PROGRAMMATIC
ENVIRONMENTAL ASSESSMENT
FINAL

REHABILITATION / REPLACEMENT OF DIVERSION DAMS PROJECT

DUCHESNE AND STRAWBERRY RIVERS, UTAH

Prepared for

Utah Reclamation Mitigation and Conservation Commission
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TABLE OF CONTENTS

TABLE OF CONTENTS

TABLE OF CONTENTS

List of Tables

List of Figures

List of Appendices

1.1 BACKGROUND

Both the Duchesne and Strawberry Rivers in Utah (Figure 1-1) are used extensively as a source of irrigation water and both support quality sport fisheries. Water rights associated with the diversion on both rivers date back to the late 1800s and early 1900s. Many of the diversions, which take place on the two rivers, are done without the benefit of permanent structures. During periods when flows in the two rivers are high (spring and early summer), surface water is diverted directly into the irrigation ditches and canals with little help from instream dams. However, the situation changes during periods of low flows (late summer and fall), as temporary instream rock diversion dams are constructed in the stream channel to direct the water to the headworks of the individual irrigation canals or ditches. These temporary diversion dams generally require reconstruction or repair annually and are marginally effective. Some of these dams are frequently operated as "dry dams", and often may act as barriers to fish movement. In addition, dry dams do not have the capability to bypass water, which can prevent Central Utah Project (CUP) water (being bypassed to maintain fish habitat) from flowing to the confluence of the two rivers. The release or bypass of CUP water is required to retain agreed-upon levels of aquatic habitat. Much of the annual instream maintenance of the dams has been done without appropriate permits from the Utah Division of Water Rights and the State has indicated that appropriate permits will need to be obtained for future work (Franson-Noble 1989).

The diversion works of the Strawberry Aqueduct and Collection System (SACS) of the Bonneville Unit of the CUP are complete and have been diverting water from the Duchesne River and Strawberry River systems up to their rights as defined by the State Engineer. This has reduced the amount of water available for diversion by others. Because of the poor quality and low effectiveness of many of the existing diversion structures, the local water users on the Duchesne and Strawberry Rivers are concerned about their ability to divert water to which they are legally entitled. The Central Utah Project Completion Act (P.L. 102-575) authorized federal funds for diversion dam rehabilitation on the Duchesne and Strawberry Rivers; however, these funds must be expended for fish and/or wildlife benefits and purposes. Improvements which would not directly improve fish or wildlife resources would require local cost sharing at 100 percent of the additional cost for accomplishing non-fish and non-wildlife benefits. To gather baseline information regarding each of the diversion facilities, the Central Utah Water Conservancy District contracted for an evaluation of the diversion dams. The analysis focused on the existing impacts of each diversion structure on fish and wildlife resources and the benefits that would be realized with the rehabilitation of the structures (Woodward-Clyde 1998). The evaluation included all diversions on the Duchesne River from the confluence of the North Fork and West Fork downstream to the confluence of the Strawberry River[1] (Figure 1-2), and on the Strawberry River from the confluence of Red Creek downstream to Starvation Reservoir (Figure 1-3). Actual structures evaluated are listed in Table 1-1.

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[1] The evaluation did not include the Knight Diversion (a CUP structure) on the Duchesne River and the Rhoades Diversion is actually located on the North Fork a short distance upstream from the West Fork confluence.

Funding for the rehabilitation of the diversion dams would be through the Utah Reclamation Mitigation and Conservation Commission (Mitigation Commission). In the Mitigation Commission's five-year Mitigation Plan, the Mitigation Commission has committed with the Central Utah Water Conservancy District, the Duchesne County Water Conservancy District, and other local water users to modify or replace the selected diversion structures that are causing the greatest problems for fish and wildlife resources. The Mitigation Commission consulted with the U.S. Fish and Wildlife Service (USFWS), the Utah Division of Wildlife Resources (UDWR), and other agencies to prioritize the diversion rehabilitation. The Interagency Biological Assessment Team (IBAT), an interagency team organized to provide recommendations regarding mitigation measures for CUP impacts, reviewed the report prepared by Woodward-Clyde Consultants (1998) and prioritized the diversions to be repaired or replaced in an order that would be the most beneficial to fish and wildlife resources (see Appendix B).

The Mitigation Commission decided to proceed with design and construction of several diversion structures so that they could be used to help conduct an evaluation of the potential impacts, design approaches, and costs involved in implementing similar projects on a broader scale. Based on the IBAT's recommendations, the Mitigation Commission initially selected the following four diversions for modification.

- Pioneer Canal
- Hicken Ditch
- Knight-Shanks Canal
- Rocky Point Canal

For the Pioneer, Hicken, and Rocky Point diversion, the Mitigation Commission and the Duchesne County Water Conservancy District conducted the following tasks:

- Completed the final engineering for each of the diversion structures,
- Determined if screens were needed to prevent fish from being lost in the canals,
- Completed surveys for threatened and endangered species (Ute ladies'-tresses),
- Obtained necessary permits from the U.S. Army Corps of Engineers (USACE), and
- Complied with the National Environmental Policy Act (NEPA) by preparing a Categorical Exclusion (Rocky Point and Hicken Ditch) or an Environmental Assessment (EA) and Finding of No Significant Impact (FONSI) (Pioneer).

Following the completion of these tasks, the Mitigation Commission provided funds to the Duchesne County Water Conservancy District in 1999 for construction of the Hicken, Pioneer and Rocky Point diversions. The Duchesne County Water Conservancy District awarded construction contracts for these three diversion dams and all three have been constructed and are presently in operation. The Knight-Shank Diversion was determined to be located within the boundaries of the Uintah and Ouray Indian Reservation and legal constraints prevented this diversion dam from being rehabilitated at that time.

1.2 PURPOSE AND NEED OF THE ACTION

The Mitigation Commission was created to coordinate the planning, funding, and implementation of measures to mitigate for past, present, and future impacts associated with the Bonneville Unit of the CUP, and other federal reclamation projects in Utah.

In the Mitigation Commission's five-year Mitigation Plan, the Mitigation Commission has committed with the Central Utah Water Conservancy District, the Duchesne County Water Conservancy District, and other local water users to rehabilitate diversion dams on the Duchesne and Strawberry Rivers that are causing the greatest problems for fish and wildlife resources. The area of concern includes the Duchesne River upstream from the confluence of the Strawberry River and the Strawberry River from the confluence of Red Creek downstream to Starvation Reservoir.

The **need** for the project is to rehabilitate or reconstruct diversion facilities on the Duchesne and Strawberry Rivers in the project area to reduce adverse affects on fish and wildlife resources in the project areas, addressing specifically the following problems:

- **Bypass CUP fish water** – CUP is responsible for releasing or bypassing an average of 44,400 acre-feet of water annually to maintain established minimum flows in four Uinta Basin streams, including the Strawberry River and the West Fork of the Duchesne River. These flows, together with reservoir spills and tributary inflows, will provide 50 percent of the historical fish habitat within the streams. Minimum flows must bypass all diversions to retain the habitat down to the confluence of the Duchesne and Strawberry Rivers, as provided by the Stream Flow Agreement of February 27, 1980 as amended September 13, 1990, and as allowed by Utah water law. Therefore, diversions should be capable of being regulated so that instream flows can be bypassed, in accordance with water right priorities.[2]
- **Dry dams** – Diversion structures that operate as dry dams have adverse effects on aquatic, riparian, and wildlife resources. Dewatering streams can strand fish in pools, increase fish mortality and predation, decrease riparian vegetation, and decrease riparian wildlife habitat. Where possible, modifications need to be made to provide for more effective diversions so that water may be bypassed.
- **Fish barriers** – Diversion dams can act as barriers to fish movement. This can adversely impact fish populations by reducing or eliminating fish from reaching important spawning, nursery, feeding, or resting areas.

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[2] Water rights for the CUP are in most cases junior to other prior water rights on the Duchesne River and Strawberry River systems. Thus, there are times when water might be bypassed from a CUP diversion to meet the minimum instream flow requirement, but a downstream non-CUP water user may be entitled to divert that water from the stream, in accordance with the State of Utah water right priority system. Therefore, there may not be instream minimum flows all the way to the confluence of the Duchesne and Strawberry rivers, especially in summer months of dry years.

- **Operation and maintenance impacts** – Diversions that are frequently washed out or damaged during high flows require instream work during the irrigation season to direct water towards the diversion. Instream work adversely affects the aquatic ecosystem by disturbing the substrate, physically altering fish habitat and riparian vegetation, and increasing stream sedimentation.
- **Diversion stability** – Unstable diversions are easily washed out and lost during high flows. Lost diversions can result in increased erosion of the adjoining streambank, loss of riparian vegetation and associated wildlife habitat, and decreased or degraded aquatic habitat.

In addition to meeting the beneficial needs listed above, other **purposes** that may be met by the proposed diversion projects are:

- Should be cost-effective
- Coordination and cooperation with the diversion structure owner and users to assure water delivery capability and that the constructed project(s) would be maintained.
- Improved capability for monitoring flows being diverted and being bypassed by the diversion facility

1.3 SCOPE OF DOCUMENT

This Programmatic Environmental Assessment (PEA) discusses the potential environmental impacts associated with the reconstruction and operation of an unspecified diversion dam on the Duchesne or Strawberry River that has been targeted for rehabilitation. The new diversion dam could serve single or multiple diversion rights. Potential environmental impacts addressed in this document are those impacts that would be expected regardless of the diversion dam that is rehabilitated. Potential impacts to wetlands, threatened and endangered species, and cultural resources generally are site specific and/or require special permits and potential impacts to these environmental disciplines would be addressed in a Supplemental EA (SEA). A SEA to address site specific impacts would be prepared for each diversion dam concurrent with the preparation of the final engineering or design report for a specific structure.

With the exception of the Knight Diversion and the Pioneer, Hicken and Rocky Point diversion dams previously rehabilitated, this PEA applies to all of the diversion dams identified in Table 1-1. The PEA provides the public and decision makers with the information to understand and evaluate potential environmental consequences. Potential alternatives that are evaluated in this PEA are described in Section 2.

1.4 PROGRAMMATIC PROCESS

As stated previously, this PEA addresses the singular and cumulative construction and operation of individual diversion dams on the Duchesne River or the Strawberry River in Utah. A Programmatic FONSI will be executed for typical actions covered by this PEA that would not result in significant impact(s). As a subsequent decision to rehabilitate or reconstruct a particular diversion structure is made, the site-specific impacts will be assessed. If no additional impacts

beyond those assessed in this PEA are identified, a memorandum would be prepared stating that the project, alternatives, potential impacts, and mitigation measures were reviewed and found to be fully and accurately described by the PEA and no further action is required to comply with NEPA.

If a project is expected to create impacts not described in the PEA, to create impacts greater in magnitude or duration than described in the PEA or would require mitigation measures to keep impacts below significant levels that are not described in the PEA, a SEA and an updated FONSI would be prepared. The analysis in this PEA, where possible has relied on the evaluation of and past experience with the construction and operation of the three diversion structures recently completed on the Duchesne River. When a specific diversion dam is ready to proceed, the Mitigation Commission will review the PEA to determine if site-specific information is available and what level of environmental analysis and documentation would be required. If the level of analysis in the PEA was not sufficient for the specific project, then additional analysis would be tiered off this PEA.

Additive impacts, defined as project effects that are greater in significance than the sum of the direct and indirect effects when combined with the total effects of the construction and operation of all of the identified diversion dams, are also addressed in this PEA. If additive impacts are identified, they would be added to those addressed in the PEA, and the overall effects would be evaluated and discussed in the SEA that would be prepared.

In addition to NEPA compliance, coordination or concurrence/approval may also be required by the following agencies:

- U.S. Army Corps of Engineers – Section 404 Permit
- U.S. Fish and Wildlife Service – Threatened and endangered species; and Fish and Wildlife Coordination Act
- Utah Division of Wildlife Resources - Fish and Wildlife Coordination Act
- Utah State Historic Preservation Officer – Cultural resources
- Utah Division of Water Rights – State Stream Alteration Permit
- U.S. Bureau of Indian Affairs – Rights-of-Way
- Ute Indian Tribe, Uintah and Ouray Agency – Rights-of-Way, cultural resources

1.5 ORGANIZATION OF THE DOCUMENT

This PEA is organized into the following sections and technical appendices:

Section 1 provides background information, a discussion of the programmatic approach for an EA, and identifies the purpose and need of the proposed action.

Section 2 describes the No Action Alternative and the two action alternatives evaluated in the PEA. This section concludes with a comparative summary of the effects of alternative actions on the local communities and the natural environment.

Section 3 provides the environmental setting (affected environment) of the project area. The baseline provides a basis for measuring the impacts of the alternative actions and is needed for analytical comparisons.

Section 4 describes potential environmental consequences of implementing the alternative actions, forms the basis for the Impact Summary Matrix in Section 2, and discusses cumulative impacts associated with the program.

Section 5 describes the public involvement measures undertaken for this project.

Section 6 provides a list of literature cited in the PEA.

Appendix A provides a list of acronyms and abbreviations used in the PEA.

Appendix B provides the letters received from public agencies, individuals, and organizations.

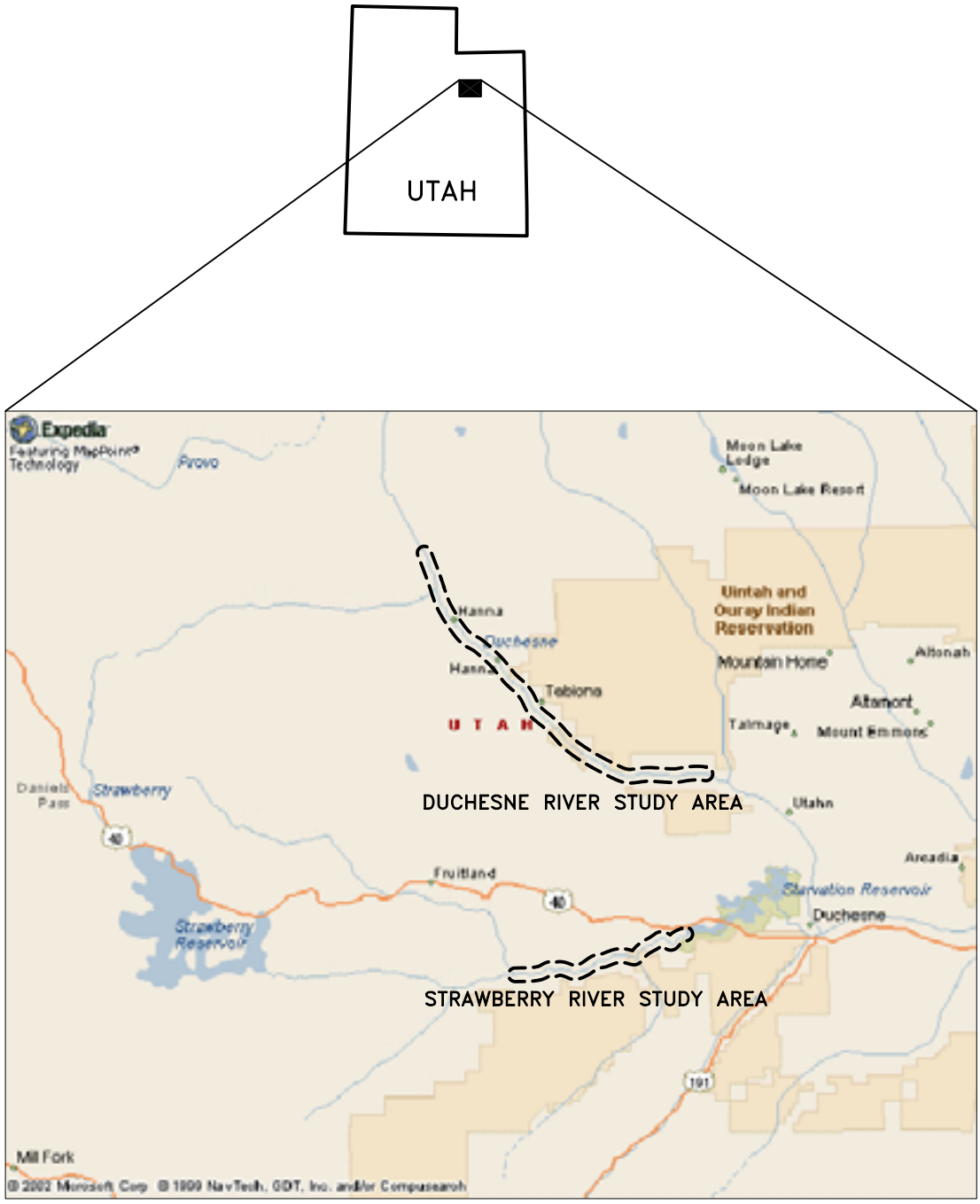
Appendix C provides descriptions of soil types that are found in the study area.

Appendix D includes the Ute ladies'-tresses survey report

Appendix E includes the list of environmental commitments for the project

TABLE 1-1
DIVERSION DAMS EVALUATED ON
THE DUCHESNE AND STRAWBERRY RIVERS

Diversion	
Duchesne River	Strawberry River
Rhoades Diversion	Strawberry Diversion #10
Turnbow Diversion 1	Strawberry Diversion #9 (Vanderhooft)
Turnbow Diversion 2	Strawberry Diversion #8
Leo S. Defa Diversion	Strawberry Diversion #7
Farm Creek Diversion	Strawberry Diversion #6 (JJNP)
New Tabby Diversion	Strawberry Diversion #5
Jasper Pike Diversion	Strawberry Diversion #4
Hicken Diversion	Strawberry Diversion #3 (Ivie & Peterson)
B. Peterson Diversion	Strawberry Diversion #2 (Peatross/Pender)
Wagstaff Diversion	Strawberry Diversion #1 (Peatross)
J. Peterson Diversion	
Brown Diversion	
Broadhead Diversion	
Jones Diversion	
Knight-Shanks Diversion	
Pioneer Diversion	
Rocky Point Diversion	



LEGEND

STUDY AREA

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APPROXIMATE SCALE IN MILES

SOURCE: WWW.EXPEDIA.COM

URS

UTAH DIVERSION DAM STUDY AREA

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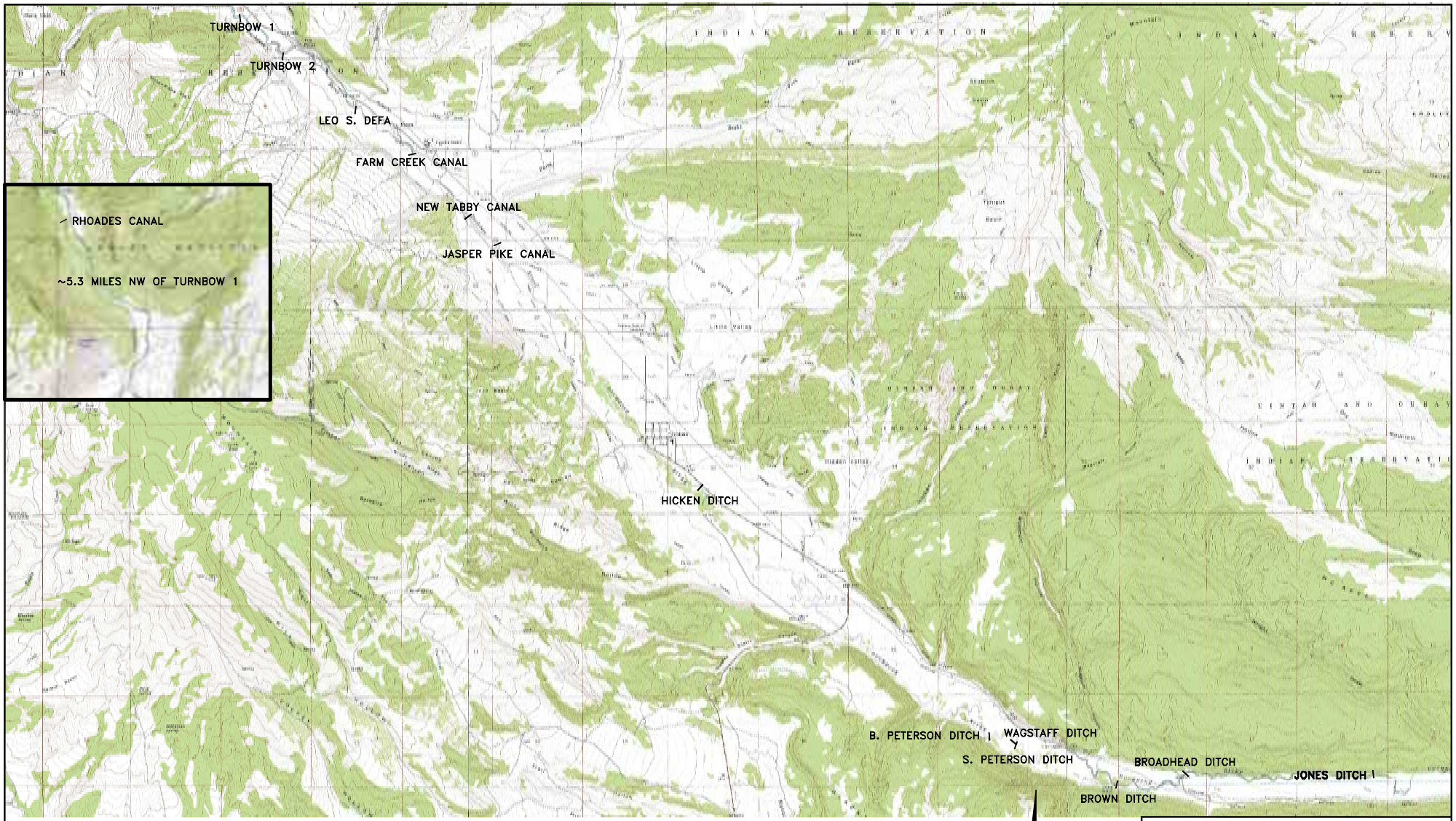

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DIVERSIONS LOCATED ON THE DUCHESNE RIVER

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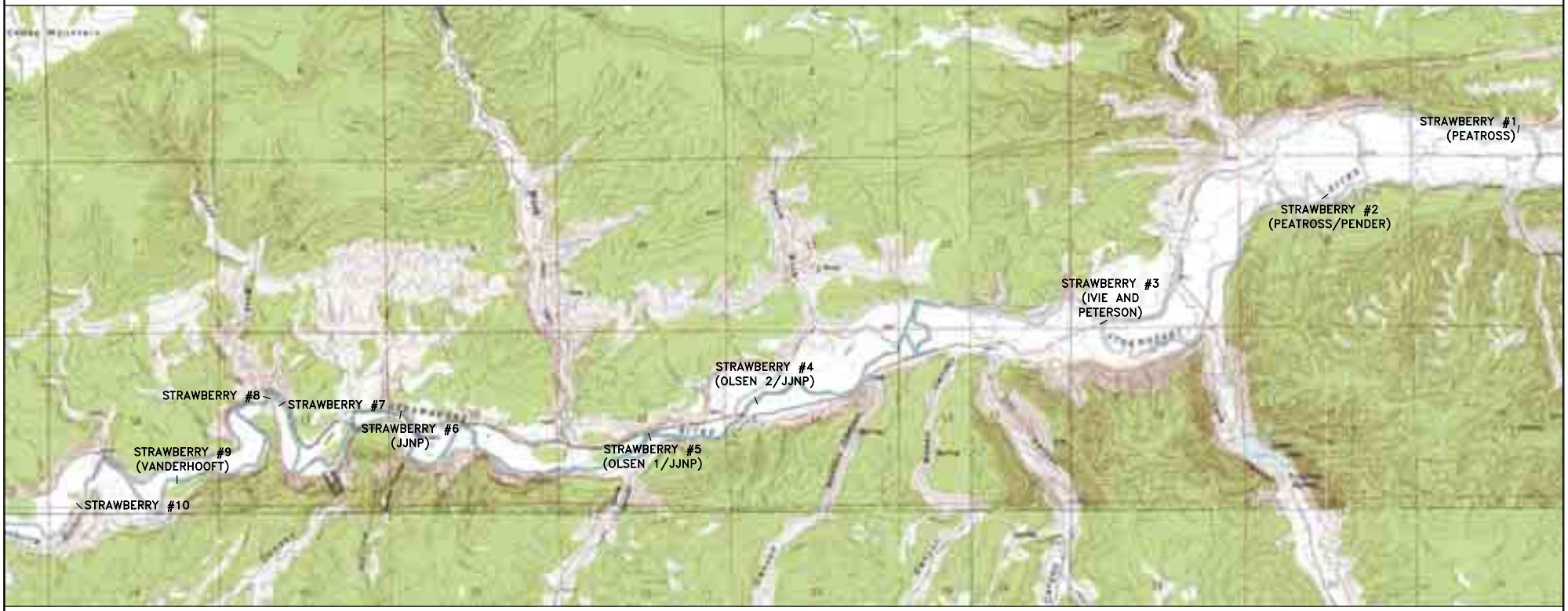

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3000 1500 0 3000

APPROXIMATE SCALE IN FEET

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DIVERSIONS LOCATED ON THE STRAWBERRY RIVER

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2.1 INTRODUCTION

As stated previously, the Central Utah Project Completion Act (P.L. 102-575) authorized federal funds for rehabilitation of diversion dams on the Duchesne and Strawberry Rivers in Utah. The diversion dams to be rehabilitated are located on the Duchesne River from the confluence of the North Fork and West Fork downstream to the Strawberry River and on the Strawberry River from the confluence of Red Creek downstream to the confluence of the Duchesne River. Since no diversion dams are located on the Strawberry River downstream from Starvation Reservoir, the headwater of Starvation Reservoir becomes the lower boundary of the study area on the Strawberry River. Likewise, the two private-diversion dams (Pioneer and Rocky Point) on the Duchesne River downstream from the confluence of Rock Creek have already been rehabilitated with Mitigation Commission funds. Therefore, the confluence of Rock Creek is the lower boundary of the study area on the Duchesne River.

Alternatives identified and evaluated in this PEA are solely for the rehabilitation of a diversion dam within the identified study areas on the Duchesne and Strawberry Rivers.

2.2 ALTERNATIVE 1 – NO ACTION

Inclusion of the No Action Alternative (Alternative 1) in the environmental analysis and documentation is required under NEPA. The No Action Alternative is defined as maintaining the status quo with no federal funding and/or involvement.[3] Under this alternative, the Mitigation Commission would not provide any funds for the rehabilitation of the diversion dams. The existing diversion dams would continue to be operated in the manner they have been operated in the past. It would be expected that most structures would require annual instream maintenance and many of the structures would continue to be operated as "dry dams" during low flow periods. The No Action Alternative does not meet the project's needs or purposes, and is in conflict with the Mitigation Commission's five-year plan. For this reason, the No Action Alternative evaluates the effect of not providing the assistance. The No Action Alternative would result in conditions similar, if not identical to, the baseline conditions.

2.3 ALTERNATIVE 2 – REPLACE DIVERSION DAM

Alternative 2 involves the construction of a new diversion facility on the Duchesne or Strawberry River at or in very close proximity to the location of the existing diversions. The new diversion dam was assumed to be located within a few hundred feet of the existing diversion dam. Typical project features of this alternative are:

- Concrete or rock sill diversion dam that includes the dam or sill, a concrete turnout with a mechanical gate, concrete wingwalls, fish passage notch, and bottom sluice gate(s).
- Removal and disposal of the old diversion works.

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[3] Routine operation and maintenance of diversion dams may require compliance with the Federal Clean Water Act and the Utah Stream Alteration Act

- If needed, installation of rock weir(s) in the river downstream of the new dam or sill to increase stream bed elevation to facilitate the movement of fish through the fish notch in the dam.
- Repair/construct up to 1,000 feet of existing canal(s), if necessary to connect with the new diversion.

Irrigators and/or canal companies would be responsible for procuring and/or producing temporary and/or permanent easements for construction of facilities and for ingress/egress for operation and maintenance activities.

To reduce potential construction-related impacts, the Mitigation Commission would assure the following procedures are implemented by the construction contractor:

- To the extent practicable, construction activities would be confined to previously disturbed areas.
- All equipment used during construction would be washed clean of any seeds prior to entering a construction site.
- For public safety, all construction sites would be closed to the public.
- Dust abatement would be implemented, as appropriate.
- The contractor would be required to implement the best available control technologies (BACT) to minimize soil erosion during precipitation events.
- All disturbed areas, resulting from construction, would be smoothed, shaped, re-contoured, reseeded with native seed mix, and rehabilitated to as-near natural conditions, as practicable.

2.4 ALTERNATIVE 3 – COMBINE DIVERSION DAMS

With Alternative 3, several of the existing diversions on the Duchesne and Strawberry Rivers would be combined and new diversion dams that would serve multiple diversion rights would be constructed (to the extent possible and practical). This would involve transferring points of diversion from the downstream diversion(s) to the upstream diversion that would be constructed. Diversions would be combined only when the involved water rights would not be adversely affected. Not every diversion structure can be potentially combined with one or more of the other diversions. This alternative was formulated to include consolidation of diversions that appeared feasible and reasonable based on physical and logistical considerations. At this time, potential legal, social, and institutional constraints have only been considered at a cursory level. Further examination of consolidation options could preclude some projects from being implemented. Project features of this alternative are:

- Concrete or rock sill diversion dam that includes the dam or sill, a concrete turnout with a mechanical gate, concrete wingwalls, fish passage notch, and bottom sluice gate(s).
- Removal and disposal of the old diversion works.

- Installation of rock weir(s) in the river downstream of the new dam or sill to increase stream bed elevation to facilitate the movement of fish through the fish notch in the dam.
- Repair/construct up to 1,000 feet of existing canal(s), if necessary to connect with new diversion.
- Construction of up to 11,000 feet of new canals or pipelines to convey water to multiple diversion systems.

The location of the Rhodes Diversion on the North Fork Duchesne precludes this diversion from being combined with any of the other diversions. Existing diversions that have the potential to be combined from upstream to downstream include:

Duchesne River

- Turnbow Diversion 1, Turnbow Diversion 2, and possibly the Leo S. Defa Diversion
- Jasper Pike Diversion, New Tabby Diversion, and possibly Farm Creek Diversion
- B. Peterson Diversion, Wagstaff Diversion, J. Peterson Diversion, and Brown Diversion
- Broadhead Diversion and Jones Diversion

Strawberry River

- Strawberry Diversion #10, Strawberry Diversion #9 (Vanderhooft), Strawberry Diversion #8, and Strawberry Diversion #7
- Strawberry Diversion #6 (JJNP), Strawberry Diversion #5, and Strawberry Diversion #4 (Diversion rights associated with Strawberry Diversion #5 and Strawberry Diversion #4 have already been combined with Strawberry Diversion #6)
- Strawberry Diversion #3 (Ivie & Peterson), Strawberry Diversion #2 (Peatross and Pender), and possibly Strawberry Diversion #1

Irrigation and/or canal companies would be responsible for procuring and/or producing temporary and/or permanent easements for construction of facilities and for ingress/egress for operation and maintenance activities.

To reduce potential construction-related impacts, the Mitigation Commission would assure the following procedures are implemented by the construction contractor:

- To the extent practicable, construction activities would be confined to previously disturbed areas.
- All equipment used during construction would be washed clean of any seeds prior to entering a construction site.
- For public safety, all construction sites would be closed to the public.
- Dust abatement would be implemented, as appropriate.

- The contractor would be required to implement the best available control technologies (BACT) to minimize soil erosion during precipitation events.
- All disturbed areas, resulting from construction, would be smoothed, shaped, re-contoured, reseeded with native seed mix, and rehabilitated to as-near natural conditions, as practicable.

2.5 COMPARISON OF ENVIRONMENTAL IMPACTS

Table 2-1 provides a summary comparison by environmental discipline of impacts that would be expected with each of the alternatives. Environmental impacts are described briefly in the summary table and discussed in greater detail in Section 4.

TABLE 2-1
COMPARISON OF ALTERNATIVES BY ENVIRONMENTAL RESOURCE

Environmental Resource	Alternative 1 No Action	Alternative 2 Replace Diversion Dam	Alternative 3 Combine Diversion Dams
Geology, Topography, and Soils	No impact on geology or topography. Soils would continue to be temporarily impacted during required maintenance activities.	No impact on geology or topography. Up to 1 acre of soils would be permanently affected by the construction of the diversion dam. Up to an additional 0.5 acre of soils temporarily disturbed during construction.	No impact on geology or topography. Construction of the diversion dam would temporarily and permanently disturb up to 1.0 and 0.5 acres of soils, respectively. Construction of the canal/pipeline would temporarily disturb up to 10 acres of soils of which 5 acres could be permanently affected.
Hydrology/Water Quality	Hydrology of Duchesne and Strawberry Rivers would not be affected. Water quality would be degraded during periods when instream maintenance of the existing structure is required.	Alternative would have no effect on hydrology of river during high and moderate flow periods. During low flow periods, it would have a beneficial effect, as the new diversion dam would provide a mechanism to by-pass flows in excess of the diversion's water right. Alternative would have temporary adverse impact of the river's water quality during construction in stream channel. However, the alternative would have long-term beneficial effects on the river's water quality because of the reduction in the amount of instream maintenance that would be needed.	Alternative would have no effect on hydrology of river during high and moderate flow periods. During low flow periods, it would have a beneficial effect as the new diversion dam would provide a mechanism to by-pass flows in excess of the diversion's water right. Alternative would have temporary adverse impact of the river's water quality during construction in stream channel. However, the alternative would have long-term beneficial effects on the river's water quality because there would be fewer diversions than there are currently and a reduction in the amount of instream maintenance that would be needed
Biological Resources -Wetlands	Wetlands adjacent to the diversion dam and along ingress and egress routes would continue to be disturbed during required maintenance activities.	Wetlands within the construction zone of the diversion dam and along the access road would be adversely affected by the alternative. Detailed assessment of wetland impacts would be completed when a diversion has been targeted for rehabilitation or replacement. All wetlands impacts would be mitigated as per USACE requirements.	Wetlands within the construction zone of the diversion dam, along the access road, and within the area disturbed by the canal/pipeline would be adversely affected by the alternative. Detailed assessment of wetland impacts would be completed when a diversion has been targeted for rehabilitation or replacement. All wetlands impacts would be mitigated as per USACE requirements.
Biological Resources -Vegetation and Wildlife Habitat	Up to 1 acre of existing vegetation and wildlife habitat would continue to be disturbed during required maintenance activities.	Up to 1.5 acres of existing vegetation and wildlife habitat would be temporarily disturbed of which approximately 1 acre could be permanently lost.	Up to 11.5 acres of existing vegetation and wildlife habitat would be temporarily disturbed of which approximately 6 acres could be permanently lost.
Biological Resources -Aquatic Resources	Aquatic resources within the study area would continue to be adversely affected when the existing dam requires instream maintenance, is operated as a "dry dam", and acts as a barrier to fish movement.	The alternative would have a beneficial affect on aquatic resources within the study area because the new dam would require less maintenance, would be operated as a "dry dam" less frequently, and would allow fish passage.	The alternative would have a beneficial affect on aquatic resources within the study area because the new dam would require less maintenance, would be operated as a "dry dam" less frequently, and would allow fish passage. In addition, this alternative would reduce the number of diversions within the study area.

TABLE 2-1
COMPARISON OF ALTERNATIVES BY ENVIRONMENTAL RESOURCE

Environmental Resource	Alternative 1 No Action	Alternative 2 Replace Diversion Dam	Alternative 3 Combine Diversion Dams
Biological Resources -Threatened and Endangered Species	The Ute ladies'-tresses has the continued potential to be adversely affected by required maintenance activities.	The Ute ladies'-tresses has the potential to be adversely affected by construction activities. Additional surveys for Ute ladies'-tresses would be conducted during the year prior to planned construction. If Ute ladies'-tresses would be affected, formal consultation with the USFWS would be required prior to initiation of construction activities.	The Ute ladies'-tresses has the potential to be adversely affected by construction activities. Additional surveys for Ute ladies'-tresses would be conducted during the year prior to planned construction. If Ute ladies'-tresses would be affected, formal consultation with the USFWS would be required prior to initiation of construction activities.
Land Use and Planning	The alternative would involve no activities within a 100-year floodplain. No farmland would be affected.	Floodplains within the study areas have not been designated. Diversion structures would be constructed so as not to impede flood flows. Therefore, there would be no impact on flood elevations. No farmland would be affected.	Floodplains within the study areas have not been designated. Diversion structures would be constructed so as not to impede flood flows. Therefore, there would be no impact on flood elevations. Up to 5 acres of farmland could be affected by the canal/pipeline that would be constructed to connect the irrigation distribution systems.
Socioeconomics	No impact on the current economic situation of the landowner or irrigation company. No disproportionate adverse impacts would be expected on any minority or low-income populations.	The alternative would have a long-term beneficial economic impact on the landowners and irrigation company involved. No disproportionate adverse impacts would be expected on any minority or low-income populations.	The alternative would have a long-term beneficial economic impact on the landowners and irrigation company involved. No disproportionate adverse impacts would be expected on any minority or low-income populations.
Cultural Resources	No impacts on cultural resources within the study area.	No known cultural resources are known within the areas that would be disturbed during the construction of a diversion dam. Class I and Class III cultural resource evaluations would be conducted the year prior to planned construction. The evaluation would include all areas that would be disturbed by project activities.	No known cultural resources are known within the areas that would be disturbed during the construction of a diversion dam. . Class I and Class III cultural resource evaluations would be conducted the year prior to planned construction. The evaluation would include all areas that would be disturbed by project activities.
Air Quality	Minor, short-term impacts to air quality related to vehicle exhaust and particulate emissions would be expected during maintenance activities.	Minor, short-term impacts to air quality related to vehicle exhaust and particulate emissions would be expected during construction activities.	Minor, short-term impacts to air quality related to vehicle exhaust and particulate emissions would be expected during construction activities.
Noise	No impact on noise levels within the study area.	The alternative would be expected to contribute to elevated noise levels in the immediate vicinity of construction activities.	The alternative would be expected to contribute to elevated noise levels in the immediate vicinity of construction activities.
Transportation	Roads, highways, and associated traffic would not be affected.	Roads, highways, and associated traffic would not be affected.	Roads, highways, and associated traffic would not be affected.
Hazardous Materials	No impacts to hazardous materials would be expected as no hazardous materials were identified in the study area.	No impacts to hazardous materials would be expected as no hazardous materials were identified in the study area.	No impacts to hazardous materials would be expected as no hazardous materials were identified in the study area.

The discussion within this section of the PEA for the various environmental disciplines focuses on a study area on the Duchesne River and a study area on the Strawberry River. The Duchesne River study area extends from the confluence of North Fork and West Fork downstream to the confluence of Rock Creek and the Strawberry River study area extends from the confluence of Red Creek downstream to Starvation Reservoir. Generally, the study areas include the river and the floor of the associated valley; however, for select environmental disciplines, such as geology and socioeconomics, the discussion covers a slightly larger area.

3.1 GEOLOGY, TOPOGRAPHY, AND SOILS

The geology of Utah is very diverse. Utah is home to several mountain ranges, plateaus, and lowland valleys and plains. The various geologic phases have shaped the landscape dramatically. As mountains rose to the west, the area became cut off from ocean winds and overlain with sand, creating a desert phase approximately 206 to 180 million years ago. As the mountains continued to grow due to continental plate collisions during the late Cretaceous period (approximately 99 to 65 million years ago), the Inland Sea covered most of the eastern half of what is now Utah (UGS 2002). The area continued to change, but always remained fairly wet with large water bodies being the predominant geologic feature. Approximately 15,000 years ago, a giant freshwater lake, Lake Bonneville, emerged and covered almost the entire western half of the state. As the climate changed and the glaciers retreated, the lakes have almost completely dried, leaving the Great Salt Lake the largest remnant of the former Lake Bonneville (University of Utah 2002).

The result of all this geologic activity has left Utah with a large number of exposed rocks and geologic structures. The present day landscape exposes a wide variety of sedimentary, igneous, and metamorphic rock formations, as well as over 500 mineral species and diverse fossils (University of Utah 2002).

The Strawberry and Duchesne River basins lie in what is known as the Uinta Basin. The Uinta Basin has an area of approximately 10,890 square miles and includes three distinct physiographic provinces. The Rocky Mountains province includes a small piece of the Wasatch Hinterlands section that drains into Strawberry Valley at the eastern edge of the basin. The central part of the basin is relatively flat and contains many river tributaries and wide, shallow valleys. The valley is underlain by Tertiary Age Mancos Shale, Uinta, and Green River geologic formations, which contribute to high amounts of salt in the water that comes in contact with them (UDEQ 2002).

The Utah Geological Survey (UGS 2002) estimated that approximately 57 earthquakes occurred in Utah during the month of July 2002. Most of these earthquakes were small (less than M1 3.0) and were clustered in specific areas over small periods of time. According to the U.S. Geological Survey (USGS) Dynamic Hazards Map program (USGS 2002), no known faults are located in Duchesne County. The county is also classified as an area with “damage not likely” (Christenson 1994).

No detailed soil survey exists for Duchesne County. However, the Duchesne County Natural Resources Conservation Service (NRCS) office had preliminary information on soil classifications available for some limited areas within the study area. It should be noted that this

information was provided in draft form, and does not include all soils that may be present in the study area. Descriptions of these soils are available in Appendix C. Soils present in the study area along the Duchesne and Strawberry Rivers are predominately loams including those classified as Alldown loam, Haverdad loam, Mikim loam, Pherson loam, Sinkson loam, Straw clay loam, Tebbs loam, and Yarts loam.

3.2 HYDROLOGY / WATER QUALITY

3.2.1 Duchesne River Study Area

The West Fork of the Duchesne River originates in the Uinta National Forest at an elevation of approximately 9,700 feet above mean sea level (msl) and travels approximately 18.2 miles to the confluence of the North Fork of the Duchesne River. The North Fork of the Duchesne River originates in the Ashley National Forest at an elevation of approximately 10,100 feet msl and flows 17.4 miles where it joins with the West Fork of the Duchesne River to form the Duchesne River. The Duchesne River starts approximately 5 miles upstream from the small village of Hanna, Utah, near the Stockmore Ranger Station and flows into the Green River near the village of Ouray, Utah. Overall within the study area, the gradient of the Duchesne River is less than 1 percent, but within short segments of the river the gradient can be between 1 and 3 percent. Upstream from the confluence of the Strawberry River, the drainage area of the Duchesne River is approximately 630 square miles. Overall, the drainage of the Duchesne River is approximately 2,640 square miles, including the drainage area of the Strawberry River.

Most of the annual discharge of the Duchesne River occurs during the months of May and June and is typical of mountain streams in the western United States. Flooding frequently occurs along the stream during the peak runoff period. In addition to the diversions discussed in this PEA, limited regulation of flow occurs through the operation of the Duchesne Diversion and Tunnel (located upstream of our study area), which diverts flows from the upper North Fork to the Great Basin and several Strawberry Aqueduct and Collection System (SACS) features. All of the SACS diversions (except the Knight Diversion) are located upstream of our study area. The SACS diversions include:

- Upper Stillwater Reservoir on Rock Creek (tributary to Duchesne River),
- Doc Diversion on South Fork of Rock Creek (tributary to Rock Creek),
- Vat Diversion on the West Fork,
- Rhodes Diversion on Wolf Creek (tributary to West Fork),
- Win Diversion on Twin Creek (tributary to Wolf Creek),
- Hades Diversion on Hades Creek (tributary to North Fork), and
- Knight Diversion on the Duchesne River.

Two USGS flow monitoring stations are currently active within the study area on the Duchesne River. These stations are 09277500, which is 6 miles upstream of the confluence of Rock Creek, and 09279150, which is 1.7 miles upstream of the Knight Diversion. Annual mean flow at the

further upstream station (09277500) for Water Years 1919 through 1996 was 192 cubic feet per second (cfs), with daily mean values ranging from 21 to 2,490 cfs (USGS 1997). Annual mean flow at the station upstream from Knight Diversion for Water Years 1971 through 1996 was 315 cfs, with daily mean values ranging from 54 to 4,700 cfs. The Knight Diversion has the ability to divert up to 300 cfs into Starvation Reservoir. Since going into operation, maximum flow past the diversion was 4,970 cfs, which occurred on June 6, 1986 (Bruton 2003). The 18 diversions on the Duchesne River that were identified and originally evaluated by Woodward-Clyde (1998) have a combined maximum diversion right of approximately 245 cfs.

Average monthly flow data (May through September) for the Duchesne River at USGS Station 09277500 for the years 1987 through 2001 (a 15-year period) is provided in Table 3-1. As shown in most years, the average monthly flows of the Duchesne River in May and June at the USGS gauging station were substantially higher than 100 cfs; however, during July, August, and September, average monthly flows between 53 and 80 percent of the years were less than 100 cfs. The average monthly flows at the USGS gauging station suggest that three of the years (1988, 1992, and 1995) were dry (low flows during the July through September period) years.

3.2.2 Strawberry River Study Area

The Strawberry River originates in the Uinta National Forest at an elevation of approximately 9,200 feet msl and travels approximately 20 miles before flowing into enlarged Strawberry Reservoir. Water released from Strawberry Reservoir flows downstream approximately 33 miles before flowing into Starvation Reservoir. Downstream from Starvation Reservoir, the Strawberry River flows approximately 3.5 miles before it flows into the Duchesne River immediately downstream from the town of Duchesne, Utah. Overall within the study area, the gradient of the Strawberry River is less than 1 percent, but within short segments of the river the gradient can be between 1 and 3 percent. The drainage area of the Strawberry River is over 920 square miles.

Most of the annual discharge of the Strawberry River occurs during the months of May and June, which is typical of mountain streams in the western United States. Upstream from enlarged Strawberry Reservoir, overbank flooding frequently occurs along the stream during the peak runoff period. However, the storage and flow regulation capability of Strawberry Reservoir and Starvation Reservoir reduce the flooding along the mid and lower reaches of the Strawberry River. The Strawberry Water Users Association and the Central Utah Water Conservancy District have diversion rights for the diversion of water from Strawberry Reservoir to the Wasatch Front (Great Basin). The study area on the Strawberry River extends from the confluence of Red Creek downstream to Starvation Reservoir. The 10 active diversions within the study area have water rights that allow up to approximately 38.2 cfs to be diverted from the Strawberry River (Woodward-Clyde 1998).

One USGS flow monitoring station is currently active within the study area on the Strawberry River. The station is 09288180, which is 2,000 feet upstream of the maximum high water line of Starvation Reservoir. Annual mean flow at this station for Water Years 1968 through 1996 was 147 cfs, with daily mean values ranging from 18 to 2,010 cfs (USGS 1997). Starvation Reservoir regulates flow in the segment of the river downstream from the dam. During the non-

irrigation season, releases are generally between 15 and 25 cfs, whereas during the irrigation season releases generally range between 350 and 500 cfs. Since going into operation, the largest daily release was 1,900 cfs, which occurred on June 3, 1983 (Bruton 2003). Due to vegetative and developmental encroachment, current safe-channel capacity in the Strawberry River from Starvation Dam to the confluence with the Duchesne River is 1,100 cfs. The Central Utah Water Conservancy District is examining approaches to restore additional safe-channel capacity (Bruton, 2003).

3.3 BIOLOGICAL RESOURCES

3.3.1 Wetlands (Executive Order 11990)

Executive Order (E.O.) 11990, entitled Protection of Wetlands, requires federal agencies to take action to minimize the loss of wetlands. Activities disturbing jurisdictional wetlands or other waters of the United States under Section 404 of the Clean Water Act require a permit from the USACE. Flows in both the Duchesne and Strawberry Rivers are greater than 5 cfs; therefore, the project area is under jurisdiction of the 404 Permit program administered by the USACE. Depending on the scope of the actions proposed for a diversion rehabilitation or combination, the work may quality for regulation by the State of Utah Stream Alteration Program under General Permit 040 issued by the USACE to the state; may fall under a Nationwide permit authorized by USACE; or may require an individual Section 404 Permit. Consultation with the State of Utah and the USACE would be initiated when draft plans/designs are developed for a particular project.

Within the study areas, wetlands are generally confined to the riparian zone along the Duchesne and Strawberry Rivers, the lower reaches of tributaries to the two rivers and along remnants of old meanders of the two rivers. Some small seasonally and permanently flooded wetlands in seeps and low areas also occur adjacent to the two rivers.

Wetland areas within the study areas are Palustrine type wetlands. The Palustrine System includes all non-tidal wetlands dominated by trees, shrubs, emergent vegetation, mosses or lichens.

3.3.2 Vegetation

Vegetation within the study areas generally includes riparian vegetation, tilled fields, and grazing land. Riparian vegetation is generally located in strips along both the Duchesne and Strawberry Rivers and along lower reaches of tributaries to the two rivers. The riparian areas contain stands of trees, shrubs and other woody vegetation (including narrowleaf cottonwood *(Populus angustifolia),* lanceleaf cottonwood (*Populus acuminata*), Russian olive (*Elaeagnus angustifolia*), American silverberry (*Elaeagnus commutata*), alder (*Alnus incana*), willows (*Salix* spp.), red-osier dogwood (*Cornus stolinifera*), water birch (*Betula occidentalis*), rose (*Rosa* spp.), and twinberry (*Lonicera involucrata*)), and native and non-native grasses and grass-like species (including Nebraska sedge (*Carex nebraskaensi*), wooly sedge (*C. languginosa*), redtop (*Agrostis stolinifera*), Baltic rush (*Juncus balticus*), swordleaf rush (*Juncus ensifolius*), and bluejoint reed grass (*Calamagrostis canadensis*). Wetter areas support spikerush

(*Eleocharis* spp.), sedges (*Carex* spp.), and bluejoint reed grass. The tilled fields are used primarily for the production of alfalfa (*Medicago sativa*), and the grazing lands include both dry and irrigated pastures containing native and planted grasses.

3.3.3 Terrestrial Wildlife

Wildlife species in the two project areas include both game and non-game species. Wildlife habitat, within or immediately adjacent to the two study areas, includes riparian, cropland, and undeveloped native uplands.

Mule deer (*Odocoileus hemionus*) is the most common big game species that occurs in the project areas, utilizing riparian, cropland, and upland habitats. Riparian habitats provide shade, cover, and browsing habitat; fawning sites (in June and July) and migration corridors for mule deer. During the winter, cropland provides valuable foraging areas for mule deer and upland areas that support grass and grass-like plants, providing foraging areas during the other periods of the year. High numbers of mule deer are regularly present in the study areas during the winter months.

During the winter months when the elk (*Cervus elaphus*) move to lower elevations, the elk are frequently present in the two study areas. During this period, alfalfa fields provide forage habitat, and upland and riparian areas provide cover when the elk are not foraging.

Non-game mammal species that are known to occur in the two study areas include beaver (*Castor canadensis*), badger (*Taxidea taxus*) , black-tailed jack rabbit (*Lepus californicus*) , bobcat (*Lynx rufus*), mountain lion (*Felis concolor*), fox (*Vulpes* spp.), and coyote (*Canis latrans*). Riparian areas are used as migration corridors, cover, and foraging areas, whereas, cropland areas are used primarily for foraging.

Game birds present within the two study areas are primarily limited to waterfowl such as Canada geese (*Branta canadensis*) and mallard (*Anas platyrhynchos)*. Cropland areas provide foraging habitat for Canada geese, and backwater areas along the two rivers provide resting, and to a limited extent, nesting habitat for waterfowl species.

A diverse group of non-game birds frequent the riparian corridors along the two rivers and include raptors, woodpeckers, owls, and passerine (perching species). Raptor species include bald eagle (*Haliaeetus leucocephalus*), golden eagle (*Aquila chrysaetos*), red-tailed hawk (*Buteo jamaicensis*), and Swanson's hawk (*Buteo swainsoni*). Ferruginous hawk (*Buteo regalis*) and Osprey (*Pandion haliaetus*) have been observed in Duchesne County. All of these species of raptors are uncommon in the two study areas. Bald eagle, when present as a winter migrant, will forage on fish, waterfowl, and rabbits, whereas the golden eagle will forage primarily on medium and small mammal species (rabbits, mice, etc.). The hawks, as well as the owls, forage on small mammals, such as mice and voles. Woodpeckers, such as the flicker (*Colaptes* spp.) and downy woodpecker (*Dendrocopus pubescens*), use mature trees and decaying trees for foraging and nesting. Frequently, other species such as tree swallow (*Iridoprocne bicolor*) and black-capped chickadee (*Parus atricapillus*) will use abandoned woodpecker nest cavities for breeding. Belted kingfisher (*Ceryle alcyon*) may occur in the riparian areas. Many songbirds such as the

American robin (*Turdus migratorius*), brown-headed cowbird (*Molothrus ater*), and red-winged black bird (*Agelaius phoeniceus*) will nest and forage within the riparian areas.

Little information is available on reptile and amphibian species that occur in the two study areas, although leopard frog (*Rana pipiens*) is likely to occur. The project area lies within the general historic range of Western (or Boreal) toad (*Bufo boreas*) and tiger salamander (*Ambystoma tigrinum*).

3.3.4 Aquatic Resources

3.3.4.1 Duchesne River

The quality of the sport fishery, as well as the UDWR classification, varies between stream segments of the Duchesne River. Both the West Fork and North Fork are classified as Class 3 streams by the UDWR, and each support self-reproducing populations of brown trout (*Salmo trutta)* and cutthroat trout (*Oncorynchus clarki*). The majority of the North Fork is within the Ashley National Forest, and receives periodic stocking of catchable-size (approximately eight or more inches in length) rainbow trout (*Oncorynchus mykiss*).

From the confluence of the Strawberry River upstream to Highway 208, the Duchesne River has been classified as a Class 3 stream by the UDWR. From Highway 208 upstream to the confluence of the West Fork and North Fork of the Duchesne River, the river has been classified as a Class 2 stream by the UDWR. Characteristics and importance of Class 1, 2, and 3 streams as per UDWR criteria are provided below.

> **Class 1** streams are the top-quality fishing waters of the state. They should be preserved and improved for fishery and similar recreational uses. These streams are generally outstanding in natural beauty and of a unique type. They are accessible with modern car at suitable points, and larger waters are floatable with suitable launching facilities. Productivity is such that it supports high fish populations, in good condition, of one or more species of the more desirable game fish. Natural reproduction or the stocking of small fish maintain an excellent sport fishery.
>
> **Class 2** streams are of great importance to the state fishery. These are productive streams with high aesthetic value and should be preserved. Fishing and other recreational uses should be primary consideration. They are moderate to large in size and may have some human development, such as farms or commercial establishments, along them. Many Class 2 streams are comparable to Class 1 streams, except for size.
>
> **Class 3** streams comprise approximately half of the total stream fishery habitat in Utah. These waters are important because they support the bulk of the fishing pressure in Utah. Water developments involving Class 3 waters should be planned to include fisheries as the primary use. Fisheries should be enhanced when possible and losses should be minimized.

The Duchesne River upstream from the Knight Diversion supports self-reproducing populations of brown trout and mountain whitefish (*Prosopium williamsoni*), and an occasional cutthroat

trout that have moved downstream from an upstream location. Fish surveys have suggested that recruitment of mountain whitefish has been quite limited in recent years (IBAT 1995a). Upstream from the Knight Diversion, low numbers of non-game fish (mountain sucker (*Catostomus platyrhynchus*), speckled dace (*Rhinichthys osculus*), longnose dace (*Rhinichthys cataractae*), and sculpin (*Cottus* spp.) have been routinely collected at a station downstream from the city of Tabiona, Utah. Within the study area, the stream segment between the cities of Tabiona and Hanna has consistently supported large numbers of sport fish. The most recent survey indicated that this segment supported between 750 and 1,000 catchable-sized (greater than eight inches total length) sport fish per mile of stream (IBAT 1995a).

Prior to the replacement of diversion dams on the Duchesne River, five diversion dams (Farm Creek, Jasper Pike, Hicken, Pioneer, and Rocky Point) within the Duchesne River study area were frequently operated as "dry dams", meaning that attempts are made by irrigators to divert the entire flow of the river into their canals. Plastic sheeting, hay bales, and other materials are typically palced on the upstream side of a sill or dam to seal the structure as much as possible. This practice results in only minor and diffuse flows seeping past a diversion. This practice is allowed under State law when the amount oif flow in the river approaches, or is equal to or less than the amount of a diverter's legal water right. When operated as dry dams, they also represented barriers to fish migration. In addition, within the Duchesne River study area, the Rhodes and Knight Diversion Dams are barriers to upstream fish movement throughout the year, and the Broadhead and Knight-Shank Diversions are barriers to upstream fish movement during most irrigation seasons. As discussed previously, three of the diversion dams (Hicken, Pioneer, and Rocky Point) within the Duchesne River study area have already been replaced with structures that have the ability to bypass flows and have functioning fish passage ways. Therefore, at the present time, the Farm Creek and Jasper Pike Diversion Dams are the only remaining structures that are operated periodically as dry dams.

Although the Rhodes Diversion Dam prevents upstream movement of fish, the Utah Division of Wildlife Resources has indicated that it would be desirable to have this structure remain as a barrier. As a barrier, it would allow the North Fork of the Duchesne River upstream of the diversion to be managed for native Colorado River cutthroat trout if so desired in the future.

Because the Knight Diversion is a Bureau of Reclamation-constructed facility, it is not one of the structures that will be upgraded or replaced as part of this project. Presently, it represents the lowest structure within the Duchesne River study area that is a barrier to upstream fish movement.

Upstream from the Knight Diversion are four remaining diversions (Farm Creek, Jasper Pike, Broadhead, and Knight-Shank) that frequently barriers fish during the irrigation season. Distance between the barriers ranges from 1.5 to 10 miles.

3.3.4.2 Strawberry River

The segment of the Strawberry River from the confluence of Red Creek downstream to Starvation Reservoir is rated as a Class 4 stream by the UDWR. Characteristics of a Class 4 stream as per the UDWR are:

Class 4 streams are typically poor in quality, with limited fishery value. Fishing should be considered a secondary use. A few Class 4 waters provide an important catchable fishery in areas where no other fishing exists. Water development plans should include proposals to enhance fisheries values where feasible.

The fish population in this segment of the Strawberry River was last sampled in 1993, and during this survey brown trout was the predominant species collected (IBAT 1995b). Brown trout represented 58 percent of the fish collected and approximately 60 percent of the brown trout collected were over 6 inches in total length. The only other sport species collected in this stream segment during the fish survey was a single cutthroat trout. Non-game fish, including bluehead sucker (*Catostomous discobolus*), mountain sucker, flannelmouth sucker (*Catostomous latipinnis)* and speckled dace, represented 40 percent of the fish collected. Of all the stations surveyed on the Strawberry River in 1993, this station (segment) had the lowest abundance of fish (approximately 270 fish per mile of stream) (IBAT 1995b).

The relatively poor-quality sport fishery that exists in this segment of the Strawberry River is attributable to the increase of silt and turbidity introduced by Red Creek and Avintaquin Canyon (Ottenbacher 1987). The elevated turbidity levels and increased silt load within the Strawberry River study area severely reduces the quality of spawning and rearing habitat for game fish, including brown trout in this reach of the river. Adult brown trout, migrating upstream from Starvation Reservoir, would need to migrate past all the identified diversion dams within the Strawberry River study area to reach the higher quality spawning and rearing habitat in the Strawberry River located upstream of the Red Creek confluence. The poor-quality game-fish habitat within the study area coupled with the degraded water quality contributes to the poor-quality sport fishery. Presently, Strawberry Diversions numbers 8, 6 (JJNP), 3 (Ivie and Peterson), and 2 (Peatross/Pender) represent barriers to fish attempting to migrate upstream, especially during low-flow periods. None of the diversions on the Strawberry River are operated as “dry dams”.

3.3.5 Threatened and Endangered Species

The Mitigation Commission sent the USFWS Salt Lake City Office a letter on September 11, 2002 requesting a list of federally listed threatened and endangered species that had the potential to occur in Duchesne County, Utah (Appendix B). The USFWS responded to the request by letter dated October 8, 2002 (Appendix B). Based on information provided by the USFWS, the following federally listed species have the potential to occur in Duchesne County.

- Barneby ridge-cress *Lepidium barnebyanum* Endangered
- Shrubby reed-mustard *Schoenocrambe suffrutescens* Endangered
- Uinta Basin hookless cactus *Sclerocactus glaucus* Threatened
- Ute ladies’-tresses *Spiranthes diluvalis* Threatened
- Bonytail *Gila elegans* Endangered
- Colorado pikeminnow *Ptychocheilus lucius* Endangered
- Humpback chub *Gila cypha* Endangered

• Razorback sucker	*Xyrauchen texanus*	Endangered
• Bald eagle	*Haliaeetus luucocephalus*	Threatened
• Mountain plover	*Charadrius montanus*	Proposed Threatened
• Black-footed ferret	*Mustela nigripes*	Endangered
• Canada lynx	*Lynx canadensis*	Threatened

Initially each of these federally-listed species was evaluated in regard to known distribution and/or the potential for habitat for the species to be present within either of the study areas. Species that had the potential to occur in either of the study areas or had the potential to be affected by the project were retained and their habitat requirements are discussed in the following sub-sections. Species that did not have the potential to occur in either study area or otherwise be affected by the projects were dropped from further evaluation. Table 3-1 provides a brief description of habitat requirements of each species and reason the species was retained or dropped from consideration. As shown, only the bald eagle and Ute ladies'-tresses have the potential to occur in the two study areas. Habitat requirements and distribution of these two species are provided in the following subsections.

Bald Eagle

The bald eagle was initially listed by the USFWS as endangered in 1967 and in 1995 its listing was changed to threatened throughout the lower 48 states (USFWS 2002). In response to recovery activities, including the ban on the use of DDT (an organochlorine pesticide), the bald eagle has made a remarkable recovery and the USFWS is evaluating a proposal to remove the bald eagle from the federal threatened and endangered species list (USFWS 2002).

The bald eagle feeds primarily on fish, aquatic birds, and mammals, which it may take alive or find dead. Much of its live prey, especially the waterfowl, consists of sickly individuals or those wounded by hunters. When their staple foods are not available, bald eagles will eat almost anything that has food value. Foraging habitat consists of large, unobstructed open areas such as openings in river corridors or lakes. Eagles also concentrate around big-game winter range and consistent sources of carrion associated with road kills (Paige et al. 1990, DeGraff et al. 1991) and downstream from hydroelectric dams where dead or injured fish are readily available (URS Greiner Woodward Clyde 1999).

Perching and roost sites (large trees with open branches) and access to prey are important habitat characteristics for bald eagles during the winter (Paige et al. 1990). Bald eagles are intolerant of human disturbance, especially during the breeding season (USFWS 1986). Consequently, they normally locate perches and nest sites away from human disturbances. Bald eagles typically nest in large ponderosa pine (*Pinus ponderosa*), Douglas fir (*Psuedotsuga menziesii*), and cottonwood trees. Only four breeding pairs are known to nest in Utah. Traveling alone or in pairs, birds breeding in central Canada migrate south in autumn to the west-central and southwestern United States and return north in the late winter or early spring. Bald eagles are known to use most of the state Utah for wintering and as a stopover during migration.

Ute Ladies'-tresses

Ute ladies'-tresses is a member of the orchid family. They are found in open woodland and riparian areas, including spring habitats, mesic to wet meadows, river meanders, and floodplains. All known populations of Ute ladies'-tresses in Utah inhabit wetland sites (Glisson 2002). Plants have most often been found in old stream channels and on fluvial deposits in the floodplain of adjacent rivers. The species appears to have an affinity for dynamic river systems and other areas that have recently been affected by ground-disturbing activities, as evidenced by its location in old gravel pits and other disturbed areas. They seem to require "permanent sub-irrigation", indicating a close affinity with floodplain areas where the water table is close to the surface throughout the growing season. They also require open habitats, and populations decline if trees and shrubs invade the habitat. They are not tolerant of permanent standing water, and do not compete well with aggressive species such as reed canarygrass or purple loosestrife. They colonize early successional riparian areas such as point bars, sand bars, and low lying gravelly, sandy, or cobbly edges. Ute ladies'-tresses bloom in late summer (early August to mid-September). Research has shown that plants can remain dormant for several growing seasons, or produce only vegetative shoots, complicating inventory and an understanding of the population structure. They probably require a symbiotic association with mycorrihizal fungi for germination, and also require pollinators to set seed. They appear to have a very low reproductive rate.

Because Ute ladies'-tresses were known to occur along the Duchesne River within the overall study area and along streams in the Strawberry River drainage upstream of the study area on the Strawberry River, surveys for Ute ladies'-tresses were conducted in 2002 in the vicinity of each diversion structure. The surveys were conducted between August 22 and September 3, 2002 which was during the flowering season of the Ute ladies'-tresses. A copy of the survey report is provided in Appendix D. During the surveys, Ute ladies'-tresses colonies were identified in the vicinity of three of the lower four diversion sites on the Duchesne River. No Ute ladies'-tresses were found within the study area on the Strawberry River. Follow up survey and mapping of Ute ladies'-tresses colonies was performed on the Duchesne River from 0.25 mile downstream of the Jones Diversion to just downstream of the abandoned Brown Diversion site. Numerous colonies of Ute ladies'-tresses were identified within this 3-mile reach of the Duchesne River and colony size ranged from 1 to 2 individuals to in excess of 675 individuals. Although no plants were observed in the vicinity of the Wagstaff and Peterson diversions, the area around these diversion sites appear to have suitable habitat (i.e. appropriate geomorphic features such as abandoned or secondary channels, low elevation point bars and islands, etc) and they are reasonably close to the uppermost observed colony of Ute ladies'-tresses.

3.4 LAND USE AND PLANNING

3.4.1 Floodplain Encroachment (Executive Order 11988)

The intent of E.O. 11988 is to require Federal agencies to take actions to minimize occupancy of and modifications to floodplains. Specifically, E.O. 11988 prohibits federal agencies from funding construction in a Federal Emergency Management Agency (FEMA) mapped 100-year

floodplain (or 500-year floodplain for a critical facility) unless there are no practicable alternatives. The study area has not been mapped by FEMA. Therefore the 100-year floodplain of neither river has been identified on a FEMA Flood Insurance Rate Map (FIRM).

3.4.2 Farmland

Farmland (cultivated fields) within the study area is located in the valley bottoms along both rivers. Individual cultivated areas are relative small and generally irregularly shaped. The majority of the farmland within the study area is used for the production of alfalfa with a limited amount used to produce small grain crops. Due to the limited amount of precipitation the area receives, tilled areas require irrigation for the consistent production of both alfalfa and small grain crops. The NRCS has not identified any prime farmland within the study area.

3.5 SOCIOECONOMICS

The 2000 U.S. Census indicated that 14,371 people live within Duchesne County (U.S. Census Bureau 2002). This represents an increase of approximately 14 percent since 1990. The City of Duchesne is the county seat of Duchesne County with a population of approximately 1,400 people. It is a hub for local farmers and ranchers to obtain supplies and equipment and is a cultural and recreational attraction. It hosts four churches, two schools (an elementary and a junior/senior high school), several businesses and the county offices. For several years, work on the CUP boosted the community's population and businesses; a park and a bowling alley were built to make the city more attractive for construction workers. However, in the mid-1980s the water projects were completed and Duchesne's population declined by several hundred people. The economic base of the community is presently centered in farming and the oil industry.

3.5.1 Economics

In 2000, the work force of Duchesne County was comprised of 5,928 people with an unemployment rate of 4.7 percent. Educational, health, and social services formed the largest employment sector (23.3 percent) in Duchesne County. Agriculture, forestry, fishing and hunting represented the next largest employment sector with 17 percent, retail sales (12 percent) represented the next largest employment sector in the county, as retail sales in Duchesne County for 1997 were over 96 million dollars (U.S. Census Bureau 2002).

The study areas are located exclusively along the Duchesne and Strawberry Rivers. Besides the city of Duchesne, the villages of Hanna and Tabiona are the only concentrated settlements in the study areas, with populations of less than 150 people. The City of Duchesne is located near the downstream end of the Duchesne River study area. The majority of the area is agricultural, with sparse population.

3.5.2 Environmental Justice (Executive Order 12898)

On February 11, 1994, the President signed E.O. 12898 entitled “Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations.” The E.O. directs federal agencies “to make environmental justice part of its mission by identifying and

addressing, as appropriate, disproportionately high and adverse human health or environmental effects of its programs, policies, and activities on minority populations and low-income populations in the United States..."

Duchesne County has a land area of approximately 3,238 square miles and a population density of 4.4 persons per square mile in 2002 (U.S. Census Bureau 2002). The 2000 U.S. Census indicated that approximately 90 percent of the population of Duchesne County were white, and the largest non-white race was American Indian, who comprised approximately 5.4 percent of the population (U.S. Census Bureau 2002). The 2000 Census poverty data was not yet available; however, the 1990 Census indicated that approximately 19 percent of the population of Duchesne County was considered to be below the poverty level.

3.6 CULTURAL RESOURCES

A cultural resource literature search was conducted to determine if any of the diversion dams and associated canals included in this evaluation had the potential to be a historic resource. The search was also conducted to identify any cultural resources (archaeological or historical) that were known to be located in the vicinity of the two study areas. The literature search was conducted at the Marriott Library on the University of Utah campus in Salt Lake City on November 14 and 15, 2002 and at the Division of History, Utah State Historic Preservation Office in Salt Lake City on November 15, 2002. Results of this cultural resource literature search was reported in a Cultural Resources Report that was prepared for the project. A copy of this report is on file at the State Historic Preservation Office in Salt Lake City.

In summary, the cultural resource literature search identified 22 previously recorded sites that are located within or in the immediate vicinity of the two study areas. These sites included 5 historic canals, the remains of 13 historic homesteads or farmsteads, 1 historic ranger station, 1 historic road, and 2 prehistoric/historic archaeological sites. Eighteen of the sites have been determined eligible to the National Register of Historic Places (NRHP) by the SHPO and four have been determined not eligible to the NRHP.

Of these previously recorded sites, three of the five historic canals are located within the two study areas. These three canals are the Farm Creek Canal, the Tabby Canal, and the Rhodes Canal. All of the historic canals appear to have been constructed during the period when the Uintah and Ouray Indian Reservation was opened up to non-Indian settlement between 1905 and 1908 (Norman et al. 1982). Structures associated with the canals consist of head gates and side gates constructed of reinforced concrete with metal drop plates and turn wheel controls, and concrete and metal measuring devices. All three of the historic canals (Rocky Point, Farm Creek, and Rhodes Canal) have been recommended as eligible to be placed on the NRHP because of their association with early agriculture and water development in the region.

36 CFR Section 800.2(c)(3)(iv) states, "When Indian tribes and Native Hawaiian organizations attach religious and cultural significance to historic properties off tribal lands, section 101(d)(6)(B) of the Act requires federal agencies to consult with such Indian tribes and Native Hawaiian organizations in the section 106 process. Federal agencies should be aware that frequently historic properties of religious and cultural significance are located on ancestral,

aboriginal, or ceded lands of Indian tribes and Native Hawaiian organizations and should consider that when complying with the procedures in this part."

From the NHPA section 106 regulations: - "Consultation means the process of seeking, discussing, and considering the views of other participants, and where feasible, seeking agreement with them regarding matters arising in the section 106 process. The Secretary's 'Standards and Guidelines for Federal Agency Preservation Programs pursuant to the National Historic Preservation Act' provide further guidance on consultation." 36 CFR 800.16(f).

Through consultation with the Utah State Historic Preservation Officer (SHPO), the Mitigation Commission identified that the Ute Indian Tribe may have religious and cultural attachment to locations within the two study areas.

In compliance with the above-cited Acts, the Mitigation Commission sent a letter (dated November 13, 2002) to the Ute Indian Tribe requesting comments on the proposed project in regard to areas that could be affected that hold religious and/or cultural significance to the Tribe or affect Indian Trust properties. The Jasper Pike Diversion provides irrigation water for Indian Trust lands and the Knight-Shank Diversion is located on Indian land. No written response was received. A copy of the Draft Programmatic EA was sent to the Ute Tribe and the U.S. Bureau of Indian Affairs for review; no written comments were received. Follow-up telephone calls were placed on March 19, 2003 and March 31, 2003 to the Ute Indian Tribe.

Although no formal response has been received by the Mitigation Commission and no known Traditional Cultural Properties or sacred sites were identified within the project area by the Ute Indian Tribe, consultation with both the Bureau of Indian Affairs and Ute Indian Tribe will continue as individual structures are identified to be rehabilitated or replaced. A Class III inventory for cultural resources will be conducted on project areas to be impacted by the project. Inventories and evaluations will be conducted by qualified archeologists, and invitations to participate in the evaluations will be extended to the Bureau of Indian Affairs and the Director of the Cultural Rights Department, Ute Indian Tribe.

Because this undertaking may have an adverse effect on an historic property, consultation in accordance with 36 CFR 800.16(f) has been initiated and will continue. A Memorandum of Agreement will be developed providing for identification, evaluation, effect determination and mitigation of the project designs, and any future development for historic properties which could be affected. The MOA will satisfy 36 CFR 800.8(c)(4) and will prescribe jointly approved mitigation measures. A signed copy of the MOA will be provided to the Advisory Council on Historic Preservation.

A paleontological report was received from the Utah Geological & Mineral Survey which indicates no known sites which would be affected by this project (Hayden 2003, Appendix B). If any fossils are found during project activities, an evaluation would be conducted by a professional paleontologist.

3.7 AIR QUALITY

The National Ambient Air Quality Standards (NAAQS) established by the United States Environmental Protection Agency define the allowable concentrations of pollutants that may be reached but not exceeded in a given time period to protect human health (primary standard) and welfare (secondary standard) with a reasonable margin of safety. The standards include maximum concentrations for ozone, carbon monoxide, nitrogen dioxide, sulfur dioxide, lead, and particulate matter with a diameter of 10 microns or less. Duchesne County is classified as a NAAQS Attainment Area (DeArcos 2002), which indicates existing concentrations of air pollutants are below the established standard(s), and limited emissions are allowable.

3.8 NOISE

Sounds that disrupt normal activities or otherwise diminish the quality of the environment are designated as noise. Noise can be stationary or transient, intermittent or continuous. Noise events that occur during the night (10 p.m. to 7 a.m.) are more annoying than those that occur during normal wake hours (7 a.m. to 10 p.m.). Noise events within the project vicinity are presently associated with climatic conditions (wind, thunder, etc.), transportation noise (traffic on existing roads), farm equipment, and "life sounds" (children playing, dogs barking, etc.).

3.9 TRANSPORTATION

Utah Highway 35 runs parallel to the Duchesne River from the confluence of the North Fork and West Fork downstream to approximately 8 miles north of the City of Duchesne where it connects with Utah Highway 87, east of Starvation Reservoir. Utah Highway 208, which provides a connection between Utah Highway 35 and US Highway 40, crosses the Duchesne River approximately 2 miles downstream from the Village of Tabiona and connects to U.S. Highway 40, approximately 2 miles west of Starvation Reservoir.

3.10 HAZARDOUS MATERIALS

No hazardous materials are known to occur within any of the project areas and no hazardous materials were identified during the site visit on August 7 and 8, 2002.

3.11 CUMULATIVE IMPACTS

Cumulative impacts are the impacts which result from the incremental impact of the selected alternative when added to impacts of other past, present, and reasonably foreseeable future actions regardless of what agency or person undertakes those actions. This section describes interrelated projects considered in the cumulative impacts analysis in this Programmatic EA.

The **Angler-Access Mitigation Program for the Strawberry Aqueduct and Collection System** is a program to complete certain mitigation requirements for losses of fish and wildlife habitats and related recreational uses associated with construction and operation of a portion of

the Bonneville Unit of the CUP. The Angler-Access Mitigation Program has been underway since the late 1980's, and is being completed under a Finding of No Significant Impact issued by the Mitigation Commission and U.S. Bureau of Reclamation in 1999. The program requires acquisition of public access fishing easements along the Duchesne River system from the National Forest boundaries on West Fork Duchesne and North Fork Duchesne, downstream past their confluence to the village of Hanna. There are four diversions considered by this Programmatic EA that are within those reaches of stream (Rhodes, Turnbow 1, Turnbow 2, and Leo S. Defa). On Strawberry River, the Angler-Access Mitigation Program requires acquisition of riparian corridors including the river, from Soldier Creek Dam downstream to a point about 1 mile upstream of the Red Creek confluence. Although there are no diversions considered by this Programmatic EA located in the reach of Strawberry River affected by the angler-access mitigation program, portions of this project are within the project area of impact for this project and will be considered in the cumulative impacts analysis for this Programmatic EA.

The **Colorado River Basin Salinity Control Program** was established by Congress in 1974 (Colorado River Water Quality Improvement Program; Salinity Control Act of 1974, as amended, P.L. 93-320) and is intended to reduce salt loads to the Colorado River and its tributaries, to improve water quality so that contractual agreements between the United States and Mexico under the Mexican Water Treaty of 1944 could be achieved. Subsequent amendments to the Act in 1984 and 1995 now authorize the program to be carried out by the U.S. Department of the Interior, Bureau of Reclamation (Reclamation) and Bureau of Land Management, and the U.S. Department of Agriculture, Natural Resources Conservation Service (NRCS). The Program reduces salinity by preventing salts from dissolving and mixing with the river flow. Irrigation improvements and vegetation management reduce water available to transport salts to surface waters. The Uinta Basin Unit of Reclamation's Basinwide Salinity Control Program includes the Duchesne River and its tributaries within its boundaries. This Reclamation program provides funds for lining canals and lateral ditches to reduce leakage of irrigation water which typically increases saline runoff. Similarly, the USDA Uinta Basin Salinity Control Plan was adopted in 1979 with amendments in 1987 and 1992, and several projects have been funded and completed within the Duchesne County/Uintah County area. The NRCS operates a similar program for conversion to sprinkler systems on individual farms to reduce the volume of runoff water from irrigated fields. The two programs are independent in terms of funding and authority, but coordinate to reduce salt loading in Duchesne River basin tributaries and, ultimately, the Colorado River. The current Duchesne County plan would improve the efficiency in five canals by converting each to a pressurized pipeline. Water users on this delivery system would be required to convert their irrigation to a pressurized sprinkler system. Most of the Bureau of Reclamation's program is expected to be focused on areas downstream of the Duchesne River/Strawberry River confluence in the future (Lee Baxter, personal communication, March 17, 2003) and therefore outside the area of impact for this Programmatic EA. Past funded projects in the vicinity occurred on the Upper Duchesne Feeder Canal and the Lower Duchesne Feeder Canal. Both projects are located downstream of and outside the project area, and will not be considered in the cumulative impacts analysis for this Programmatic EA.

The **Duchesne River Area Canal Rehabilitation Program** was developed and implemented in the 1980s in order to improve the efficiency of canals conveying water from the Duchesne River

to irrigators (U.S. Bureau of Reclamation, 1984). Many of the canals experienced severe leakage, and water users were at times unable to receive their full entitled water rights at their farms due to those conveyance losses. This program resulted in the improvement (through canal lining or placement in pipes) of about 41 miles of canal in the Duchesne Area. Canals affected were Orchard Mesa Canal (piped), Duchesne Feeder Canal (clay-lined in some sections), Pioneer Canal (concrete-lined in some sections), Farm Creek Canal (partially piped), Taylor Canal (partially piped), New Tabby Canal (partially piped), and Rocky Point Canal (partially piped). Wetland impacts were mitigated through purchase of Duchesne River bottomlands near Myton (known as the Riverdell Property). This project is within the potential area of impact for this project and is considered in the cumulative impacts analysis for this Programmatic EA.

The **Riverdell Water System Improvement Project** has been proposed by the U.S. Department of the Interior and the Mitigation Commission as a means of rehabilitating or revising the water delivery and distribution system to the properties acquired to serve as a mitigation area for the Duchesne River Area Canal Rehabilitation Program. The approximately 1,087 acres, located along the Duchesne River near the town of Myton, was acquired by the U.S. Bureau of Reclamation in the 1980s. Subsequent improvements and management to mitigate for losses of wetlands has been hampered by the inadequate water delivery and distribution system. A Draft EA was released in 2002, and a Final EA is anticipated in 2003. This project is outside the potential area of impact for this project and is not considered in the cumulative impacts analysis for this Programmatic EA.

The **Lower Duchesne River Wetlands Mitigation Project** is required to mitigate for impacts of the Strawberry Aqueduct and Collection System on wetlands, mostly downstream of the Strawberry/Duchesne Rivers confluence, and to compensate the Ute Indian Tribe for impacts to wetlands and fish and wildlife resources and related recreational opportunities caused by the Central Utah Project. A Draft Environmental Impact Statement is anticipated late in 2003. The project area for this project is the Duchesne River corridor from Bridgeland to the confluence with the Green River. This project is outside the potential area of impact for this project and is not considered in the cumulative impacts analysis for this Programmatic EA.

The **Uinta Basin Replacement Project** is authorized under the Central Utah Project Completion Act (P.L. 102-575(CUPCA), Sec 203a). The project would develop water for irrigation and municipal use in the Uinta Basin. Plans include the enlargement of Big Sand Wash Reservoir; an upstream diversion dam and feeder pipeline; a municipal water pipeline from the enlarged reservoir to Roosevelt, Utah; stabilization of several high mountain lakes, and other features. The project is located on the Lake Fork River; the Lake Fork is tributary to the Duchesne River west of Myton, Utah. This project is outside the potential area of impact for this project and is not considered in the cumulative impacts analysis for this Programmatic EA.

TABLE 3-1
AVERAGE MONTHLY FLOWS IN DUCHESNE RIVER AT USGS STATION NEAR TABIONA

	May	June	July	August	September
1987	262	167	115	110	78.1
1988	154	83.4	51.4	51.7	65.8
1989	118	77.9	82.6	69.0	61.6
1990	87.6	124	76.2	58.2	70.7
1991	155	365	100	76.3	96.7
1992	63.9	54.7	52.5	48.7	49.0
1993	446	412	99.3	81.3	74.6
1994	102	65.4	40.3	60.4	56.2
1995	166	951	418	61.1	77.0
1996	292	530	115	69.5	86.5
1997	530	760	118	130	147
1998	435	866	354	124	127
1999	348	976	200	97.9	121
2000	170	118	68.7	67.0	80.6
2001	291	100	73.9	70.2	64.6

Monthly Flow Data (cfs) [1]

[1] Utah Division of Water Rights 2003

TABLE 3-2

FEDERALLY LISTED SPECIES WITH THE POTENTIAL TO OCCUR WITHIN DUCHESNE COUNTY

Scientific Name	Common Name	Federal Status	Preferred Habitat/Distribution	Potential to be Affected by Project
Lepidium barnebyanum	Barneby ridge-cress	Endangered	White shale outcrops on the Uinta Formation in pinyon-juniper (mainly on ridge crests) at 6,200 to 6,510 feet elevation.	**No.** Project will not impact habitat that has the potential to be occupied by the species.
Schoenocrambe suffrutescens	Shrubby reed-mustard	Endangered	Calcareous shale on the Green River Shale Formation in shadscale, pygmy sagebrush, mountain mahogany, juniper, and other mixed desert communities at 5,400 to 6,000 feet elevation.	**No.** Project will not impact habitat that has the potential to be occupied by the species.
Sclerocactus glaucus	Uinta Basin hookless cactus	Threatened	Gravelly hills and terraces on Quaternary and Tertiary alluvium soils in cold desert shrub communities at 4,700 to 6,000 feet elevation.	**No.** Project will not impact habitat that has the potential to be occupied by the species.
Spiranthes diluvialis	Ute ladies'-tresses	Threatened	Occurs along streams, bogs, and open seepage areas in cottonwood, tamarix, willow, and pinyon-juniper communities at 4,400 to 6,810 feet elevation.	**Yes.** Colonies of this plant species are known to occur along the Duchesne River within the identified study area.
Gila elegans	Bonytail	Endangered	The species is a large river fish found only in the Colorado River basin. Historically, its distribution included the Colorado, Green, Gunnison, Yampa, Gila, and Salt rivers. However, the last confirmed bonytail taken from a river was in 1985 and the species is probably extinct in the upper Colorado River basin.	**No.** Current distribution does not include any rivers in Duchesne County and project activities will not affect water depletions in the Colorado River basin.
Ptychocheilus lucius	Colorado pikeminnow	Endangered	Adults occur in turbid, deep, and strong-flowing water. Younger individuals occupy shallow backwater areas, with little or no current and silty or sandy substrates. Endemic to the Colorado River Basin.	**No.** Current distribution does not include any rivers in Duchesne County and project activities will not affect water depletions in the Colorado River basin.
Gila cypha	Humpback chub	Endangered	Lives primarily in canyons with swift currents and white water. Present and past distribution includes the canyons of the Colorado River and four of its tributaries (Green, Yampa, White, and Little Colorado rivers).	**No.** Current distribution does not include any rivers in Duchesne County and project activities will not affect water depletions in the Colorado River basin.

TABLE 3-2

FEDERALLY LISTED SPECIES WITH THE POTENTIAL TO OCCUR WITHIN DUCHESNE COUNTY

Scientific Name	Common Name	Federal Status	Preferred Habitat/Distribution	Potential to be Affected by Project
Xyrauchen texanus	Razorback sucker	Endangered	Prefers rivers with strong, uniform currents over sandy bottoms. Also found in eddies and backwaters adjacent to river channels, concentrating in deep water near cut banks. In Utah, current distribution includes the Colorado, Green, and Duchesne (lower reaches) rivers.	**No.** Current distribution does not include the portion of the Duchesne River located in Duchesne County. Project activities will not affect water depletions in the Colorado River basin.
Haliaeetus leucocephalus	Bald eagle	Threatened	Primarily water oriented, and the majority of the populations occurring in Utah are found near streams and lakes. Winters in Utah and only four nesting pairs are known in Utah. Frequently utilizes large trees (pines and cottonwoods) along streams as perches and night roosts.	**Yes.** Suitable habitat (large cottonwood trees) is located within both study areas.
Charadrius montanus	Mountain plover	Proposed Threatened	Lowland grassland species. Strongly associated with sites of heaviest grazing pressure to the point of excessive disturbance. Nesting sites are dominated by short vegetation and bare ground.	**No.** Project would not be expected to impact the type of habitat that has the potential to be utilized by this species.
Mustela nigripes	Black-footed ferret	Endangered	Closely sympatic with prairie dogs. All viable breeding populations have been associated with large prairie dog colonies, which they use for food and shelter.	**No.** No prairie dog colonies located within either study area.
Lynx canadensis	Canada lynx	Threatened	Northern coniferous forests are the preferred habitat. Usually will not cross an opening in the forest that is greater than 300 feet.	**No.** No suitable habitat within either of the study areas.

This section addresses what impacts (if any) each of the alternatives described in Section 2 may have on the environment. Each alternative is evaluated with respect to its potential impact on relevant aspects of human health and/or environmental resources.

4.1 GEOLOGY, TOPOGRAPHY, AND SOILS

Neither the No Action Alternative, Alternative 2, nor Alternative 3 have the potential to affect geology or topography within the study area. Soils may be affected, and those effects are discussed below.

4.1.1 Alternative 1 – No Action

With the No Action Alternative, no funding would be provided by the Mitigation Commission to increase the stability of the diversion dam. Therefore, maintenance activities (which can be annually or even more frequently in a high water year) may require the use of heavy equipment (backhoe, bulldozer, dragline, etc.). During these events, soils along the equipment access route as well as soils on the streambank(s) adjacent to the structure would be disturbed. With the No Action Alternative, these ongoing temporary impacts to soils would continue and areas that are void of vegetation would be expected to experience accelerated soil loss during major precipitation events and/or during periods of high stream flows.

4.1.2 Alternative 2 – Replacement of Diversion Dam

Removal and replacement of an existing diversion dam would be expected to result in the permanent disturbance of up 1 acre of soils adjacent to the diversion dam and canal or pipeline. As much as 50 percent of the permanently disturbed area would have been disturbed during previous construction and maintenance activities at the site. Up to an additional 0.5 acres of soils would be expected to be temporarily disturbed during construction of the diversion dam and access road (that will be needed to get construction equipment to the construction area). During construction, best available control technologies (BACTs) would be used to minimize the amount of soil loss during precipitation periods. Once the diversion dam has been completed, all temporarily disturbed areas would be graded to blend with existing landforms and revegetated with native plant species. Overall, the disturbance (permanent and temporary) of less than 1.5 acres of soils would not be considered a significant impact.

4.1.3 Alternative 3 – Combining Diversions

Soil impacts associated with the removal and replacement of the existing diversion dam would be the same as discussed for Alternative 2 in Section 4.1.2. In addition, construction of the conveyance canal to connect the two or more of the diversions would result in the permanent loss of up to 5 acres of soils and the temporary disturbance of up to an additional 5 acres. However, if a pipeline would be used to connect the two diversions, impacts to soils would be reduced to 5 acres temporarily disturbed. During construction, best available control technologies (BACTs) would be used to minimize the amount of soil loss during precipitation periods. As discussed in Section 4.1.2, all temporarily disturbed areas would be graded to blend with existing landforms

and revegetated with native plant species. Overall, the disturbance (permanent and temporary) of less than 11.5 acres of soils would not be considered a significant impact.

4.2 HYDROLOGY / WATER QUALITY

None of the alternatives would affect the amount of water that could be legally diverted. Therefore, the depletion (amount of water consumptively used) within the Duchesne River system would not be altered regardless of the alternative selected.

4.2.1 Alternative 1 – No Action

Existing hydrology and water quality of the Duchesne or Strawberry Rivers would not be affected by the No Action Alternative. The diversion dam would continue to be operated as it has been in the past. Water quality would be reduced temporarily when maintenance of the structure required repairs within the active stream channel and/or the streambanks adjacent to the diversion. During low flow period the structure would continue to be operated as a "dry dam", which would preclude the bypassing of flows. This condition occurs in four out of five years.

4.2.2 Alternative 2 – Replace Diversion Dam

Removal and replacement of the existing diversion dam would affect the hydrology and water quality of the river on which the diversion dam is replaced. Operation of the new diversion dam would not be expected to have any affect on the hydrology of stream within the study area during low and high flow periods. However, the dam would be operated to divert the amount of water the diversion is legally entitled to divert, while allowing flows in excess of the diversion's water right to flow on downstream. Therefore, the new dam would be operated as a "dry dam" only during severe low flow periods when the flow in the river equals or is less than the water right for the diversion. Severe low flows are expected to occur on average in one out of five years. In addition, the structure would be able to let CUP project water released to maintain fish habitat to flow past the structure. Therefore, construction and operation of Alternative 2 would be expected to have a long-term beneficial effect on the hydrology of the river downstream from the diversion.

Alternative 2 would be expected to cause a temporary increase in turbidity (sediment induced) while construction is occurring in the stream channel and streambanks. This adverse impact would be temporary and localized. BACTs would be employed to reduce/control the amount of sediment entering the stream. However, on the long-term, Alternative 2 would have a beneficial effect on the water quality of river on which the diversion is constructed because the new structure would not require annual instream maintenance. Therefore, the degraded water quality (sediment induced) that the stream generally experiences annually would be alleviated with the operation of the new diversion dam.

The short-term, localized adverse effect that Alternative 2 would have on the water quality of the receiving waters would not be considered a significant impact. On the long-term, operation of the new diversion dam would have a beneficial effect on the water quality of the receiving waters during low flows. Although the beneficial effect would not be considered significant in any one

year, it would have a major effect on water quality when considered over the life of the diversion dam.

4.2.3 Alternative 3 – Combine Diversion Dams

Alternative 3 would have the same effect on the hydrology of the rivers as discussed for Alternative 2 in Section 4.2.2. Construction and operation of the diversion dam would have the same effect on water quality as discussed for Alternative 2. However, when the overall project is considered, the alternative provides additional water quality benefits because it eliminates the need for at least one other diversion dam.

With Alternative 3, up to 11,000 linear feet of water conveyance system (canal and/or pipeline) would be constructed to deliver irrigation water to the irrigation system associated with the diversions that were eliminated. During the construction of this water conveyance system up to 10 acres of land would be disturbed and could experience accelerated erosion during a major precipitation event. BACTs would be employed to reduce/control the amount of sediment entering the stream.

Overall, the alternative would not be expected to effect the hydrology of either stream. Long-term operation of the new diversion would have a beneficial effect on the water quality of the receiving water during low flow periods. Although the beneficial effect on water quality would not be considered significant in any one year, it would have a major effect on water quality when considered over the life of the diversion dam.

4.3 BIOLOGICAL RESOURCES

Biological resources within the Duchesne and Strawberry River drainages are quite abundant. However, this section addresses only those biological resources that occur or have the potential to occur in the study area.

4.3.1 Wetlands

As stated in Section 3.4.1, wetlands within the study area are generally confined to a riparian zone adjacent to each of the rivers and to meanders of the rivers that are isolated from the main channel of the river except when the rivers are at flood stage.

4.3.1.1 Alternative 1 – No Action

The No Action Alternative would have no impact on wetlands; however, continued annual maintenance activities on the existing diversion dams would continue to disturb small areas of wetlands adjacent to the dams and along ingress and egress routes to the dams.

4.3.1.2 Alternative 2 – Replace Diversion Dam

Removal and construction of the new diversion dam would be expected to affect riparian wetlands immediately upstream and downstream from the existing diversion dam. The potential

also exists that construction of the dam would affect instream gravel bars that contain wetland vegetation and construction of the temporary access road could also affect wetlands including additional riparian wetlands. Since the location of the diversion dam and access road would largely affect the amount of wetlands disturbed, impacts on wetlands cannot be precisely predicted.

Once a precise project has been targeted, the Mitigation Commission would complete a detailed assessment of expected wetland impacts and initiate consultation with the State of Utah and the USACE to determine which permitting process would apply to the project (State of Utah Stream Alteration Permit under General Permit 040; Nationwide Permit under USACE administration; or individual Section 404 Permit under USACE administration). As per USACE guidance, wetlands would be avoided to extent possible, impacts to wetlands that cannot be avoided would be minimized, and wetland impacts that cannot be avoided would be mitigated.

4.3.1.3 Alternative 3 – Combine Diversion Dams

Potential impacts to wetlands associated with the construction of the diversion dam would be the same as discussed for Alternative 2 in Section 4.3.1.2. Construction of the water conveyance system (canal or pipeline) also has the potential to impact wetland areas. As discussed for Alternative 2, once a precise project has been targeted, the Mitigation Commission would complete a detailed assessment of expected wetland impacts and initiate consultation with the State of Utah and the USACE to determine which permitting process would apply to the project (State of Utah Stream Alternation Permit under General Permit 040; Nationwide Permit under USACE administration; or individual Section 404 Permit under USACE administration). As per USACE guidance, wetlands would be avoided to extent possible, impacts to wetlands that cannot be avoided would be minimized, and wetland impacts that cannot be avoided would be mitigated.

4.3.2 Vegetation

Vegetation within the study area is limited to riparian vegetation that occurs adjacent to both rivers, tilled irrigated fields that are primarily used for the production of alfalfa, and pasture land (both irrigated and non-irrigated) that are foraged upon by livestock.

4.3.2.1 Alternative 1 – No Action

Presently, vegetation adjacent to the existing diversion dam and along ingress and egress routes for maintenance equipment is disturbed when the structures need to be repaired. Disturbed areas are generally less than 1 acre in size. With the No Action Alternative, these impacts on vegetation would remain.

4.3.2.2 Alternative 2 – Replace Diversion Dam

With this alternative, vegetation in the construction area for the diversion dam and along the temporary access roads would be temporarily lost during construction. Areas disturbed with this alternative would be expected to be less than 1.5 acres. Areas that would be affected by

construction of the dam and associated access roads includes a mixture of riparian vegetation, alfalfa, and pasture. Once the diversion dam has been constructed, the disturbed areas would be recontoured and reseeded. The disturbed cropland areas would again be available for alfalfa production and grazing. Nonagricultural areas would be recontoured and reseeded with an appropriate mix of species native to the study area. Overall, the temporary loss of up 1.5 acres of vegetation would not be considered a significant impact.

4.3.2.3 Alternative 3 – Combine Diversion Dams

With this alternative, impacts to vegetation associated with the construction of the diversion dam and associated access road would be the same as discussed for Alternative 2. Construction of up to 11,000 feet of new canal or pipelines to convey water to multiple diversion systems would potentially impact up to an additional 10 acres of vegetation. Much of the area that would be affected by canal and/or pipeline is cropland and pasture land. Since fewer structures would be constructed than with Alternative 2, potentially less riparian vegetation would be impacted.

Once the diversion dam and conveyance system have been constructed, most of the agricultural areas would again be available for crop production and pasture. If a canal is used to convey water to the downstream diversion(s), the land occupied by the canal would represent a permanent loss of existing vegetation. Nonagricultural areas would be revegetated with an appropriate mixture of species native to the project area. Overall, the permanent and temporary loss of up to 6 and 5.5 acres, respectively, of existing vegetation would not be considered a significant impact.

4.3.3 Terrestrial Wildlife

Riparian vegetation within the study area provides valuable habitat throughout the year for many terrestrial wildlife species. Use of the agricultural land by wildlife species varies between the different seasons. Pastures and alfalfa fields in the spring provide nesting habitat for ground nesting birds and the valley bottoms provide important winter habitat for big game species, especially mule deer.

4.3.3.1 Alternative 1 – No Action

Presently, limited wildlife species and their habitat are disturbed when the existing diversion dam requires repair. Impacts to wildlife resources are temporary and disturbance of wildlife habitat is generally less than 1 acre. With the No Action Alternative, it would be expected that periodic maintenance activities would still be required. Therefore, wildlife and their habitat would continue to be disturbed when maintenance of the structure is required.

4.3.3.2 Alternative 2 – Replace Diversion Dam

Removing and reconstructing the diversion dam would have a temporary impact on wildlife resources and their habitat. Construction personnel and noise from the heavy equipment would have a direct impact on wildlife in the study area. This impact would last through the construction period, but would not likely result in any long-term adverse impacts. In addition, up

to 1.5 acres of wildlife habitat would be disturbed during the construction of the diversion dam and associated features and as discussed previously upon completion of the new diversion dam, all disturbed non-crop areas would be re-seeded with native plant species. Again this impact would be temporary and localized. By reducing the necessity for future maintenance, there would be a long-term beneficial impact on local wildlife resources. Overall, potential effects (beneficial or adverse) of Alternative 2 on wildlife resources and/or their habitat would not be expected to be significant.

4.3.3.3 Alternative 3 – Combine Diversion Dams

Potential impacts to wildlife resources associated with the removal and reconstruction of the diversion dam would be the same as discussed for Alternative 2. In addition, up to additional 10 acres of wildlife habitat would be temporarily disturbed during the construction of the canal or pipeline to convey water to the irrigation system associated with the other diversion(s). Upon completion of the new diversion dam and conveyance system, non-crop areas would be re-seeded with native plant species. Pipeline rights-of-way (ROWs) would be revegetated with native non-woody plant species. If a canal were selected, 5 acres of wildlife habitat would be permanently affected. By reducing the number of diversions and the necessity for future maintenance, there would be a long-term beneficial impact on local wildlife resources. Overall, potential effects (beneficial or adverse) of Alternative 3 on wildlife resources and/or their habitat would not be expected to be significant.

4.3.4 Aquatic Resources

The reach of the Duchesne River that may be potentially impacted is classified as a Class 2 Stream. Class 2 streams are of great importance to the state fishery. These are productive streams with high aesthetic value and should be preserved. The potentially affected area of the Strawberry River is classified as a Class 4 Stream. Class 4 streams are typically poor in quality, with limited fishery value. However, non-sport fish species residing in both rivers within the two study areas have the potential to be affected.

4.3.4.1 Alternative 1 – No Action

As discussed previously, the following items associated with the operation of the existing diversion dams on the Duchesne and Strawberry Rivers contribute to an adverse effect on fish species in the two rivers:

- Require frequent (generally annual) maintenance that involves instream alterations,
- Some are frequently operated as “dry dams”,
- Some structures do not have the ability to by-pass a set amount of flow, and
- Some dams serve as barriers to migrating fish (especially fish attempting to migrate upstream).

With the No Action Alternative operation (including maintenance activities) of the diversion dam would not be changed. Aquatic resources including game fish species would continue to be adversely affected by the factors listed above.

4.3.4.2 Alternative 2 – Replace Diversion Dam

Removal of the existing diversion dam and the construction of a new diversion dam would require construction activities within the active stream channel and would be expected to have a temporary adverse effect on instream habitat and water quality in the vicinity of the diversion dam. These impacts would be temporary (construction period) and since instream work would primarily occur during periods of low flow, the effects on water quality would be localized. As discussed in Section 4.2.2, BACTs would be used during construction to reduce/control the amount of sediment entering the stream during construction and this would also contribute to only localized water quality impacts. Neither of these impacts would be expected to have a significant adverse impact on aquatic resources in the study area.

The new diversion dam would need little if any instream maintenance, the frequency of it being operated as a dry dam would be reduced, it would have the ability to by-pass a set amount of water, and it would allow fish passage via a fish passageway in the dam. Characteristics and water diversion summary by specific diversions on the Duchesne River are provided in Appendix F. As shown, Farm Creek and Jasper Pike Diversions are the only diversions remaining on the Duchesne River that are operated as "dry dams." Frequency of these diversions being operated as "dry dams" is expected to be reduced from about three to four out of five years to one to two out of five years. No diversions on the Strawberry River study area are presently operated as "dry dams."

The ability of a structure to allow upstream fish passage also represents a significant benefit to fishes, especially game fish (i.e. brown trout), migrating upstream to spawn. The magnitude of the benefit would depend largely on how far upstream the fish could migrate before being encountered with another migration barrier. On the Duchesne River, elimination of a diversion dam as an upstream barrier would open between 1.5 and 10 miles of stream to migrating fish. However, in the Strawberry River study area, to realize spawning benefits to upstream migrating game fish, all the barriers would have to be removed, because potential spawning habitat for brown trout is located upstream of the study area.

Overall, operation of the new diversion dams would be expected to have a long-term beneficial effect on aquatic resources in both study areas.

4.3.4.3 Alternative 3 – Combine Diversion Dams

Temporary and localized adverse impacts on aquatic resources associated with the removal of the existing diversion dams and the construction of the new diversion dam are the same as discussed for Alternative 2. With Alternative 3, up to 11,000 feet of a water conveyance system would be constructed and up to 10 acres of land could be disturbed and could experience increased soil erosion during a major precipitation event. However, as discussed in Section 4.2.3, BACTs would be used to reduce/control the amount of sediment that would enter the

stream. Since the adverse effects on aquatic resources with Alternative 3 would be short-term and restricted to a localized area, they were not judged to be significant.

Most potential combinations would not result in cumulative water depletions at a single point that would be large enough to cause the river to be dewatered downstream from the new combined structure. An exception might involve the potential combination of Farm Creek, Jasper-Pike, and New Tabby canals into a single diversion and canal heading at or near the existing Farm Creek diversion. These three canals collectively could divert as much as 72 cfs from the river. Under existing conditions, the Jasper-Pike Canal, which is located approximately 1.5 miles downstream of the Farm Creek Canal diversion, periodically (during low water years) is for all intent and purposes a dry-dam. Moving the diversion point for the Jasper Pike Canal approximately 1.5 miles upstream to a common location with the Farm Creek Canal could lead to periodic dewatering of an additional 1.5 miles of the Duchesne River between the two existing diversion points, compared to baseline conditions. This would be an adverse impact of this alternative, if implemented on these three structures together.

The new diversion dam would need little if any instream maintenance, its frequency of being operated as a dry dam would be reduced, would have the ability to by-pass a set amount of water, would allow fish passage via a fish passageway in the dam, and would require fewer diversion dams. Characteristics and water diversion summary by specific diversions on the Duchesne River are provided in Appendix F. As shown, Farm Creek and Jasper Pike Diversions are the only diversions remaining on the Duchesne River that are operated as "dry dams." Frequency of these diversions being operated as "dry dams" is expected to be reduced from about three to four out of five years to one to two out of five years. No diversions on the Strawberry River study area are presently operated as dry dams.

The ability of a structure to allow upstream fish passage also represents a significant benefit to fishes migrating upstream to spawn. The magnitude of the benefit would depend largely on how far upstream the fish could migrate before being encountered with another migration barrier. On the Duchesne River, elimination of a diversion dam as an upstream barrier would open between 1.5 and 10 miles of stream to migrating fish. However, in the Strawberry River study area, to realize benefits to upstream migrating game fish, all the barriers would have to be removed, because potential spawning and rearing habitat for brown trout is located upstream of the study area. Migration for non-trout species would be improved as well.

Overall, operation of the new diversion dams would be expected to have a long-term beneficial effect on aquatic resources in both study areas.

4.3.5 Threatened and Endangered Species

As discussed in Section 3.4.5, the bald eagle and the Ute ladies'-tresses are the only federally listed threatened and endangered species that have the potential to occur in the study area. Other threatened and endangered species listed as potentially occurring in Duchesne County were determined not to occur within the project area, and therefore a conclusion of "No Effect" has been reached.

Each of the alternatives was evaluated with regard to the potential effect on bald eagle and Ute ladies'-tresses. However, since the implementation date for a specific structure may be several years in the future, once a specific diversion dam has been targeted, the Mitigation Commission would initiate additional consultation with the USFWS, if needed.

4.3.5.1 Alternative 1 – No Action

Frequent maintenance of the existing diversion dams would continue to be needed with the No Action Alternative. Routine maintenance activities on the diversion dam generally do not occur during the winter and large trees are not impacted by the maintenance activities. Therefore, the No Action Alternative would is expected to have no effects or impacts on the bald eagle.

Based on surveys that were conducted within the study area during August and September 2002 (Glisson 2002), any diversion dam on the Duchesne River downstream from Highway 208 bridge would have a high potential to have Ute ladies'-tresses in the vicinity of the structure. Therefore, the ingress and egress of equipment and /or the actual repair activities for a diversion dam on the Duchesne River downstream from Highway 208 bridge has the potential to impact the species. Therefore, the No Action Alternative for structures on the lower Duchesne River may affect the species. Under the existing operating procedures, the need for and magnitude of needed maintenance of a specific diversion dam is not known until the effects of winter icing and high flows in the spring are evaluated and repairs needed to be completed prior to low flow conditions (normally in July). This means that when repairs are needed, the repairs need to be completed prior to the flowering period of the Ute ladies'-tresses. Therefore, when repairs are made, it is not known if Ute ladies'-tresses are present or if there are measures that could be implemented to avoid and/or minimize potential impacts.

Other threatened and endangered species listed as potentially occurring in Duchesne County were determined not to occur within the project area, and therefore a conclusion of "No Effect" has been reached.

4.3.5.2 Alternative 2 – Replace Diversion Dam

Routine maintenance activities on the diversion dam generally have contributed to the absence of large cottonwood trees in the immediate vicinity of the existing diversion dam. No known concentration of foraging and/or roosting bald eagles occur within the two study areas. Construction between November and March would potentially result in temporary and indirect disturbance to the occasional bald eagle that may occur in the study areas during the winter and/or spring and fall migration periods. Disturbance would be limited to the construction period and bald eagle usage would be expected to return to pre-project levels once construction has been completed. Therefore, activities associated with Alternative 2 may affect but are not likely to adversely affect the bald eagle.

Based on surveys that were conducted within the study area during August and September 2002 (Glisson 2002), diversion dams on the Duchesne River downstream from Highway 208 bridge would have a high potential to have Ute ladies'-tresses present. Therefore, the removal and construction of a diversion dam in this reach of the Duchesne River may affect the species. For

all diversion dams identified, the Mitigation Commission would conduct additional surveys for the Ute ladies'-tresses in August/September of the year prior to planned construction activities to confirm their presence or absence. If Ute ladies'-tresses are found within the proposed construction area, the Mitigation Commission would initiate formal consultation with the USFWS through the submittal of a Biological Assessment that discusses procedures that would be utilized to avoid and/or minimize impacts on the species. Site specific information is required to properly assess impacts on the species. This assessment would be completed by the Mitigation Commission when a specific diversion dam has been targeted for rehabilitation/replacement and the results of the assessment as well as any requirements identified by the USFWS would be included in the SEA that will be prepared. The Mitigation Commission would implement conservation measures as required by the USFWS.

Other threatened and endangered species listed as potentially occurring in Duchesne County were determined not to occur within the project area, and therefore a conclusion of "No Effect" has been reached.

4.3.5.3 Alternative 3 – Combine Diversion Dams

Routine maintenance activities on the diversion dam generally have contributed to the absence of large cottonwood trees in the immediate vicinity of the existing diversion dam and the alignment of the conveyance would avoid large cottonwood trees in the limited area that would be crossed. No known concentration of foraging and/or roosting bald eagles occurs within the two study areas. Construction between November and March would potentially result in temporary and indirect disturbance to the occasional bald eagle that may occur in the study areas during the winter and/or spring and fall migration periods. Disturbance would be limited to the construction period and bald eagle usage would be expected to return to pre-project levels once construction has been completed. Therefore, activities associated with Alternative 3 may affect but are not likely to adversely affect the bald eagle.

Based on surveys that were conducted within the study area during August and September 2002 (Glisson 2002), diversion dams on the Duchesne River downstream from Highway 208 bridge would have a high potential to have Ute ladies'-tresses present. Therefore, the removal and construction of a diversion dam and the installation of a water conveyance system in this reach of the Duchesne River may affect the species. For all diversion dams identified (and associated conveyance systems), the Mitigation Commission would conduct surveys for the Ute ladies'-tresses in August/September of the year prior to planned construction activities to confirm their presence or absence. If Ute ladies'-tresses are found within the proposed construction area, the Mitigation Commission would initiate formal consultation with the USFWS through the submittal of a Biological Assessment that discusses procedures that were utilized to avoid and/or minimize impacts on the species. Site specific information is required to properly assess impacts on the species. This assessment would be completed by the Mitigation Commission when a specific diversion dam and associated conveyance system has been targeted for replacement. The results of the assessment as well as any requirements identified by the USFWS would be included in the SEA that would be prepared. The Mitigation Commission would implement conservation as required by the USFWS.

Other threatened and endangered species listed as potentially occurring in Duchesne County were determined not to occur within the project area, and therefore a conclusion of "No Effect" has been reached.

4.4 LAND USE AND PLANNING

4.4.1 Floodplain

All of the diversions structures would be located within the floodplain area of either the Duchesne or Strawberry Rivers, and the structures will be designed and operated in a manner which would not cause the structures to alter flood flows. However, the study area is not mapped on a FIRM map, and is therefore not considered to be within an identified 100-year floodplain. As a result, there would be no impacts to designated FIRM floodplains nor to any associated land use planning with any of the alternatives.

4.4.2 Farmland

4.4.2.1 Alternative 1 – No Action

No changes in land use would occur since this alternative would not alter existing practices in the study area.

4.4.2.2 Alternative 2 – Replace Diversion Dam

Constructing a permanent diversion structure would have little impact on land use in the project areas since no land would be converted from its existing use by this alternative. No farmland would be lost with the construction of any diversion dam or canal.

4.4.2.3 Alternative 3 – Combine Diversion Dams

With this alternative, there is the potential that existing farmland may be lost as new irrigation pipelines are installed. The amount of land would vary, depending on which diversions would be combined. It is estimated that the amount of land converted per structure would be between 1 and 5 acres. This would not be considered a significant impact on local farmland.

4.5 SOCIOECONOMICS

4.5.1 Economics

4.5.1.1 Alternative 1 – No Action

This alternative would have no impact on the current economic situation of the landowners or irrigation districts. Both would be financially responsible for any maintenance activities for an existing dam that would be necessary in the future. Inconsistent delivery of irrigation water would also continue to be a concern.

4.5.1.2 Alternative 2 – Replace Diversion Dam

The use of irrigation water is an important component to successful agricultural production in the study area. This alternative would provide a mechanism for the stable delivery of irrigation water to the agricultural land. With a permanent structure in place, the potential for failure would be decreased. This would reduce the amount of money that would be necessary for future maintenance. These factors all provide for beneficial economic impacts on the landowners and irrigation districts in the study area.

4.5.1.3 Alternative 3 – Combine Diversion Dams

The effects (beneficial) of this alternative would be the same as discussed for Alternative 2.

4.5.2 Environmental Justice (Executive Order 12898)

There are no concentrated minority or low-income populations within the study area. Therefore, no disproportionate adverse impacts would be expected with any of the alternatives.

4.6 CULTURAL RESOURCES

4.6.1 Alternative 1 – No Action

The No Action Alternative would have no affect on cultural resources as no new areas would be disturbed and the existing facility would continue to be maintained (repaired) as it has been maintained previously.

4.6.2 Alternative 2 – Replace Diversion Dam

The Farm Creek Canal, Tabby Canal, and Rhodes Canal are historic canals that have been recommended for placement on the NRHP. Prior to any construction on these three canals, the Mitigation Commission would consult with the SPHO and implement mitigation measures as may be required. In addition, pedestrian surveys for archaeological resources have not been previously conducted on areas that would be disturbed during construction. Therefore, when a specific diversion dam has been targeted for rehabilitation/replacement, the Mitigation Commission would have a Class I and Class III cultural resources evaluation for archaeological resources completed for all areas that would be disturbed by the construction. If archaeological resources are found within the proposed construction area, the Mitigation Commission would determine if the impacts to the identified resources can be avoided. If the cultural resources cannot be avoided, the Mitigation Commission would implement mitigation procedures as prescribed by the SHPO and/or the Ute Indian Tribe, as incorporated in a MOA to be developed.

In the unlikely event that cultural resources are encountered during construction, construction activities would be halted and the SHPO notified. Construction would not be resumed until appropriate coordination with the SHPO has been completed.

No historic properties of religious and cultural significance to an Indian tribe(s) are known to be located within either of the study areas. Even though the Jasper Pike and Knight-Shank Diversions and associated water distribution systems are located on and/or serve Indian lands, the rehabilitation/replacement of any of the other diversions would not be expect to adversely affect any Indian lands or Indian Trust lands. Coordination with the Ute Indian Tribe and U.S. Bureau of Indian Affairs and their approval would be required before rehabilitation/replacement of either the Jasper Pike or Knight-Shank diversions would be considered. If necessary approvals are received, rehabilitation/replacement of either diversion dam would be expected to have a beneficial effect on Indian/Indian Trust lands served by the diversion.

4.6.3 Alternative 3 – Combine Diversion Dams

The Farm Creek Canal, Tabby Canal, and Rhodes Canal are historic canals that have been recommended for placement on the NRHP. Prior to any construction on these three canals, the Mitigation Commission would need to consult with the SHPO and implement mitigation measures as may be required. In addition, pedestrian surveys for archaeological resources have not been previously conducted on areas that would be disturbed during construction. Therefore, when a specific diversion dam has been targeted for rehabilitation/replacement, the Mitigation Commission would have a pedestrian survey for archaeological resources completed for all areas that would be disturbed by the construction. If archaeological resources are found within the proposed construction area, the Mitigation Commission would determine if the impacts to the identified resources can be avoided. If the cultural resources cannot be avoided, the Mitigation Commission would implement mitigation procedures as prescribed by the SHPO and/or the Ute Indian Tribe, Uintah and Ouray Agency.

In the unlikely event that cultural resources are encountered during construction, construction activities would be halted and the SHPO notified. Construction would not be resumed until appropriate coordination with the SHPO has been completed.

No historic properties of religious and cultural significance to an Indian tribe(s) are known to be located within either of the study areas. Even though the Jasper Pike and Knight-Shank Diversions and associated water distribution systems are located on and/or serve Indian lands, the rehabilitation/replacement of any of the other diversions would not be expect to adversely affect any Indian lands or Indian Trust lands. Coordination with the Ute Indian Tribe and U.S. Bureau of Indian Affairs and their approval would be required before rehabilitation/replacement of either the Jasper Pike or Knight-Shank diversions would be considered. If necessary approvals are received, rehabilitation/replacement of either diversion dam would be expected to have a beneficial effect on Indian/Indian Trust lands served by the diversion.

4.7 AIR QUALITY

4.7.1 Alternative 1 – No Action

Minor, short-term impacts to air quality related to vehicle exhaust and particulate emissions would be expected during construction activities. While these impacts would likely have a

negligible impact on the overall air quality of the region, maintenance activities would continue to be necessary in the future.

4.7.2 Alternative 2 – Replace Diversion Dam

Minor, short-term impacts to air quality related to vehicle exhaust and particulates would be expected during construction of the new dam and associated structures. These impacts would likely have a negligible impact on the overall air quality of the region. If dust were to become a problem, the contractor may be required to water down the work area.

4.7.3 Alternative 3 – Combine Diversion Dams

Alternative 3 would have the same impact on air quality as discussed for Alternative 2.

4.8 NOISE

No significant impacts in relation to noise disturbance would be expected with any of the alternatives. While construction and/or maintenance activities may produce temporary noise disturbances, the noise levels would be similar to noise levels that currently occur in the study area.

4.9 TRANSPORTATION

No significant impacts to transportation would occur as a result of any of the three alternatives.

4.10 HAZARDOUS MATERIALS

Since no hazardous materials have been identified in the study area, it is unlikely that any of the alternatives would result in significant impacts. The potential exists for fuel spills to occur from construction equipment; however, minimization efforts would reduce this potential.

4.11 CUMULATIVE IMPACTS

Cumulative impacts included the rehabilitation (replacement or combining) of all of the diversions on the Duchesne and Strawberry Rivers identified in Table 1-1 that could be rehabilitated plus the three diversion dams that have already been replaced. Overall, the cumulative impact assessment involves 27 diversion dams that are present within the Duchesne River and Strawberry River study areas. In addition, cumulative impacts of this project are evaluated together with the SACS Angler-Access Mitigation Program and the Duchesne River Area Canal Rehabilitation Program (DRACR), both on the Duchesne River only. The DRACR program resulted in the improvement (through canal lining or placement in pipes) of about 41 miles of canal in the Duchesne Area, including canals associated with the Pioneer, Rocky Point, New Tabby and Farm Creek systems. However, the DRACR project did not alter the diversions on the river; rather the focus was on reducing seepage form portions of the canals themselves.

There are no diversions considered by this Programmatic EA located in the reach of Strawberry River affected by the SACS angler-access mitigation program, or by the DRACR program, and therefore no cumulative impacts would be anticipated from those projects in the Strawberry River project area.

4.11.1 Alternative 2 – Replacement of Diversion Dam

Construction/replacement of the 27 diversion dams in the study area would be expected to have no affect on the geology and topography of the study area. In addition, there were no impacts associated with the construction/replacement of the diversion dams on designated floodplains, air quality, noise, transportation, and hazardous materials. Therefore, cumulative impacts for these environmental resources would be expected to be the same as discussed previously for the construction/replacement of an individual diversion dam. There would be no cumulative impacts from the SACS angler access mitigation program or the DRACR on these resources.

Replacement of the 27 diversion dams within the study area would be expected to disturb up to 40 acres of soils of which approximately 27 acres would be within the footprints of the dams and would be permanently disturbed. Since these areas would be spread throughout the study area, most of the soils have been previously disturbed by previous agricultural activities and construction/maintenance of the existing diversions, and overall construction activities would extend over numerous years, this disturbance would not be considered a significant impact on soils. The SACS angler-access mitigation program is expected to permanently disturb less than 1 acre due to construction of small parking areas for angler access. The DRACR program, already completed, restored or mitigated disturbed soils with no remaining long-term impacts.

With the replacement of all 27 diversion dams, individual diversions would be able to bypass flows in excess of their legal water right, and CUP water would be conveyed to the confluence of the Duchesne and Strawberry Rivers. This represents a significant benefit to the hydrology of both rivers. In addition, since the new structures would require less routine instream maintenance, there would be a long-term cumulative benefit on the water quality of both the Duchesne and Strawberry Rivers. There are no cumulative effects on water rights from the SAACS angler-access mitigation program or the DRACR program.

As stated previously, the construction of all 27 structures would temporarily disturb approximately 40 acres of vegetation. This would include a mixture of riparian vegetation, alfalfa, and pasture. Following the completion of construction, these areas would be revegetated, either as cropland or with native species. Potential cumulative impacts to vegetation including wetlands, wildlife, and threatened and endangered species would be similar to the impacts discussed in Section 4.4 because disturbed areas associated with the construction of one diversion dam would essentially be restored before the construction of other dams occur. As a result, the cumulative impacts of constructing all 27 dams would not be considered significant. The DRACR program did have impacts on non-vegetation, but those impacts were mitigated on-site. Impacts on wetlands are not anticipated to be significant; impacts on wetlands from the DRACR project are being mitigated through purchase, development and management of lands along the lower Duchesne River corridor (Riverdell property acquired by Reclamation in the 1980s).

As the permanent diversion structures are constructed, there may be temporary impacts to existing aquatic resources associated with water quality degradation and disturbance of instream habitat during the construction period. However, since the construction of these dams would be scattered over time, these impacts would generally be localized and not additive. Following the replacement of all 27 diversion dams, the diversions would no longer act as barriers to fish movement and fish could migrate throughout the study area of both the Strawberry and Duchesne Rivers (the exception being the Knight Diversion on the Duchesne River). This represents a significant benefit to many of the game fish species that generally want to migrate upstream to spawn. In addition, the new diversions would be able bypass flow in excess of the diversion's water right thus more useable aquatic habitat would be expected downstream of the diversions. The new structures would also allow CUP water released to preserve fish habitat to be shepherded downstream to the confluence of the two rivers. Overall, replacement of all diversion dams in the study area would have a significant beneficial effect on aquatic resources in the Duchesne and Strawberry Rivers. The DRACR project and SACS angler-access mitigation program had no adverse impacts on aquatic habitats or resources.

Up to 40 acres of land would be affected by the construction of the 27 diversion dams. Only the access road has the potential to involve tilled fields. Therefore, only a small portion of the disturbed areas would be within tilled fields and those impacts would only be temporary, as all disturbed areas associated with the access road would be restored to existing use. The SACS angler-access mitigation program had no effects on farmlands in the project area, and the DRACR project restored disturbed areas, as well as had a net benefit to farmlands by providing more water to fields by reducing canal conveyance losses. Therefore, cumulative impacts on farmland would be beneficial.

With the rehabilitation or replacement of the 27 diversion dams, the cost of annual maintenance to the local irrigation companies would be expected to be reduced. This alternative would be expected to have slight positive impacts on socioeconomics by minor increased temporary employment during construction, and slightly reduced operation and maintenance costs of the diversions. The SACS angler-access mitigation program was anticipated to have a minor beneficial impact on socioeconomics by increasing tourism expenditures in the area due to increased fishing trips, and a minor negative impact by reducing tax payments to the County governments because of land acquisition by the federal government. This project does not involve land acquisition by the federal government and so no cumulative impacts would occur. The DRACR program was found to have positive impacts on socioeconomics through improvement in water delivery to crops and better crop yields. Therefore, the cumulative impact on local socioeconomics would be expected to be minor but beneficial.

4.11.2 Alternative 3 – Combine Diversion Dams

This alternative would allow for the combination of up to 22 of the existing diversion structures into 7 structures. Five other existing diversions would be rehabilitated or replaced as individual structures. This reduction of up to 15 diversion dams would require an increase in the overall conveyance system to assure that each water user can divert the amount of water they are legally entitled to divert. It is assumed that 11,000 feet would be the maximum distance for a

conveyance system (canals or pipe) from a new combined diversion to the existing canal delivery systems.

Replacement of 12 diversion dams (7 combined and 5 single use diversion dams) would be expected to have no effect on the geology and topography of the study area. In addition, impacts associated with the construction/replacement of the diversion dams would be conducted according to standard procedures so that the project would not have adverse impacts on designated floodplains, air quality, noise, transportation, and hazardous materials. Therefore, cumulative impacts of this project together with the DRACR and SACS angler-access mitigation program for these environmental resources would be expected to be the same as discussed previously for the construction/replacement of an individual diversion dam.

This project would be expected to have slight positive impacts on socioeconomics by minor increased temporary employment during construction, and slightly reduced operation and maintenance costs of the diversions. The SACS angler-access mitigation program was anticipated to have a minor beneficial impact on socioeconomics by increasing tourism expenditures in the area due to increased fishing trips, and a minor negative impact by reducing tax payments to the County governments because of land acquisition by the federal government. This project does not involve land acquisition by the federal government and so no cumulative impacts would occur. The DRACR program was found to have positive impacts on socioeconomics through improvement in water delivery to crops and better crop yields. Overall, this project would result in cumulative beneficial socioeconomic impacts.

Replacement of the 27 diversion dams with 7 combination diversion dams and 5 single diversion dams and the construction of up to a maximum of 20 miles of new conveyance system would be expected to disturb up to 120 acres of soils. Approximately 60 acres of the soils would be within the footprints of the new diversion dams or the conveyance canals. Since these areas would be spread throughout the study area, most of the soils have been previously disturbed by previous agricultural activities and construction/maintenance of the existing diversions, and overall construction activities would extend over numerous years, this disturbance would not be considered a significant impact on soils. Impacts of the DRACR project on soils and geology were temporary and have been restored or mitigated. There were be no impacts on soils or geology from the SACS angler-access mitigation project, so no cumulative effects would result from that project.

With the replacement of all 27 diversion dams with 7 combination and 5 single diversion dams, individual diversions would be able to bypass flows in excess of their legal water right, and CUP water would be able to be conveyed to the confluence of the Duchesne and Strawberry Rivers. Since the new structures would require less routine instream maintenance, there would be a long-term cumulative benefit on the water quality of both the Duchesne and Strawberry Rivers. No cumulative effects on water rights from the SACS angler-access mitigation program or the DRACR program are anticipated.

As stated previously, the rehabilitation of all 27 structures would temporarily disturb approximately 120 acres of vegetation (up to 60 acres would be permanently lost within the footprint of the structures). This would include a mixture of riparian vegetation, alfalfa, and

pasture. Following the completion of construction, these areas would be revegetated, either as cropland or with native species. Potential cumulative impacts to vegetation, wetlands, wildlife, and threatened and endangered species would be similar to the impacts discussed in Section 4.4 because disturbed areas associated with the construction of one combined diversion dam would essentially be restored before the construction of other dams occur. The DRACR program did have substantial impacts on wetlands, but those impacts are being mitigated through purchase, development and management of lands along the lower Duchesne River corridor (Riverdell property acquired by Reclamation in the 1980s). As a result, the cumulative impacts of Alternative 3 on the biological resources would not be considered significant.

As the permanent diversion structures and associated conveyance systems are constructed, there may be temporary impacts to existing aquatic resources associated with water quality degradation and disturbance of instream habitat during the construction period. However, since the construction of these dams would be scattered over time, these impacts would generally be localized and not additive. Following the replacement of all of the diversion dams, the diversions would no longer act as barriers to fish movement and fish could migrate throughout the study area of both the Strawberry and Duchesne Rivers (the exception being the Knight Diversion on the Duchesne River). This represents a significant benefit to many of the game fish species that generally attempt to migrate upstream to spawn. In addition, there would be 15 fewer diversions and the 12 new diversions would be able bypass flow in excess of the diversion's water right thus more useable aquatic habitat would be expected downstream of the diversions. The new structures would also allow CUP water released to preserve fish habitat to be shepherded downstream to the confluence of the two rivers. The DRACR project and SACS angler-access mitigation program had no adverse impacts on aquatic habitats or resources. Overall, replacement of all diversion dams in the study area would have a significant cumulative beneficial effect on aquatic resources in the Duchesne and Strawberry Rivers.

Although up to 120 acres of land would be affected by the construction of the 12 diversion dams and up to 20 miles of water conveyance system, most of the disturbed areas would not be located within tilled fields. The potential cumulative adverse impacts to farmland from construction would be restored or would be offset by more efficient water diversion and delivery systems that would be achieved with a stable diversion dam. The SACS angler-access mitigation program had no effects on farmlands in the project area, and the DRACR project restored disturbed areas, as well as had a net benefit to farmlands by providing more water to fields by reducing canal conveyance losses. Therefore, net cumulative impacts of Alternative 3 on farmland would be beneficial.

One of the most important objectives of public involvement is to obtain information from a well-informed public to assist decision makers throughout the planning process. Public involvement processes provide opportunities for the public and agencies affected by this action to comment on the possible impacts of this action.

Agency scoping meetings and/or progress reviews were held on March 24, 1998; April 29, 1998; July 21, 1999; August 8-9, 2002; and October 28, 2002 with interested agencies to determine the significant issues to be addressed in this EA. Formal public meetings with the affected water interests were held in September, 1997; February 12, 1998; and November 3, 2002. Public information and comment was also presented and received on this project at public meetings of the Mitigation Commission, on December 7, 1998 and January 15, 1999. Attendance lists and meeting records are on file with the Mitigation Commission.

The Mitigation Commission has utilized an interdisciplinary approach to prepare the EA to comply with the NEPA mandates at 40 CFR 1501.2(a). The principal disciplines involved with preparation of the EA include the following: Environmental Scientist, Fish and Wildlife Biologist, Water Rights Specialist/Hydrologist, Archaeologist, Wetlands Biologist, Civil Engineer, and a Botanist.

This EA has been distributed as a public review draft to individuals, local governments, and agencies for comment. Notice of availability was published in the Federal Register on January 3, 2003 (Vol. 68, No. 2, pages 400-401) announcing the public comment period. The following agencies/groups were mailed a copy of the Draft Programmatic EA (the mailing list is available upon request) or have been contacted specifically regarding its content:

- U.S. Department of the Interior- CUP Completion Act Office
- U.S. Fish & Wildlife Service
- U.S. Bureau of Reclamation
- U.S. Environmental Protection Agency
- U.S. Bureau of Indian Affairs
- Ute Indian Tribe
- Utah Division of Wildlife Resources
- Utah Division of Water Rights
- Utah State Historic Preservation Office
- Utah Geological & Mineral Survey
- Duchesne County Water Conservancy District
- Central Utah Water Conservancy District
- Duchesne River Commissioner
- Duchesne – Strawberry Water Users' Association
- Farm Creek Canal Company

- Hicken Ditch Canal Company
- Pioneer Canal Company
- Rocky Point Canal Company
- Jasper – Pike Canal representatives
- Private landowners / water right holders

The National Historic Preservation Act of 1966 (as amended) requires consultation with the Utah State Historic Preservation Office (USHPO) concerning potential effects of Federal actions on historic properties, including significant prehistoric or historic archaeological resources. Documentation of consultation conducted with USHPO is on file at the USHPO office in Salt Lake City, Utah.

Section 101(d)(2) and 106 of the National Historic Preservation Act of 1966 (16 U.S.C. 470), the Native American Graves Protection and Repatriation Act of 1990 (25 U.S.C. 3001), the Archaeological Resource Protection Act of 1979 (16 U.S.C. 470)(43 CFR Part 10), the National Environmental Policy Act of 1969 (16 U.S.C. 470), the American Indian Religious Freedom Act of 1978 (42 U.S.C. 1966), and Executive Order 13007 (Protection of American Indian Sacred Sites) require consultation with Indian tribes on complex and culturally sensitive issues (Reclamation Manual, Native American Directives, NIA-01). Consultation has occurred during planning and will continue during construction. Documentation of consultation conducted with the Ute Indian Tribe is on file at the Mitigation Commission office in Salt Lake City, Utah.

Comment letters on the Draft Programmatic EA were received from Duchesne County Water Conservancy District, Central Utah Water Conservancy District, U.S. Bureau of Reclamation, and the U.S. Environmental Protection Agency. All comments were reviewed and modifications were made to the Final EA accordingly to address the comments.

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BACTs	Best Available Control Technologies
BuRec	Bureau of Reclamation
cfs	cubic feet per second
CUP	Central Utah Project
DDT	Dichlorodiphenyltrichloroethane
EA	Environmental Assessment
E.O.	Executive Order
FEMA	Federal Emergency Management Agency
FIRM	Flood Insurance Rate Map
FONSI	Finding Of No Significant Impact
IBAT	Interagency Biological Assessment Team
Mitigation Commission	Utah Reclamation Mitigation and Conservation Commission
msl	mean sea level
NAAQS	National Ambient Air Quality Standards
NEPA	National Environmental Policy Act
NRCS	National Resources Conservation Serivce
NRHP	National Register of Historic Places
PEA	Programmatic Environmental Assessment
SACS	Strawberry Aqueduct and Collection System
SEA	Supplemental Environmental Quality
SHPO	State Historic Preservation Officer
UDEQ	Utah Division of Environmental Quality
UDWR	Utah Division of Wildlife Resources
UGS	Utah Geological Survey
UNHP	Utah National Heritage Program
USACE	U.S. Army Corps of Engineers
USFWS	U.S. Fish and Wildlife Service
USGS	U.S. Geological Survey
USHS	Utah State Historic Society

Agency and Public Correspondence are not included in the electronic version. Please see hard copy.

Soil Classification descriptions are not included in the electronic version. Please see hard copy.

Ute Ladies' – Tresses Survey Report is not included in the electronic version. Please see hard copy.

Standard Procedures to be Followed During Construction

To reduce potential construction-related impacts, the Mitigation Commission will assure the following procedures are implemented by the construction contractor:

1. All construction activities and appurtenances (such as borrow sources, waste areas, work, staging and storage areas, and vehicle and equipment parking areas) will be located on previously disturbed areas, excluding wetlands, drainages and riparian areas, to the extent practicable. Land disturbances occurring during construction will be reclaimed.
2. All equipment used during construction will be washed clean of any seeds prior to entering a construction site.
3. For public safety, all construction sites will be closed to the public
4. Dust abatement will be implemented, as appropriate.
5. The contractor will be required to implement the best available control technologies (BACT) to minimize soil erosion during precipitation events.
6. All disturbed areas, resulting from construction, will be smoothed, shaped, re-contoured, reseeded with native seed mix, and rehabilitated to as-near natural conditions, as practicable.

Environmental Commitments

The following commitments would be implemented as an integral part of the selected alternative:

1. If the selected alternative changes significantly from that described in this EA due to new information, additional environmental analyses and compliance may be necessary.
2. Federal and State permits (U.S. Army Corps of Engineers Clean Water Act-Section 404 Permit and/or Utah Stream Alteration Permit) for discharge of dredged or fill material into waters of the United States (construction of rock sills) will be acquired. Mitigation requirements of the 404 Permit/stream alteration permit should address any impacts to wetlands and/or waters of the United States.
3. Requirements prescribed by the Native American Graves Protection and Repatriation Act (Public Law 101-601/ 104 Stat. 3042) shall apply. Any discovery of possible human remains on Federal or Ute Tribal land will cause immediate telephone notification to Reclamation=s Provo Area Office Archaeologist. Work will stop until the proper authorities are able to assess the situation onsite. Written confirmation to the responsible Federal agency official with respect to Federal lands will follow. On Ute Tribal lands, responsible Ute Indian Tribal officials will be notified. A AQuick Reference@ of instructions for proper procedure in case of an inadvertent discovery situation will be placed in all construction vehicles.
4. Prior to construction, site-specific surveys and consultation regarding historic or cultural properties will be done in accordance with a Programmatic MOA. During construction in of this portion of the project, a qualified archaeologist will monitor the entire pipeline trench for subsurface artifact material. If any subsurface artifact materials are found during this

investigation, work will stop and the situation will be assessed and mitigated according to 36 CFR 800.11(b)(iii) and 800.11(c)(3). See also Commitment #4.

5. Existing roads will be used for all project activities to the extent practicable.
6. An Environmental Commitment Plan (ECP) and Checklist (ECC) will be prepared and used by the Mitigation Commission and Duchesne County Water Conservancy District to ensure compliance with these environmental commitments and environmental protection requirements.
7. Permits required pursuant to compliance with Federal, State, local and tribal environmental protection laws and regulations shall be acquired prior to initiation of ground disturbing activities. Conditions of such permits shall be mandatory.
8. Protection of raptors with regard to all construction and land management activities will be with reference to Utah Field Office Guidelines for Raptor Protection from Human and Land Use Disturbances prepared by the U.S. Fish and Wildlife Service.

APPENDIX F

Characteristics and Diversion Summary for Select Diversion Dams on the Duchesne River

TABLE F-1
SUMMARY AND EVALUATION OF DIVERSION
RHOADES CANAL

Characteristic / Criterion	Data / Comment
General	
Water Source	North Fork Duchesne River
Location	SW1/4, Section 7, T1N, R8W
Acres Served	1,305.23
Diversion Water Right (cfs)	22.37
Diversion Structure	
Dam Type or Material	Concrete
Dam Stability	Fair
Headworks Type	Concrete with 2 metal slide gates
Headworks Stability	Fair to poor
Flow Bypass Device	Non-gated sluiceway
Flow Measuring Device - Canal	None at point of diversion

Diversion Record Summary

Monthly Flow Data (cfs) [1]

	May	June	July	August	September
1988	14.19	18.23	19.29	12.84	11.90
1989	30.19*	22.83*	16.03	15.23	12.97
1990	22.38*	30.12*	18.56	18.00	12.60
1991	14.23	19.03	17.71	16.87	15.43
1992	18.98	18.80	18.74	13.40	10.55
1993	3.06	8.27	12.65	11.71	9.07
1994	8.29	12.27	11.94	14.03	11.87
1995	3.32	5.87	6.26	5.85	4.60
1996	7.60	10.00	9.87	9.24	5.57
1997	2.95	5.78	7.39	5.56	3.39
1998	1.42	4.36	5.88	2.95	2.36
1999	1.20	4.32	5.28	4.20	4.22
2000	5.70	7.45	6.42	4.82	3.07
2001	7.60	12.03	14.86	11.16	9.66

Evaluation of Diversion

Flow Bypass Capability	**Yes.** The sluiceway presently by-passes a portion of the flow. However, the diversion is not located within a stream segment that receives CUP fishery water.
Operated as a Dry Dam	**No.** The diversion is not operated as a dry dam. The sluiceway is located near the canal headgate but there is no gate on the sluiceway.
Barrier to Fish Migration	**Yes.** During most flows, especially during low flow, the structure is a barrier to upstream migrating fish.
Instream Operation and Maintenance Requirements	**Low.** No routine instream operation or maintenance is required, except for periodic removal of woody debris that may accumulate on dam and canal headworks.
Physical Stability of Structure	**Fair.** Overall, the structure has fair stability. In several areas along the dam, the concrete has eroded and reinforcing steel is exposed. Wing wall on left abutment is broken and displaced. Water can also be seen flowing through cracks or holes in si

[1] Utah Division of Water Rights 2003

* Diversion exceeded water right.

TABLE F-2
SUMMARY AND EVALUATION OF DIVERSION
TURNBOW DITCH #1 AND #2 COMBINED

Characteristic / Criterion	Data / Comment
General	
Water Source	Duchesne River
Location	SW1/4, Section 4, T1S, R8W
Acres Served	156.03
Diversion Water Right (cfs)	2.61
Diversion Structure	
Dam Type or Material	Cobbles and boulders wrapped in chain-link fabric (partial dam)
Dam Stability	Fair to poor
Headworks Type	Concrete with metal slide gate
Headworks Stability	Fair
Flow Bypass Device	None
Flow Measuring Device - Canal	Parshall flume (downstream)

Diversion Record Summary

Monthly Flow Data (cfs) [1]

	May	June	July	August	September
1993	1.37	2.30	2.56	1.98	--
1994	2.19	2.40	1.90	1.34	1.46
1995	2.00	2.35	2.26	1.34	1.53
1996	1.38	2.33	3.23*	3.13*	2.01
1997	2.61	2.67*	2.10	2.16	0.90
1998	0.19	2.97*	2.47	1.40	1.28
1999	0.44	2.63*	2.27	1.48	1.38
2000	2.26	2.92*	2.70*	1.30	1.18
2001	2.38	3.49*	2.13	1.13	1.08

Evaluation of Diversion

Flow Bypass Capability	**No.** Although the diversion dam does not extend across the entire stream channel, the structure does not have a mechanism to assure a set amount of water is by-passed.
Operated as a Dry Dam	**No.** The diversion dam does not extend across the entire stream channel.
Barrier to Fish Migration	**No.** The diversion dam does not extend across the entire stream channel.
Instream Operation and Maintenance Requirements	**Medium.** During periods of low flow, cobbles and plastic sheeting are placed at the upstream end of the dam to help direct additional water to the headworks.
Physical Stability of Structure	**Fair to Poor.** Diversion dam is gabion-like consisting of cobbles and boulders wrapped in a chain-link fabric which gives the dam some additional stability. However, it is still susceptible to erosion during periods of high flow.

[1] Utah Division of Water Rights 2003

* Diversion exceeded water right.

TABLE F-3
SUMMARY AND EVALUATION OF DIVERSION
FARM CREEK CANAL

Characteristic / Criterion	Data / Comment
General	
Water Source	Duchesne River
Location	SW1/4, Section 11, T1S, R8W
Acres Served	2,397.6
Diversion Water Right (cfs)	38.36
Diversion Structure	
Dam Type or Material	Cobbles, boulders, fence posts, bales of straw, and plastic
Dam Stability	Poor
Headworks Type	Concrete with 2 metal slide gates
Headworks Stability	Good
Flow Bypass Device	None
Flow Measuring Device - Canal	Parshall flume (downstream)

Diversion Record Summary

Monthly Flow Data (cfs) [1]

	May	June	July	August	September
1987	55.16*	25.47	31.16	22.13	20.00
1988	32.13	29.47	24.39	19.19	14.00
1989	43.13*	36.17	26.26	24.45	24.63
1990	32.19	55.43*	35.48	26.61	24.43
1991	37.00	46.50*	49.27*	40.63*	15.51
1992	43.50*	39.06*	33.45	31.71	25.81
1993	25.66	43.64*	44.66*	37.29	23.85
1994	33.07	44.46*	30.70	18.86	16.01
1995	6.79	27.25	46.00*	37.61	36.38
1996	18.45	40.74*	35.36	32.64	21.71
1997	10.78	35.20	26.95	17.08	11.35
1998	19.86	38.16	32.57	15.12	2.99
1999	26.33	40.30*	36.28	30.55	7.81
2000	42.10*	39.84*	27.64	22.69	19.72
2001	31.55	40.43*	25.57	20.55	13.88

Evaluation of Diversion

Flow Bypass Capability	**No.** The diversion structure does not have a mechanism to assure a set amount of water is allowed to flow downstream.
Operated as a Dry Dam	**Yes.** The diversion dam extends across the entire stream channel. During low flow periods, straw bales and/or plastic are placed in porous areas of the diversion structure to increase the amount of water that can be diverted.
Barrier to Fish Migration	**Yes.** During low flows the diversion dam is a barrier to fish migration and this condition remains until increased flows overtop the structure.
Instream Operation and Maintenance Requirements	**Medium to High.** Maintenance in most years requires restoring cobble and rubble to the diversion dam and placement of straw bales on the upstream side of the dam. After extremely high flows, maintenance activities can be substantial.
Physical Stability of Structure	**Fair to Poor.** The diversion dam is stable during low and moderate flows, but a portion of the dam is frequently displaced during high flows. The headworks of the canal are stable. Stream bank erosion is minor.

[1] Utah Division of Water Rights 2003

* Diversion exceeded water right.

TABLE F-4
SUMMARY AND EVALUATION OF DIVERSION
NEW TABBY CANAL

Characteristic / Criterion	Data / Comment
General	
Water Source	Duchesne River
Location	SE1/4, Section 14, T1S, R8W
Acres Served	921.28
Diversion Water Right (cfs)	16.40
Diversion Structure	
Dam Type or Material	Cobbles and boulders (partial dam)
Dam Stability	Fair to poor
Headworks Type	Open channel
Headworks Stability	Fair
Flow Bypass Device	None
Flow Measuring Device - Canal	Rectangular weir

Diversion Record Summary

Monthly Flow Data (cfs) [1]

	May	June	July	August	September
1987	15.90	31.47*	26.77*	26.77*	0.97
1988	12.48	24.60*	18.52*	17.32*	--
1989	17.39*	18.07*	16.68*	14.97	1.74
1990	10.51	13.19	12.80	10.03	--
1991	7.87	13.80	17.65*	11.42	2.32
1992	14.94	11.53	11.06	11.07	4.29
1993	5.10	10.79	10.67	14.88	4.92
1994	9.85	10.89	8.97	8.68	0.85
1995	5.76	7.99	8.14	8.07	1.73
1996	8.12	8.56	8.07	7.96	3.79
1997	3.61	4.80	10.01	7.81	1.95
1998	3.92	9.95	9.28	6.98	0.72
1999	5.05	13.08	12.67	10.21	0.19
2000	5.66	9.61	11.67	7.14	1.69
2001	11.56	11.08	11.19	7.58	2.45

Evaluation of Diversion

Flow Bypass Capability	**No.** The diversion structure does not have a mechanism to assure a set amount of water is allowed to flow downstream.
Operated as a Dry Dam	**No.** The diversion dam does not extend across the entire stream channel.
Barrier to Fish Migration	**No.** The diversion dam does not extend across the entire stream channel.
Instream Operation and Maintenance Requirements	**Medium.** Maintenance of the diversion dam is typically required after periods of high flow to replace cobbles and boulders.
Physical Stability of Structure	**Fair to Poor.** The diversion dam is stable during low and moderate flows, but cobbles and boulders can be displaced during high flows. The opening of the canal and stream banks are generally stable.

[1] Utah Division of Water Rights 2003

* Diversion exceeded water right.

TABLE F-5
SUMMARY AND EVALUATION OF DIVERSION
JASPER PIKE CANAL

Characteristic / Criterion	Data / Comment
General	
Water Source	Duchesne River
Location	NW1/4, Section 24, T1S, R8W
Acres Served	~1,200
Diversion Water Right (cfs)	17.25
Diversion Structure	
Dam Type or Material	Cobbles and boulders
Dam Stability	Fair to poor
Headworks Type	Concrete with metal slide gate
Headworks Stability	Good
Flow Bypass Device	None
Flow Measuring Device - Canal	Rated section (downstream)

Diversion Record Summary

Monthly Flow Data (cfs) [1]

	May	June	July	August	September
1987	18.32*	23.73*	20.19*	15.97	17.50*
1988	12.52	19.07*	18.06*	20.13*	15.67
1989	19.42*	15.57	14.68	12.68	12.97
1990	13.85	20.68*	18.13*	14.81	10.98
1991	15.61	23.60*	23.45*	14.42	10.23
1992	26.33*	21.03*	18.41*	13.44	11.00
1993	16.56	19.58*	14.87	15.11	11.42
1994	19.28*	30.61*	16.15	13.70	9.83
1995	3.74	17.63*	20.31*	26.10*	22.80*
1996	20.39*	19.98*	21.55*	19.42*	15.94
1997	11.22	22.10*	19.30*	12.44	13.70
1998	17.82*	27.22*	24.01*	15.55	5.92
1999	9.08	34.59*	35.03*	19.21*	8.20
2000	7.45	23.59*	17.97*	15.79	14.92
2001	18.14*	22.33*	18.68*	14.73	11.84

Evaluation of Diversion

Flow Bypass Capability	**No.** The diversion structure does not have a mechanism to assure a set amount of water is allowed to flow downstream.
Operated as a Dry Dam	**Yes.** A low head rock dam extends across the stream channel. During low flow periods all flow in the stream is diverted into the canal.
Barrier to Fish Migration	**Yes.** During low flows the diversion dam is a barrier to fish migration and this conditions remains until increased flows overtop the structure.
Instream Operation and Maintenance Requirements	**Medium to High.** In most years, high flows displace cobble and boulders from the diversion dam which are replaced when high flows subside. During low flow periods additional materials are added to the dam to reduce seepage.
Physical Stability of Structure	**Fair to Poor.** The headworks of the canal are stable, but not the diversion dam. Cobbles and boulders are routinely displaced from the dam during high flow periods.

[1] Utah Division of Water Rights 2003

* Diversion exceeded water right.

TABLE F-6
SUMMARY AND EVALUATION OF DIVERSION
HICKEN DITCH

Characteristic / Criterion	Data / Comment
General	
Water Source	Duchesne River
Location	SW1/4, Section 32, T1S, R7W
Acres Served	429.3
Diversion Water Right (cfs)	6.75
Diversion Structure	
Dam Type or Material	Cobbles and boulders in riffle (partial dam)
Dam Stability	Fair
Headworks Type	Concrete with metal slide gate
Headworks Stability	Poor
Flow Bypass Device	None
Flow Measuring Device - Canal	Parshall flume (downstream)

Diversion Record Summary

Monthly Flow Data (cfs) [1]

	May	June	July	August	September
1990	7.63*	10.93*	8.46*	6.69	5.10
1991	6.90*	7.15*	13.23*	10.84*	6.00
1992	11.48*	10.06*	6.29	8.84*	7.81*
1993	12.65*	15.46*	11.38*	11.44*	8.15*
1994	11.79*	16.06*	12.35*	13.97*	6.29
1995	3.63	7.19*	12.37*	13.93*	13.64*
1996	14.06*	20.59*	15.10*	14.13*	5.72
1997	3.49	7.09*	13.37*	10.64*	5.54
1998	5.24	11.98*	10.57*	11.90*	4.33
1999	6.08	10.83*	10.30*	10.23*	7.88*
2000	9.29*	11.65*	8.46*	8.98*	4.33
2001	18.08*	13.23*	9.28*	8.18*	6.00

Evaluation of Diversion

Flow Bypass Capability	**No.** The diversion structure does not have a mechanism to assure a set amount of water is allowed to flow downstream.
Operated as a Dry Dam	**Yes.** A large riffle area is located adjacent to the headworks of the canal. Dry dam conditions have been known to occur in the riffle area during periods of low flow.
Barrier to Fish Migration	**Yes.** The diversion dam does not typically create a total barrier, but during low flows diversion of water reduces water depth across the riffle such that fish passage would be extremely difficult if not impossible.
Instream Operation and Maintenance Requirements	**Medium.** During low flow periods cobble within the riffle area is moved to create a berm and small channel within the riffle to enhance flow to the headworks of the ditch.
Physical Stability of Structure	**Fair to Poor.** This diversion does not contain a typical rock dam in the stream channel. The concrete headworks to the ditch, however, is in poor condition. Its headwall has been displaced and it appears to be unstable.

[1] Utah Division of Water Rights 2003

* Diversion exceeded water right.

TABLE F-7
SUMMARY AND EVALUATION OF DIVERSION
WAGSTAFF DITCH

Characteristic / Criterion	Data / Comment
General	
Water Source	Duchesne River
Location	SE1/4, Section 14, T2S, R7W
Acres Served	138.72
Diversion Water Right (cfs)	2.52
Diversion Structure	
Dam Type or Material	Cobbles and boulders
Dam Stability	Fair to poor
Headworks Type	Metal slide gate
Headworks Stability	Good
Flow Bypass Device	None
Flow Measuring Device - Canal	None

Diversion Record Summary

Monthly Flow Data (cfs) [1]

	May	June	July	August	September
1991	0.65	3.70*	1.90	1.32	1.67
1992	1.89	1.57	1.96	2.24	2.38
1993	1.32	1.77	1.82	2.81*	2.33
1994	3.73*	2.37	2.00	2.26	2.10
1995	1.23	2.00	1.48	2.45	3.30*
1996	3.16*	3.00*	3.16*	2.74*	1.15
1997	1.06	2.47	1.87	2.16	1.67
1998	1.71	2.13	2.21	1.97	1.38
1999	0.65	3.60*	3.24*	2.90*	2.81*
2000	--	2.13	1.93	1.22	1.00
2001	2.00	1.54	1.31	1.55	0.98

Evaluation of Diversion

Flow Bypass Capability	**No.** The diversion structure does not have a mechanism to assure a set amount of water is allowed to flow downstream.
Operated as a Dry Dam	**No.** Due to the low head required to satisfy the diversion water right, the dam is not usually operated as a dry dam.
Barrier to Fish Migration	**No.** Due to adequate depth and typical low head conditions, fish are generally able to migrate past the diversion dam.
Instream Operation and Maintenance Requirements	**Medium.** The diversion dam can wash out during high flows requiring replacement when the high flows subside.
Physical Stability of Structure	**Fair.** This diversion dam is not stable at high flows as cobbles and boulders can be displaced during these flows. The headworks of the ditch appear to be stable.

[1] Utah Division of Water Rights 2003

* Diversion exceeded water right.

TABLE F-8
SUMMARY AND EVALUATION OF DIVERSION
BROADHEAD DITCH

Characteristic / Criterion	Data / Comment
General	
Water Source	Duchesne River
Location	SE1/4, Section 18, T2S, R6W
Acres Served	335.5
Diversion Water Right (cfs)	6.56
Diversion Structure	
Dam Type or Material	Cobbles, boulders, and log
Dam Stability	Fair to poor
Headworks Type	Concrete with metal slide gate
Headworks Stability	Good
Flow Bypass Device	None
Flow Measuring Device - Canal	Weir

Diversion Record Summary

Monthly Flow Data (cfs)[1]

	May	June	July	August	September
1991	6.39	5.47	4.69	4.18	1.37
1992	5.11	3.90	4.50	5.21	3.48
1993	6.66*	6.23	6.15	6.29	6.20
1994	7.71*	6.57	5.74	3.60	2.37
1995	3.61	6.55	6.00	5.13	5.00
1996	8.81*	6.93*	5.65	6.94*	3.67
1997	6.27	7.83*	6.35	8.55*	5.20
1998	6.65*	7.73*	7.45*	5.87	5.73
1999	7.68*	9.27*	9.45*	5.94	7.70*
2000	4.35	10.50*	4.80	5.00	4.77
2001	7.00*	8.33*	4.87	5.56	4.34

Evaluation of Diversion

Flow Bypass Capability	**No.** The diversion structure does not have a mechanism to assure a set amount of water is allowed to flow downstream.
Operated as a Dry Dam	**No.** A rock dam extends across the stream channel, but the diversion is generally not operated as a dry dam.
Barrier to Fish Migration	**Yes.** During periods of low flow, upstream movement of fish past the structure would be difficult.
Instream Operation and Maintenance Requirements	**Medium.** In most years, high flows can displace cobbles and boulders from the diversion structure which are replaced when high flows subside.
Physical Stability of Structure	**Fair.** This diversion dam is not stable at high flows as cobbles and boulders can be displaced during these flows. The headworks of the ditch appear to be stable.

[1] Utah Division of Water Rights 2003

* Diversion exceeded water right.

TABLE F-9
SUMMARY AND EVALUATION OF DIVERSION
KNIGHT-SHANKS DIVERSION

Characteristic / Criterion	Data / Comment
General	
Water Source	Rock Creek
Location	NE1/4, Section 19, T2S, R5W
Acres Served	~440
Diversion Water Right (cfs)	7.74
Diversion Structure	
Dam Type or Material	Cobbles and boulders
Dam Stability	Fair to poor
Headworks Type	Concrete intake for pipelines
Headworks Stability	Fair to good
Flow By-Pass Device	None
Flow Measuring Device - Pipeline	Flow Meter

Diversion Record Summary

Monthly Flow Data (cfs) [1]

	May	June	July	August	September
1994	2.80	3.65	3.88	3.11	0.76
1996	3.30	2.44	1.66	3.30	3.51
1997	3.42	3.14	2.94	2.16	2.56
1998	2.47	3.85	2.89	3.04	2.02
1999	1.19	3.04	4.96	2.99	2.40
2000	2.75	3.82	4.18	3.27	1.63
2001	2.65	3.44	2.91	3.58	2.60

Evaluation of Diversion

Flow By-Pass Capability	**No.** The diversion structure does not have a mechanism to assure a set amount of water is allowed to flow downstream.
Operated as a Dry Dam	**No.** Although the diversion dam extends fully across the stream, the dam is not usually operated as a dry dam.
Barrier to Fish Migration	**Yes.** During periods of low flow, upstream movement of fish past the structure would be difficult.
Instream Operation and Maintenance Requirements	**Medium.** High flows can displace cobbles and boulders from the diversion structure which are replaced when high flows subside.
Physical Stability of Structure	**Fair.** The diversion dam is not stable at high flows as cobbles and boulders can be displaced at these flows. The headworks appear to be stable.

[1] Utah Division of Water Rights 1997a

Data is combined from the Knight and Shanks pipelines.

* Diversion exceeded water right.

TABLE F-10
SUMMARY AND EVALUATION OF DIVERSION
PIONEER CANAL

Characteristic / Criterion	Data / Comment
General	
Water Source	Duchesne River
Location	NE1/4, Section 29, T2S, R5W
Acres Served	> 1,400
Diversion Water Right (cfs)	22.61
Diversion Structure	
Dam Type or Material	Cobbles and boulders in the main or side channels
Dam Stability	Poor
Headworks Type	Concrete with metal slide gate
Headworks Stability	Poor
Flow Bypass Device	None
Flow Measuring Device - Canal	Rectangular weir

Diversion Record Summary

Monthly Flow Data (cfs) [1]

	May	June	July	August	September
1987	22.97*	22.30	23.77*	20.81	18.13
1988	18.10	22.07	21.84	15.19	13.07
1989	19.45	18.60	16.94	14.06	11.60
1990	18.29	20.40	19.32	17.90	9.03
1991	19.03	20.63	19.35	18.45	12.33
1992	17.69	15.34	16.13	19.10	13.56
1993	22.37	27.65*	28.11*	21.37	15.59
1994	20.12	22.54	19.10	21.76	14.15
1995	9.65	17.24	20.55	20.50	18.59
1996	27.83*	22.32	27.76*	23.43*	14.51
1997	17.25	15.38	16.52	13.12	10.40
1998	21.61	25.00*	28.60*	18.45	18.22
1999	18.14	16.94	26.35*	17.79	14.46
2000	25.27*	22.59	19.13	14.40	9.77
2001	26.87*	24.17*	21.09	13.25	12.43

Evaluation of Diversion

Flow Bypass Capability	**No.** The diversion structure does not have a mechanism to assure a set amount of water is allowed to flow downstream.
Operated as a Dry Dam	**Yes.** The diversion is located within a braided area of the river and the headworks is located on a side channel. One or more of the main channels are frequently blocked (i.e., dry dam) to assure adequate flow in the side channel.
Barrier to Fish Migration	**Yes.** During periods of low flow, the channel blockages represent barriers to upstream fish movement. This situation would continue until the end of the irrigation season.
Instream Operation and Maintenance Requirements	**High.** This diversion requires considerable O&M activities in the stream channel each year as cobble and boulders are moved to block main channels of the river. Also, in some years cobble is removed from the side channel to help move water towards the canal headworks.
Physical Stability of Structure	**Poor. T**he headworks are in poor condition and downcutting has occurred adjacent to the abutments. Also, the channel blockages require replacement in most years.

[1] Utah Division of Water Rights 2003

* Diversion exceeded water right.

TABLE F-11
SUMMARY AND EVALUATION OF DIVERSION
ROCKY POINT CANAL

Characteristic / Criterion	Data / Comment
General	
Water Source	Duchesne River
Location	SE1/4, Section 12, T3S, R5W
Acres Served	~ 3,560
Diversion Water Right (cfs)	78.38
Diversion Structure	
Dam Type or Material	Boulders, car bodies, and plastic
Dam Stability	Poor
Headworks Type	Wood with wooden slide gate
Headworks Stability	Poor
Flow Bypass Device	None at point of diversion
Flow Measuring Device - Canal	None at point of diversion

Diversion Record Summary

Monthly Flow Data (cfs) [1]

	May	June	July	August	September
1987	43.74	51.43	48.74	40.19	35.47
1988	46.55	55.73	61.52	56.06	37.13
1989	41.35	47.47	47.68	34.52	34.00
1990	47.19	50.30	48.90	46.26	34.07
1991	39.61	36.51	49.48	39.64	30.37
1992	38.45	45.74	43.09	44.93	39.04
1993	36.88	39.52	56.75	40.95	38.05
1994	47.12	47.84	54.60	48.99	37.37
1995	29.96	37.45	49.49	43.42	34.85
1996	47.52	46.77	53.97	51.53	29.00
1997	37.40	35.43	56.75	23.62	17.93
1998	49.36	37.13	53.07	47.09	24.78
1999	33.78	41.08	57.25	34.95	18.31
2000	48.60	52.72	56.60	48.49	24.12
2001	45.10	54.31	53.24	47.71	32.57

Evaluation of Diversion

Flow Bypass Capability	**No.** The diversion structure does not have a mechanism to assure a set amount of water is allowed to flow downstream.
Operated as a Dry Dam	**Yes.** During low flow periods, plastic is laid on the upstream side of the dam to reduce the amount of water flowing through the rock structure. Water in excess of the canal's irrigation needs is returned to the river about 400 feet
Barrier to Fish Migration	**Yes.** During the irrigation season when low flows occur, the lack of water flowing over the diversion dam would prevent fish from migrating downstream. Upstream migration following irrigation season is also a
Instream Operation and Maintenance Requirements	**High.** Generally, the dam will require some work annually to replace boulders and cobble lost during high flows. In years when river flow is quite limited, plastic is laid on the upstream side of the dam to enhance diversion of water. Downstream of the headworks, the canal has a sedimentation basin that requires periodic cleaning. Disposal of accumulated sediment can
Physical Stability of Structure	**Poor.** The present headgate is a wooden structure which is in poor condition. If lost, erosion downstream from the headworks could cause considerable damage to riparian vegetation. Even though large boulders have been placed to increase the stability of the diversion dam, its stability remains poor and major repairs are frequently needed.

[1] Utah Division of Water Rights 2003

* Diversion exceeded water right.