased dissolved oxygen, lower summer water temperatures, and lower total dissolved solids. Total phosphorus concentrations in Hobble Creek would increase under the Proposed Action. Water quality conditions in the Spanish Fork River would slightly degrade, with decreased dissolved oxygen, higher summer water temperatures, increased total dissolved solids, and increased total phosphorus. These impacts would occur because Bonneville Unit flows would be removed from the Spanish Fork River and discharged into Hobble Creek and the lower Provo River.

Bonneville Unit Water Alternative
The primary impacts on surface water quality would occur in Utah Lake, Hobble Creek and the Spanish Fork River. Total phosphorus load in Utah Lake would increase by 4.2 tons per year from baseline conditions. Total dissolved solids concentrations in Utah Lake would change slightly and remain below the water quality standard for agricultural use. Water quality conditions in Hobble Creek would improve, with increased dissolved oxygen, lower summer water temperatures, and lower total dissolved solids. Total phosphorus concentrations in Hobble Creek would increase under the Bonneville Unit Water Alternative. Water quality conditions in the Spanish Fork River would include increased dissolved oxygen, decreased summer water temperatures, increased total dissolved solids, and increased total phosphorus. Water quality in the lower Provo River would be the same as baseline conditions.

No Action Alternative
The primary impacts on surface water quality would occur in Utah Lake and the Spanish Fork River. Total phosphorus load in Utah Lake would increase by 2.5 tons per year from baseline conditions. Total dissolved solids concentrations in Utah Lake would change slightly and remain below the water quality standard for agricultural use. Water quality conditions in the Spanish

Fork River would include decreased summer water temperatures and decreased dissolved oxygen, total dissolved solids, total phosphorus, and selenium concentrations. Water quality in the lower Provo River would be the same as baseline conditions.

Environmental Commitments
Although there are water quality impacts that occur to Utah Lake and the Spanish Fork River under all alternatives, no mitigation measures are presented by the District because impacts on water quality would not exceed State of Utah water quality standards.

Service Recommendations
The Service recommends the following additional measures to avoid, minimize, or mitigate surface water quality impacts.

We are aware that the Central Utah Project Bonneville Unit, including the ULS, is one of many contributors to water quality problems in Utah Lake, particularly with regard to phosphorus and total dissolved solids. The District and the other joint lead agencies (DOI and the Mitigation Commission) should participate in the State of Utah's process for establishing TMDL's for Utah Lake and take appropriate efforts to help meet standards established through that process.

Aquatic Resources

Generally, impacts to aquatics resources will result from changes in stream flows and resultant changes in water quality parameters and aquatic habitat for the Provo River, Spanish Fork River, and Hobble Creek. Under the Proposed Action average flows will decrease in Spanish Fork River and increase in the lower Provo River and Hobble Creek. Under the Bonneville Unit Water Alternative a similar pattern to the Proposed Action is projected for average flow increases and decreases. However, average flow decreases on the Spanish Fork River would not be as extensive, average flow increases on the lower Provo River would be less extensive, and average flow increases on Hobble Creek would be more extensive as compared to those projected under the Proposed Action. Under the No Action Alternative changes in average flows would be exactly the same as the Bonneville Unit Water Alternative for the lower Provo River. There would be no changes in flows compared to baseline on the Hobble Creek and Spanish Fork River reaches. The following sections explain the changes to aquatic habitat, fish biomass, and macroinvertebrate populations that would result from changes in flow under the three alternatives.

Proposed Action
Estimated change in habitat is variable for the areas of impact and by habitat type. In the Provo River slow and backwater habitats generally would decrease while moderate and fast water habitats will increase. One notable exception is the lowest reach of the lower Provo River where large increases in all habitats would be expected. Projected increases in habitat would provide a significant benefit to aquatic species in Hobble Creek. Although a net loss would not be expected, high spring flows in Hobble Creek pose a risk to trout spawning habitat. Large projected flow decreases in the Spanish Fork River would be expected to decrease habitat complexity for fishes and macroinvertebrates.

Game fish biomass and total biomass are projected to increase substantially because of increases in available habitat on the Provo River downstream of the Olmsted Diversion Dam. Trout standing crop and total biomass are projected to decrease compared to baseline conditions in two of four reaches in the Spanish Fork River. In Hobble Creek, game fish populations are estimated to experience significant long-term increases. Total biomass is estimated to increase in Hobble

Creek. Overall the game fish biomass would experience an increase of 19,496 pounds under the Proposed Action.

Macroinvertebrate populations may experience high potential increases in the Provo River downstream of the I-15 Bridge. Habitat change in Hobble Creek associated with enhanced flows has a moderate to high potential to benefit macroinvertebrates. In the Spanish Fork River, macroinvertebrate populations may experience a low to moderate negative impact because flow would be decreased in all months.

Bonneville Unit Water Alternative
Large increases in habitat availability would be expected for the lower Provo River. The greatest increases would be expected to occur downstream of the Murdock Diversion Dam reach and should improve game and non-game fish habitats. In the Spanish Fork River habitat is projected to increase and decrease seasonally. The greatest potential loss would occur during summer months and could have significant impact on non-game spawning habitat. Hobble Creek habitat is projected to increase significantly under the Bonneville Unit Water Alternative.

Game fish biomass may be expected to increase as a result of habitat increases in the Provo River downstream of the Olmsted Diversion Dam to the Murdock Diversion Dam reach. Game fish populations in the Spanish Fork River are projected to decrease because of changes in late summer flows, nitrate-nitrogen, and cover. In Hobble Creek, game fish populations and total biomass are estimated to experience significant long-term increases. Overall the Bonneville Unit Water Alternative would result in an increase of 10,220 pounds of fish biomass.

Macroinvertebrate populations are expected to experience habitat changes that range from low to moderate potential and moderate to high benefit for populations in the Provo River downstream of the Murdock Diversion Dam. Flow decreases in the Spanish Fork River are not expected to result in significant impacts to macroinvertebrates. There is a low to moderate potential for benefits to macroinvertebrates in Hobble Creek.

No Action Alternative
There would be no change in habitat, standing crop per acre or total biomass, and macroinvertebrate populations and communities from baseline in the following reaches:

- Spanish Fork River from Diamond Fork to Utah Lake
- Hobble Creek from Mapleton-Springville Lateral discharge to Utah Lake
- Provo River from Deer Creek Reservoir to Olmsted Diversion

The change in habitat, standing crop per acre, total biomass, and macroinvertebrate populations and communities would be the same as under the Bonneville Unit Water Alternative for the following reach:

- Provo River from Olmsted Diversion to Utah Lake

The No Action Alternative would result in an increase of 9,703 pounds of fish biomass.

Environmental Commitments
General project plan environmental commitments to avoid and/or minimize environmental impacts to aquatic resources have been provided by the joint-lead agencies and are listed in Appendix B. No additional mitigation measures have been provided in the Proposed Action or

Bonneville Unit Water Alternative; however, limited project-level impacts to Spanish Fork River would be compensated by improvements in lower Provo River and Hobble Creek.

The June Sucker Recovery Plan (USFWS 1999) identifies the need to establish and maintain spawning stocks in other viable tributaries to Utah Lake. A study conducted in 2001 (Bio-West, Inc. 2002b) examined the potential of all tributaries entering Utah Lake to serve as additional spawning locations. Hobble Creek is currently being targeted as an additional spawning area and the importance of other tributaries, such as Spanish Fork River and American Fork River, to June sucker recovery will be deemphasized. Reductions in flows on the Spanish Fork River will allow for improvements in flow regime on Hobble Creek and the lower Provo River. Hence, decreases in habitat, game fish biomass, and macroinvertebrate populations on Spanish Fork River will be offset by proportionally greater increases in these aquatic resources on Hobble Creek and the lower Provo River.

Service Recommendations
Despite the efforts to provide increased flows to the lower Provo River and Hobble Creek, additional spawning habitat in Spanish Fork River may prove important for June sucker recovery if attempts on Hobble Creek are unsuccessful. Habitat enhancement, including diversion removal or the construction of suitable fish passage structures, will be required on any tributary that is pursued for developing additional spawning habitat. The relationship between water supply and habitat maintenance will be an important consideration as spawning populations are developed in other tributaries.

The Service encourages the joint-lead agencies to maintain enough flexibility in water operations and delivery configurations such that unforeseen circumstances that may arise in the June sucker recovery process can be accommodated. These could include restoring flows in and fish passage to Spanish Fork River as well as other tributaries to Utah Lake.

<u>Wildlife Resources and Habitats</u>

Proposed Action
The Proposed Action would result in a loss of 2.4 acres of wildlife habitat, scattered throughout the impact area of influence. Impacts on game and non-game wildlife home ranges would be minimal. Construction and operation of the alternative would not cause a substantial disturbance to wildlife habitats.

Bonneville Unit Water Alternative
Construction would eliminate 1.8 acres of wildlife habitat scattered throughout the impact area of influence. These acres have marginal wildlife values. Impacts on game and non-game wildlife habitat and home ranges would be minimal. The alternative would not cause a substantial disturbance to wildlife habitats.

No Action Alternative
The DEIS asserts that the No Action Alternative could cause significant impacts on wetland wildlife habitats in southern Utah County. This judgment assumes that water provided by the ULS project will reduce groundwater pumping in areas where species rely on specific wetland habitat. See our discussion on this topic in the Wetlands section.

Environmental Commitments
General project plan environmental commitments to avoid and/or minimize environmental impacts to wildlife resources have been provided by the joint-lead agencies and are listed in

Appendix B. No additional mitigation measures have been provided because impacts to wildlife habitat or species populations are minor.

Service Recommendations
The Service recommends the following additional measures to avoid, minimize, or mitigate wildlife impacts.

Although no significant impacts to wildlife habitat are anticipated, it is estimated that 1.8 to 2.4 acres of wildlife habitat will be affected by the Proposed Action and the Bonneville Unit Water Alternative. The Service recommends that the joint-lead agencies compensate for these wildlife losses by expanding or incorporating these types of habitats into June sucker riparian and wetland restoration efforts intended for the lower Provo River or other similar suitable projects.

Endangered and Threatened Species

Proposed Action
June sucker
Beneficial flow increases that are part of the Proposed Action include providing: an annual average 16,000 acre-feet to the lower Provo River to assist in meeting the in-stream flow target of 75 cfs; 12,165 acre-feet of water for June sucker spawning in the lower Provo River; and 3,300 acre-feet of lower Provo River water rights already purchased by the Mitigation Commission. The following paragraph details the specific changes to June sucker weighted useable area (WUA) resulting from these changes in flow.

The Proposed Action flows in the Provo River would provide a 192 percent higher weighted usable area (WUA) in May and 122 percent higher WUA in June for the moderate flow – mid-depth habitat on an annual basis for June sucker specific spawning habitat between the Tanner Diversion and Interstate 15 compared to baseline conditions. Proposed flows would provide a 181 percent higher WUA in May and 96 percent higher WUA in June for the moderate flow – mid-depth habitat on an annual basis for June sucker specific spawning habitat in the Provo River between the Interstate 15 and Utah Lake compared to baseline conditions. Backwater/edge habitat niche would decrease by 61 percent and slow flow/shallow habitat would decrease by 8 percent from baseline from Tanner Diversion to Interstate 15 due to higher stream flows. Backwater/edge and slow flow/shallow habitat would not change from Interstate 15 to Utah Lake. The small magnitude of projected habitat decreases for early life stages would be offset by large predicted habitat gains for spawning June sucker. July flow increases in both reaches of the Provo River would provide a benefit to young-of-year June sucker by restoring the hydrograph to a more natural condition. Additionally, increased flows in the lower Provo River will provide opportunities to create or restore rearing habitat in the lower Provo River and associated floodplain wetlands. Changes in predation on June sucker from increased populations of predator studies were not analyzed.

Stream flows provided to Hobble Creek to assist in June sucker recovery would increase by 33 to 300 percent during the spawning and rearing period from May through July.

Ute Ladies'-tresses
Projected decreased flows in the Spanish Fork River are not likely to adversely affect Ute ladies'-tresses individuals or habitat.

Bonneville Unit Water Alternative
June sucker
The Bonneville Unit Water Alternative will provide the same additional flows to the lower Provo River as described for the Proposed Action Alternative; however the annual average 16,000 acre-feet is not included in these flows. As a result, Bonneville Unit Water Alternative changes to June sucker WUA are similar to changes described under the Proposed Action Alternative but occur at lower levels. The changes are described in the following paragraph.

Proposed flows in the Provo River would provide a 134 percent higher WUA in May and 642 percent higher WUA in June for the moderate flow – mid-depth habitat on an annual basis for June sucker specific spawning habitat between the Tanner Diversion and Interstate 15 compared to baseline conditions. Proposed flows would provide a 111 percent higher WUA in May and 64 percent higher WUA in June for the moderate flow – mid-depth habitat on an annual basis for June sucker specific spawning habitat in the Provo River between the Interstate 15 and Utah Lake compared to baseline conditions. Backwater/edge habitat niche would decrease by 55 percent and slow flow/shallow habitat would increase by 10 percent from baseline from Tanner Diversion to Interstate 15. Backwater/edge habitat would increase by 160 percent and slow flow/shallow habitat would increase by 324 percent over baseline from Interstate 15 to Utah Lake. The large predicted habitat gains for spawning June sucker would provide a benefit to young-of-year June sucker by restoring the hydrograph to a more natural condition. Additionally, increased flows in the lower Provo River will provide opportunities to create or restore rearing habitat in the lower Provo River and associated floodplain wetlands. Changes in predation on June sucker from increased populations of predator studies were not analyzed.

Stream flows provided to Hobble Creek to assist in June sucker recovery would increase by 35 to 775 percent during the spawning and rearing period from May through July.

Ute Ladies'-tresses
Projected decreased flows in the Spanish Fork River in July through September are not likely to adversely affect Ute ladies'-tresses individuals or habitat.

No Action Alternative
June sucker
Changes in flows in the lower Provo River and resulting changes to June sucker habitat would be the same as changes described for the Bonneville Unit Water Alternative.

Under the No Action Alternative no additional stream flows would be provided to Hobble Creek.

Ute Ladies'-tresses
There would be no effect as flows in the Spanish Fork River would be the same as under baseline.

Environmental Commitments
The following recommendations, listed in the Service's Section 7 consultation, were developed for June sucker and Ute ladies'- tresses orchid and should be incorporated into the list of environmental commitments and Record of Decision for this project.

June Sucker
Conservation measures for June sucker that were identified in the recovery plan (FWS 1999) are being coordinated through the JSRIP. The District, DOI and Mitigation Commission have been participating in the JSRIP to support June sucker recovery.

The joint-lead agencies should continue efforts to acquire water rights and modify water supply operations to achieve the minimum 75 cfs target in-stream flows between Olmsted Diversion and Utah Lake.

As previously recommended in the Aquatic Resources section, we encourage the joint-lead agencies to maintain enough flexibility in water operations and delivery configurations such that unforeseen circumstances that may arise in the June sucker recovery process can be accommodated. These could include restoring flows in and fish passage to Spanish Fork River as well as other tributaries to Utah Lake.

Ute Ladies'-tresses
We acknowledge as a conservation measure the contribution of the many years of monitoring, research, and presentations to academic societies that have been committed by the joint-lead agencies to increase the body of knowledge for Ute ladies'-tresses.

The monitoring program should be carried forward for a number of years (to be determined jointly by the District, Mitigation Commission, and the Service) similar to the pre-operation study in Diamond Fork. If the changes to the Ute ladies'-tresses population in Spanish Fork Canyon exceed the variation expected from pre-operation analysis and the critical values established, management guidelines presented in the 1999 Diamond Fork Biological Opinion may be implemented to compensate for impacts.

If post-operation monitoring results in measured parameters exceeding pre-set critical values, the Diamond Fork System operation has the flexibility to supplement flows in Spanish Fork River. Other measures, such as a rescue/transplant program, could be initiated based on consultation between the joint-lead agencies and the Service.

Wetland Resources

Proposed Action
A total of 0.27 acres comprised of 12 small, scattered non-jurisdictional wetlands would be temporarily lost, but then restored upon completion of construction; 1.03 acres comprised of 16 small, scattered, non-jurisdictional wetlands would be permanently lost from construction of the Mapleton-Springville Lateral Pipeline and drain or discharge structures associated with other pipelines.

Construction of the Mapleton-Springville Lateral Pipeline would cause permanent conversion of 0.3 acres of riparian forest and 0.7 acres of scrub-shrub wetland to upland vegetation. Construction of drain or discharge structures would result in the loss of 0.04 acres of riparian forest, scrub-shrub and emergent marsh wetlands. Soils would be restored after pipeline construction disturbance, but hydrology would be permanently affected within the pipeline corridor. Wetland functions would be permanently lost on 1.03 acres of riparian forest, scrub-shrub and emergent marsh wetlands that would be converted to upland vegetation from construction of the Mapleton-Springville Lateral Pipeline and drain or discharge structures on other pipelines. Wetland functions would be temporarily lost on an additional 0.27 acres until restoration was completed.

Proposed mitigation for the ULS project would include 10 acres of the 85.5 acre Mona Springs Unit. This would result in a mitigation ratio of approximately 9.7 to 1.

Bonneville Unit Water Alternative
One acre of wetland habitat would be lost from construction of the Mapleton-Springville Lateral Pipeline and 0.02 acres from construction of drain or discharge structures. The Spanish Fork-Santaquin Pipeline would cause a temporary loss of 0.18 acres during construction and until restoration was completed.

Construction of the Mapleton-Springville Lateral Pipeline would permanently convert 0.3 acres of riparian forest and 0.7 acres of scrub-shrub wetland to upland vegetation, while 0.02 acres of riparian wetlands would be converted from construction of drain or discharge structures. Soils would be restored after pipeline construction disturbance, but hydrology would be permanently affected.

Wetland functions would be permanently lost in 1.0 acre of riparian forest and scrub-shrub wetland converted to upland vegetation from construction of the Mapleton-Springville Lateral Pipeline and 0.02 acres of riparian wetlands from construction of drain or discharge structures. Wetland functions would be temporarily lost on 0.18 acres until restoration was completed.

Mitigation for wetland impacts would be the same as described for the Proposed Action.

No Action Alternative
The DEIS states that compared to the action alternatives, more groundwater pumping would occur under the No Action Alternative. Wetlands that could be potentially impacted are those that occur in the area where the wetland water supply may decline due to groundwater drawdown of one foot or more.

We do not believe that the connection between providing project water for secondary irrigation use and groundwater pumping is that direct. We anticipate groundwater pumping to continue at more or less the same rate regardless of availability of Bonneville Unit water, especially since project water will not be available until the project is constructed, approximately 10 years. Given the expected growth rate and changes in land use, we expect that there will be large impacts on wetlands from groundwater pumping and other water use and allocation changes. It could perhaps be surmised that availability of Bonneville Unit project water would slow the rate and delay the extent of wetland loss somewhat, but in the long run we would expect the outcome for wetlands supported by groundwater in the project area to be the same for all alternatives.

Environmental Commitments
General project plan environmental commitments to avoid and/or minimize environmental impacts to wetland resources have been provided by the joint-lead agencies and are listed in Appendix B. The following additional mitigation measures have been provided to address significant impacts to wetland resources. Under the Proposed Action, a total of 1.03 acres comprised of 16 small, scattered, non-jurisdictional wetlands would be permanently lost and a total of an additional 0.27 acres comprised of 12 small, scattered non-jurisdictional wetlands would be temporarily impacted by construction. After construction is completed, the temporarily impacted wetlands would be restored by replacing wetland soils and revegetating the areas with plants that match existing species. These wetlands are expected to be fully restored and functional within three growing seasons. Mitigation for permanently lost and temporarily impacted non-jurisdictional wetlands would be off-site and out-of-kind, but would include wetlands in a much larger contiguous complex with high functional value and habitat for TES species.

The establishment of the Mona Springs Unit of the Burraston Ponds Wildlife Management Area in Juab County would mitigate these impacts. The Mitigation Commission acquired 85.5 acres of a natural spring-fed wetland complex in Juab County south of Mona Reservoir in 1998 as mitigation for anticipated wetland and riparian impacts of the then-planned SFN System. Subsequently, planning for the SFN System was abandoned. Therefore, a portion of this wetland area is available for mitigation for the ULS project.

The 85 plus-acre parcel of land has abundant spring sources, but was historically used for grazing and other agricultural uses. Since acquiring the property, the Mitigation Commission entered into an Operating Agreement with the UDWR, and numerous habitat improvement measures have been implemented, including elimination of grazing, fencing of sensitive spring areas to protect against trespass grazing, and expansion of spring head pools. The wetland complex on the property supports viable populations of spotted frog, least chub, and California floater and is managed for the protection of those species, for miscellaneous migratory bird wildlife habitat and wetland values.

Proposed mitigation for the ULS project would include 10 acres of the 85.5 acre Mona Springs Unit. This would result in a mitigation ratio of approximately 9.7 to 1.

Service Recommendations
We support the mitigation proposal to compensate for unavoidable losses of wetlands at the Mona Springs Unit. They were acquired with this purpose in mind after consultation with our agency, other natural resource agencies, and the joint-lead agencies.

Through projects such as the Utah Lake Wetland Preserve and Jordan River and Great Salt Lake wetland acquisitions authorized by CUPCA, direct and indirect impacts to Wasatch Front wetlands are being mitigated. We note that as reported in the Mitigation Commission's Mitigation and Conservation Plan, the 1988 Definite Plan Report established a mitigation obligation and funding of $3,397,000 for fish, wildlife, and recreation measures to mitigate impacts for what is now the ULS. Some of those funds have been allocated towards aiding June sucker recovery. We encourage the Mitigation Commission to continue to allocate these mitigation funds towards fish and wildlife resource and wetland protection and conservation in the Utah Lake drainage basin.

Recreation Resources - Angler Day Use

Proposed Action
Based on the change in biomass as detailed in the Aquatic Resources section, there would be an estimated increase of 96 angler-days per year over baseline in the publicly accessible reaches of the Spanish Fork River. There would be an overall 10,200 angler-day loss per year from baseline if public fishing access were available along all Spanish Fork River reaches.

Based on the change in biomass as detailed in the Aquatic Resources section there would be an estimated increase of 13,509 angler days over baseline if public access were available in the project area of Hobble Creek.

Based on the change in biomass as detailed in the Aquatic Resources section, there would be an estimated increase of 36,342 angler-days per year over baseline in the publicly accessible reaches of the lower Provo River. There would be an overall increase of 50,807 angler-days per year over baseline if public fishing access were available along all lower Provo River reaches.

Net angler-days per year in all reaches with public access of the Spanish Fork River, Hobble Creek, and lower Provo River would increase by 36,438 over baseline in the Proposed Action.

Bonneville Unit Water Alternative
Based on the change in biomass as detailed in Aquatic Resources section, there would be an estimated decrease of 1,662 angler-days per year from baseline in the publicly accessible reaches of the Spanish Fork River. There would be an overall 15,859 angler-day decrease per year from baseline if public fishing access were available along all Spanish Fork River reaches.

Based on the change in biomass as detailed in Aquatic Resources section there would be an estimated increase of 17,166 angler days over baseline if public access were available in the project area on Hobble Creek.

Based on the change in biomass as detailed in the Aquatics Resources section, under the Bonneville Unit Water Alternative, angler day use on the lower Provo River would increase by 19,716 days over baseline conditions in reaches with public access and by 27, 265 days over baseline if public fishing access were available along all lower Provo River reaches.

Net angler-days per year in all reaches with public access of the Spanish Fork River, Hobble Creek, and lower Provo River would increase by 18,054 over baseline in the Bonneville Unit Water Alternative.

No Action Alternative
No features would be constructed under the No Action Alternative. There would be no change in potential angler day use on the Spanish Fork River or Hobble Creek. Based on the change in biomass as detailed in the Aquatics Resources section, under the No Action Alternative angler-days on the lower Provo River would increase by 19,716 over baseline conditions in reaches with public access, and by 27,265 days over baseline conditions if public fishing access were available along all lower Provo River reaches.

Environmental Commitments
General project plan environmental commitments to avoid and/or minimize environmental impacts to aquatic resources that would ultimately affect angler-days have been provided by the joint-lead agencies and are listed in Appendix B. No additional mitigation measures have been provided in the Proposed Action or Bonneville Unit Water Alternative; however, limited project-level impacts to angler-days on the Spanish Fork River would be compensated by proportionally increased angler-day improvements in lower Provo River and Hobble Creek. The following paragraph summarizes these changes.

If public access were available along all project affected river reaches of the Spanish Fork River, Hobble Creek, and the lower Provo River there would be a net gain of 54,116 angler days over baseline conditions with the Proposed Action; 28,572 angler days over the baseline condition would be gained with the Bonneville Unit Water Alternative; and 19,716 angler days gained when compared to baseline conditions for the No Action Alternative. If the lack of public access is accounted for in these calculations for the same river reaches, there would be a net gain of 36,438 angler days over baseline conditions with the Proposed Action; 18,054 angler days gained compared to baseline conditions for the Bonneville Unit Water Alternative; and 19,716 angler-days gained when compared to baseline conditions for the No Action Alternative.

Service Recommendations
The Service and UDWR have worked with the joint-lead agencies on the calculations for angler days and therefore concur with the estimates provide in the DEIS.

The Service encourages the joint-lead agencies and other interested publics to work together on a willing party basis to acquire angler access in reaches of streams where fishery improvements are anticipated as a result of improved stream flows.

Sensitive Species

Proposed Action
Leatherside chub would be significantly impacted in the Spanish Fork River. Although the change in habitat is not expected to be substantial (i.e., greater than 25 percent of habitat in the eco-region), the impact can be considered significant because it meets the following previously determined significance criteria:

- A reduction in fish numbers and/or biomass in an affected stream section as a result of change in habitat conditions (quantity and quality of in-stream flows or water quality) as defined by a sensitivity analysis on existing HQI and IFIM/PHABSIM data.

To offset potential impacts on leatherside chub, the joint-lead agencies commit to supporting the UDWR in evaluating population and habitat status, or determining threats and/or identifying conservation actions that could protect, and where appropriate, enhance leatherside chub. This would occur first in the Spanish Fork River, but if more ecologically desirable, may occur in other streams of the Utah Lake drainage.

No other sensitive species would be significantly impacted by the Proposed Action.

Bonneville Unit Water Alternative
Leatherside chub would be significantly impacted in the Spanish Fork River. Although the change in habitat is not expected to be substantial (i.e., greater than 25 percent of habitat in the eco-region), the impact can be considered significant because it meets the following previously determined significance criterion:

- A reduction in fish numbers and/or biomass in an affected stream section as a result of change in habitat conditions (quantity and quality of in-stream flows or water quality) as defined by a sensitivity analysis on existing HQI and IFIM/PHABSIM data.

Mitigation for leatherside chub impacts would be the same as described for the Proposed Action.

No other sensitive species would be impacted

No Action Alternative
No impact.

Environmental Commitments
To offset potential impacts on leatherside chub, the joint-lead agencies commit to supporting the UDWR in evaluating population and habitat status, or determining threats and/or identifying conservation actions that could protect and where appropriate enhance leatherside chub. This

would occur first in the Spanish Fork River, but if more ecologically desirable, may occur in other streams of the Utah Lake drainage.

Service Recommendations
We believe the environmental commitment above is sufficient to offset losses of leatherside chub habitat.

MONITORING AND REPORTING

A periodic comprehensive report should be provided to the Environmental Protection Agency, UDWR, and the Service, that evaluates the effectiveness of mitigation measures including revegetation and erosion control measures, control of noxious weeds and undesirable plants, and wetland habitat mitigation. Analysis of any unintended impacts and subsequent mitigation measures should be included in this report as well. Reporting should occur at a frequency determined jointly by the joint-lead agencies, the Service, and the UDWR, and continue until success criteria are met or by consensus of the agencies.

SUMMARY OF FISH AND WILDLIFE SERVICE RECOMMENDATIONS

Surface Water Quality

The joint-lead agencies should participate in the State of Utah's process for establishing TMDL's for Utah Lake and make appropriate efforts to help meet standards established through that process.

Aquatic Resources

The Service encourages the joint-lead agencies to maintain enough flexibility in water operations and delivery configurations such that unforeseen circumstances that may arise in the June sucker recovery process can be accommodated. These could include restoring flows in and fish passage to Spanish Fork River as well as other tributaries to Utah Lake.

Wildlife Resources

Although no significant impacts to wildlife habitat are anticipated, estimates of 1.8 to 2.4 acres of wildlife habitat will be affected by the Proposed Action and the Bonneville Unit Water Alternative. The joint-lead agencies should compensate for these wildlife losses by expanding or incorporating these types of habitats into June sucker riparian and wetland restoration efforts intended for the lower Provo River or other similar suitable projects.

Endangered and Threatened Species

We have no additional recommendations other than the Environmental Commitments made in response to Section 7 consultation.

Wetland Resources

We support the mitigation proposal to compensate for unavoidable losses of wetlands at the Mona Springs Unit.

We encourage the Mitigation Commission to continue to allocate funds towards fish and wildlife resource and wetland protection and conservation in the Utah Lake drainage basin.

Recreation Resources – Angler Day Use

We encourage the joint-lead agencies and other interested publics to work together on a willing party basis to acquire angler access in reaches of streams where fishery improvements are anticipated as a result of improved stream flows.

Sensitive Species

We believe the environmental commitment by the joint-lead agencies to support the Utah Division of Wildlife Resources in evaluating population and habitat status, or determining threats and/or identifying conservation actions that could protect and where appropriate enhance leatherside chub, is sufficient to offset losses of leatherside chub habitat.

Monitoring and Reporting

A periodic comprehensive report should be provided to the Environmental Protection Agency, UDWR, and the Service, that evaluates the effectiveness of mitigation measures including revegetation and erosion control measures, control of noxious weeds and undesirable plants, and wetland habitat mitigation. Analysis of any unintended impacts and subsequent mitigation measures should be included in this report as well. Reporting should occur at a frequency determined jointly by the joint-lead agencies, the Service, and the UDWR, and continue until success criteria are met or by consensus of the agencies.

CONCLUSION

The ULS will complete the Bonneville Unit of CUP with minor impacts to fish and wildlife resources. We appreciate that the final two systems to be planned and constructed, the Diamond Fork System and the ULS, include many environmental features to minimize detrimental impacts and take advantage of opportunities to improve fish and wildlife resources while also fulfilling water supply purposes. We recognize, however, that the past, current, and prospective availability of transbasin water for M&I and other purposes has facilitated development along the Wasatch Front with concomitant loss of fish and wildlife resources. CUPCA, through establishment and funding of the Mitigation Commission in Titles III and IV, made provisions for mitigating these impacts to the extent possible given funding authorization. We look forward to working with the Mitigation Commission to accomplish as much compensation for fish and wildlife resource losses as is possible given budgetary, land use, and water resource constraints.

We believe the Proposed Action provides benefits to June sucker recovery and other aquatic resources that are not available through other alternatives nor were available in prior Bonneville Unit water delivery project plans. Specifically:

The Proposed Action provides an annual average 16,000 acre-feet to the lower Provo River to assist in meeting the in-stream flow target of 75 cfs. This water will substantially achieve the in-stream flow target of 75 cfs, improve aquatic habitat in the lower Provo River, and provide opportunities to create or restore June sucker rearing habitat.

Both action alternatives benefit June sucker by providing flows to help establish a second spawning area in Hobble Creek.

Both action alternatives would have minimal direct impacts to wetlands and wildlife habitat that can be easily and appropriately compensated.

Both action alternatives have detrimental impacts to the lower Spanish Fork River due to reduced summer flows.

Both action alternatives and the no action alternative would provide an average annual 12,165 acre-feet of water for June sucker spawning in the lower Provo River.

Both action alternatives and the no action alternative would continue to deliver the 3,300 acre-feet of lower Provo River rights already purchased by the Mitigation Commission.

Under both action alternatives and the no action alternative, the joint-lead agencies would continue to acquire or manage water so as to meet a minimum stream flow of 75 cfs in the lower Provo River.

The No Action Alternative would provide an opportunity to improve habitat in the lower Spanish Fork River, including the possibility of establishing an additional spawning area for June sucker.

Under both action alternatives and the no action alternative, long term declines in wetlands supported by groundwater in the project area are expected to occur.

We appreciate the close collaboration with the joint-lead agencies and being involved throughout the ULS project planning process. If we can be of further assistance, please contact Lucy Jordan, Ph.D., at the letterhead address or (801) 975-3330 EXT. 143, or email: lucy_jordan@fws.gov.

Sincerely,

For Henry R. Maddux
Utah Field Supervisor

cc: UDWR – Salt Lake City (Attn: Rick Larson)
DOI – CUPCA (Attn: Ron Johnston, Program Director)
URMCC (Attn: Mike Weland, Executive Director)

File: CUP/Title II/Utah Lake Drainage Basin Water Delivery System (ULS)/NEPA

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