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Agriculture

Forest
Service

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Environmental Assessment

Three Forks Fish Barrier

Spanish Fork Ranger District, Uinta National Forest Utah County, Utah

Township 8 South, Range 5 East, Section 26

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SUMMARY

The Uinta National Forest proposes to conduct a fisheries restoration project involving the construction and placement of a fish barrier in the Diamond Fork watershed to protect the Bonneville cutthroat trout meta-population in the headwater reaches of the drainage.

The fish barrier would be installed on upper Diamond Fork, approximately 0.5 mile above the Three-Forks parking area. The fish barrier would be located in Township 8 South, Range 5 East, Section 26. The fish barrier would stop the migration of non-native fish species from the lower reaches of Diamond Fork drainage into the upper reaches of this drainage. The proposed fish barrier would be constructed using native materials brought in from off-site and would be approximately 20-30 feet wide and 5-10 feet high.

This action is needed to prevent the movement on non-native fish species from lower Diamond Fork into the upper Diamond Fork drainage so that they cannot compete with native Bonneville cutthroat trout populations.

This environmental analysis will consider the affects of both the proposed action and no action alternatives. Under the no action alternative, the fish barrier would not be constructed and non-native fish species would continue to compete with the native Bonneville cutthroat trout. No other alternatives were identified through the scoping process.

The Spanish Fork District Ranger will decide whether and how to construct a fish barrier on upper Diamond Fork, in accordance with Forest Plan goals, objectives, and desired future conditions.

INTRODUCTION

Document Structure

The Forest Service has prepared this Environmental Assessment in compliance with the National Environmental Policy Act (NEPA) and other relevant Federal and State laws and regulations. This Environmental Assessment discloses the direct, indirect, and cumulative environmental impacts that would result from the proposed action and alternatives. The document is organized into four parts:

- *Introduction:* The section includes information on the history of the project proposal, the purpose of and need for the project, and the agency's proposal for achieving that purpose and need. This section also details how the Forest Service informed the public of the proposal and how the public responded.
- *Comparison of Alternatives, including the Proposed Action:* This section provides a more detailed description of the agency's proposed action as well as alternative methods for achieving the stated purpose. These alternatives were developed based on significant issues raised by the public and other agencies. This discussion also includes possible mitigation measures. Finally, this section provides a summary table of the environmental consequences associated with each alternative.
- *Environmental Consequences:* This section describes the environmental effects of implementing the proposed action and other alternatives. This analysis is organized by resource area. Within each section, the affected environment is described first, followed by the effects of the No Action Alternative that provides a baseline for evaluation and comparison of the other alternatives that follow.
- *Agencies and Persons Consulted:* This section provides a list of preparers and agencies consulted during the development of the environmental assessment.

Additional documentation, including more detailed analyses of project-area resources, may be found in the project planning record located at the Uinta National Forest Supervisor's Office in Provo, Utah.

Purpose and Need for Action

Bonneville cutthroat trout (*Oncorhynchus clarki utah*) are identified as an aquatic Management Indicator Species (MIS) for the Uinta National Forest and are listed as a United States Forest Service (USFS) Region 4 and State of Utah sensitive species. Conservation agreements have been developed for this species within the State of Utah. Goals and objectives for the protection, recovery, and enhancement of Bonneville cutthroat trout (BCT) are identified in the *Conservation Agreement and Strategy for BCT in the State of Utah* (UDWR 1997; 2000) and the *Land and Resource Management Plan for the Uinta National Forest* (USDA Forest Service 2003).

The upper Diamond Fork watershed contains the Halls Fork, Shingle Mill Creek, Chase Creek, and upper Diamond Fork drainages. The 2003 LRMP for the Uinta National Forest includes a sub-goal (G-2-20, page 2-7) to protect and maintain conservation

populations in Halls Fork, Shingle Mill Creek, and Chase Creek, and to protect and maintain a metapopulation that includes these streams. Consistent with this, the *Conservation Agreement and Strategy for BCT in the State of Utah* (UDNR 1997) also identifies a goal to protect and maintain a meta-population within the Utah Lake/Provo River drainage of the Northern Bonneville Geographic Management Unit (GMU) (UDWR 1997a, p. 52). As a meta-population, the BCT populations in the upper Diamond Fork watershed are critical to the identified restoration and recovery goals and objectives for BCT populations throughout the region.

The introduction and subsequent naturalization of populations of non-native German brown trout (*Salmon trutta*) and rainbow trout (*Oncorhynchus mykiss*) presents a risk to the future viability of BCT populations throughout the Diamond Fork watershed. Historically, upper Diamond Fork was isolated from lower Diamond Fork by a bridge culvert at Springville Crossing. Ongoing changes in the stream channel and culvert gradually reduced the effectiveness of this fish barrier. Reconstruction of the road and bridge during 2003 removed this barrier thereby allowing German brown (GBT) and rainbow trout (RBT) easier access to the upper Diamond Fork watershed. Recent population surveys have noted an increase in GBT distribution and abundance in the upper Diamond Fork watershed. The continued and increasing presence of GBT in the upper Diamond Fork watershed presents a serious threat to the continued viability of the BCT meta-population in the upper drainage.

In order to insure the continued viability of the BCT meta-population in upper Diamond Fork, it is necessary to re-establish a barrier between the upper and lower reaches of the watershed. The re-establishment of this barrier will prevent the continued movement of non-native GBT and RBT from the lower to the upper reaches of watershed.

The purpose of this project is to prevent the movement of non-native fish species (GBT and RBT) from the lower Diamond Fork into the upper Diamond Fork watershed so that they cannot compete with and replace the native BCT populations in the upper Diamond Fork drainage.

In order to prevent the movement of non-native fish species and to protect the BCT meta-population in the upper Diamond Fork watershed, the Utah Division of Wildlife Resources and USFS agreed that a fish barrier near the Three Forks area would be a good strategy towards protecting the native BCT meta-population within the upper Diamond Fork drainage.

Conformance with the Forest Plan

This action responds to the goals and objectives outlined in the 2003 Land and Resource Management Plan (LRMP) for the Uinta National Forest, and helps move the project area towards desired conditions described in that plan (USDA Forest Service 2003). The Three Forks Fish Barrier project is consistent with Forest-wide and Management Area specific direction and with management direction for aquatic species or aquatic habitat found in the 2003 LRMP. Specific Forest-wide goals identified in the 2003 LRMP that have applicability to this project include:

FW-Goal-1 Soil, air, and water resources provide for watershed health, public health and safety, long-term soil productivity, and ecosystem sustainability, and meet applicable laws and regulations.

FW-Goal-2 Biologically diverse, sustainable ecosystems maintain or enhance habitats for native flora and fauna, forest and rangeland health, watershed health, and water quality.

> Sub-goal-2-20 (G-2-20) Protect and maintain 10 conservation populations, 12 persistence populations, and one metapopulation (consisting of six waterbodies in the Diamond Fork drainage) of Bonneville cutthroat trout within the Utah Lake/Provo River drainage of the Northern Bonneville Geographic Management Unit (GMU) (UDWR 1997a, p. 52).

FW-Goal-5 Scenic quality and desired landscape character are maintained and/or enhanced.

FW-Goal-6 Diverse and suitable recreational opportunities are provided responsive to public demand while maintaining ecosystem health and contributing to social and economic sustainability.

FW-Goal-8 Forest infrastructure, including facilities and transportation systems, is safe and responsive to public needs and desires; has minimal adverse effects on ecological processes and ecosystem health, diversity, and productivity; and is in balance with needed management actions.

Proposed Action

The proposed action is Alternative B in which the Spanish Fork Ranger District of the Uinta National Forest is proposing to install a fish barrier on upper Diamond Fork, approximately 0.5 miles above the Three-Forks parking area (Map 1). The fish barrier would be located in Township 8 South, Range 5 East, Section 26, Salt Lake Meridian, Utah County. Specific details of the proposed action are addressed in the *Alternatives, Including the Proposed Action* section of this EA.

Decision Framework

Based on the environmental analysis in this EA, the Spanish Fork District Ranger will decide whether and how to construct a fish barrier on upper Diamond Fork 0.5 miles above Three Forks in accordance with Forest Plan goals, objectives and desired future conditions.

Public Involvement

A legal notice initiating the public scoping process was published in the Provo Daily Herald on January 23, 2006. Scoping letters were also sent to known interested and affected publics on January 19, 2006. The proposal was listed in the spring 2006 Schedule of Proposed Actions. In addition, as part of the public involvement process, the agency has coordinated with the Utah Division of Wildlife Resources (UDWR), US Fish and Wildlife Service, and Trout Unlimited.

One comment letter was received in response to the Forest's public involvement process. This letter requested additional information regarding BCT populations. This information is included in this environmental assessment. The letter also stated that this entity was supportive of the proposal and encouraged the Forest to spearhead a larger proposal to conserve BCT populations and habitat conditions.

Using the comments from the public and other agencies, the interdisciplinary team developed a list of issues to address in considering the possible effects of implementing the proposed action.

Issues

The Forest Service separated the issues into two groups: Key and non-key issues. Key issues were defined as those directly or indirectly caused by implementing the proposed action. Non-significant issues were identified as those: (1) outside the scope of the proposed action; (2) already decided by law, regulation, Forest Plan, or other higher level decision; (3) irrelevant to the decision to be made; or (4) conjectural and not supported by scientific or factual evidence. The Council on Environmental Quality (CEQ) NEPA regulations require this delineation in Sec. 1501.7, "…identify and eliminate from detailed study the issues which are not significant or which have been covered by prior environmental review (Sec. 1506.3)…"

Through the scoping process, the Forest Service identified the following key issues:

- Pubic safety during installation of the barrier requiring temporary closure of FS Road 70029 (Diamond Fork Road); and
- concerns addressing the overall conservation and recovery of BCT populations throughout the watershed.

ALTERNATIVES, INCLUDING THE PROPOSED ACTION

Alternative A

No Action

Under the No Action alternative, current management plans would continue to guide management of fish populations in the action area. The fish barrier would not be built. Non-native fish populations would continue to have access into the upper Diamond Fork drainage. The long-term viability of BCT populations in the upper Diamond Fork drainage will decline and the risk of extirpation of these populations will increase.

Alternative B

The Proposed Action

The Spanish Fork Ranger District of the Uinta National Forest is proposing to install a fish barrier on the upper Diamond Fork River, approximately 0.5 miles above the Three-Forks parking area (Map 1). The fish barrier would be located in Township 8 South, Range 5 East, Section 26, Salt Lake Meridian, Utah County.

The fish barrier would restrict non-native fish species including GBT and RBT from the upper reaches of the Diamond Fork watershed so they are no longer competing with native BCT populations. The proposed fish barrier would be constructed using native materials brought in from off-site and would be approximately 20-30 feet wide, 5-10 feet high and will include upper/lower splash aprons extending about five feet above and below the structure. Rip-rap extending up to 30 feet up and downstream of the barrier along both banks will prevent erosion of the opposing hill slope and road embankment. The channel notch in the barrier will be designed to pass 100-year runoff flows. The barrier is designed to be the same width as the stream channel and will not impede debris and bedload transport. The streambed below the barrier will be armored with large stone to ensure that channel incision is not triggered by the gradient change. The side walls of the structure will extend above the stream banks and will be keyed into the banks or natural anchor points. Road fill and streambanks above and below the structure will be rip-rapped to prevent erosion. Woody vegetation from the site will be avoided to the extent possible during construction or incorporated into the rip-rap design for additional bank stabilization. The total length of disturbance along Diamond Fork Creek (including the structure and rip-rap above and below) would involve approximately 100 feet of stream. Work in the stream channel will take approximately 2-4 days, will be implemented during low summer flows, and is anticipated to begin mid-July to late-August of 2006.

Design Criteria, Best Management Practices and Mitigation Measures

In order to minimize impacts to soil and water quality and vegetation resources, the following BMPs have been incorporated into the design of the barrier or will be utilized during installation:

- Select the site of the fish barrer strongly considering the need to minimize disturbance during construction. This included finding a location where most of the construction could be done without equipment having to leave the road, and a fairly steep and incised channel location where impacts to the Diamond Fork Road could be avoided and the size of the structure and upstream/downstream disturbed areas could be minimized.
- Conduct barrier construction during low streamflow conditions to minimize sedimentation to Diamond Fork Creek.
- Minimize disturbance in the channel by conducting only essential access and work in the stream area. Conduct staging activities, material/equipment storage

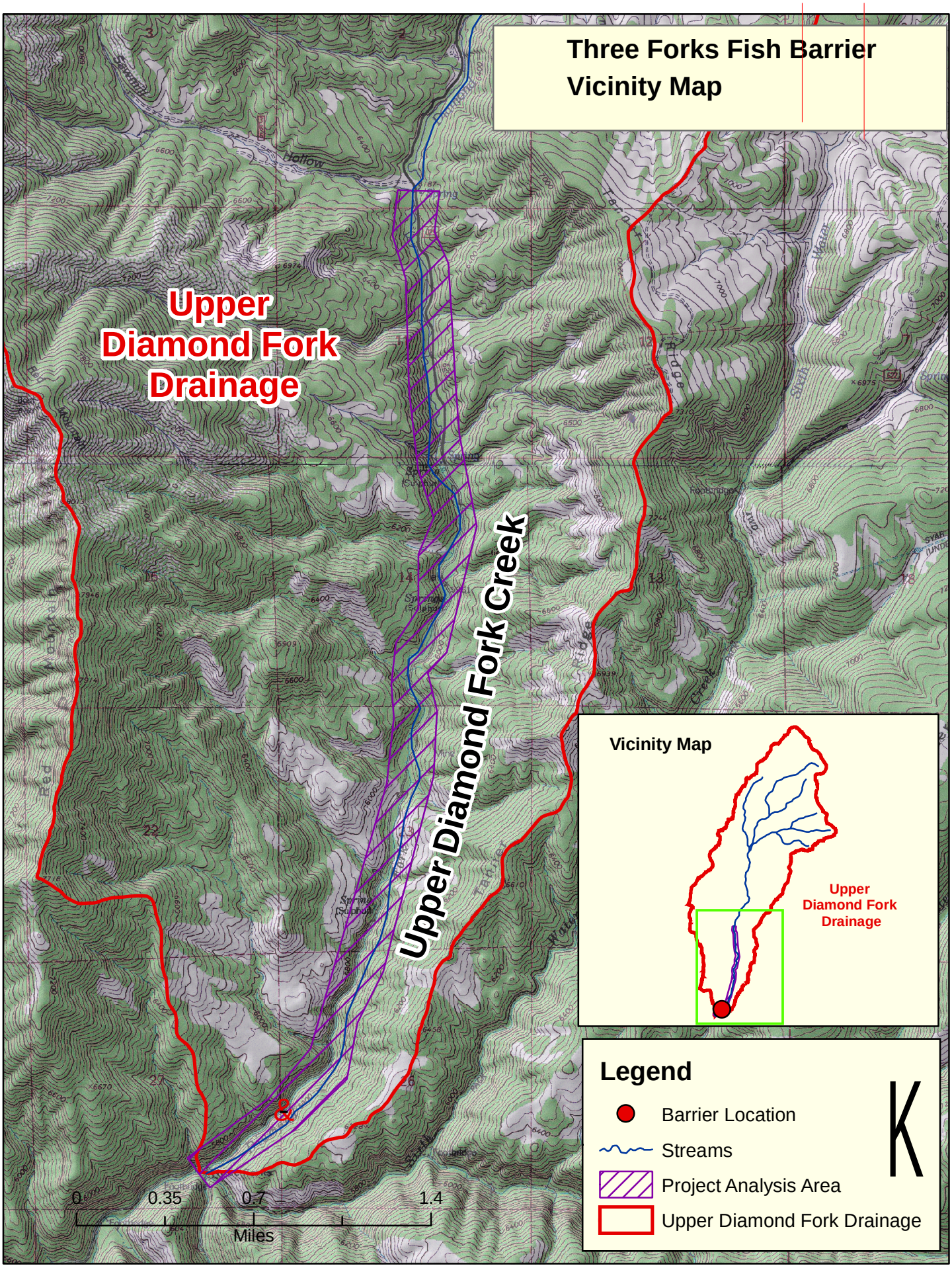
well away from the stream. Use physical markers to delineate the area to be disturbed.

- Minimize the length of time that stream specific construction occurs. Consolidate channel work and complete the installation without interruption. Avoid conducting concurrent site activities that may delay channel work and increase exposure time of disturbance.
- Conduct the construction activity in phases. Avoid area-wide clearance of the construction site. Disturb areas in small parcels and stabilize them before proceeding with the next phase.
- Ensure that all needed materials, manpower, and equipment are available on-site prior to initiating any disturbance in the stream channel/floodplain and tributaries.
- Dispose of excess material out of the stream channel/floodplain.
- Install temporary sediment control measures prior to initiating construction in the stream channel/floodplain.
- Structures must be substantially keyed into the streambanks and installed to a depth below maximum expected bed scour. Use armoring or other treatments, as appropriate, to prevent scouring.
- In-stream structure must be substantially keyed into the streambanks and channel bed to reduce the possibility of erosion under, around, or through the structure.
- Riparian vegetation should generally be planted and managed in association with any grade control project. Salvage/transplant rooted native material where feasible.
- Maintaining existing road embankment can be accomplished by installing Class V riprap (Class V: 770-2200 lbs each, minimum dimension of 20 inches, and breadth and thickness at least one-third its length) at a minimum of 2-feet thick on a permanent erosion control geotextile (Type IV-A minimum). Rip-rap should extend upstream as far as water will be backed up and downstream until stream flows are consistent with existing flows.
- Above the water line the disturbed area would be revegetated by sowing native bunchgrass seed, to minimize space for new weeds and provide ground cover.

In order to minimize impacts on recreational use and public safety the following measures have been incorporated into this alternative:

- A temporary road closure would be issued during construction of the fish barrier to provide for public safety. Construction would last two to four days. The road closure would not be issued Friday through Sunday or on a federal holiday to limit recreation user conflicts. Signs will be displayed at the Forest Service Bulletin Boards in Diamond Fork, a press release will be issued in the *Provo Daily Herald*, and the Central Utah Project Office will be notified prior to the closure order.
- Provide adequate turnaround for trailers at the closure points,
- Provide alternative travel routes to upper Diamond Fork via Right Fork of Hobble Creek (FS 70058) and Sheep Creek-Rays Valley Road (FS 70051)

- Signing roads in accordance with MUTCD, *Manual on Uniform Traffic Control Devices*. Inform the public about the travel delays that may be encountered. Signs should be displayed at the Forest Service Bulletin Boards in Diamond Fork.
- Protect the asphalt road surface by restricting point loading from heavy equipment supports and by unloading imported material on turnout approximately 100 feet up canyon from site.


Three Forks Fish Barrier
Vicinity Map
Upper
Diamond Fork
Drainage
Upper Diamond Fork Creek
Vicinity Map
Upper
Diamond Fork
Drainage
Legend
Barrier Location
Streams
Project Analysis Area
Upper Diamond Fork Drainage
0
0.35
0.7
1.4
Miles

Alternatives Considered but Eliminated from Detailed Analysis

The presence of a sulfur spring further upstream of the proposed site was considered as a natural fish barrier. However, evaluation of the alternate site showed that during high flows, the site would not keep non-native trout from passing. Therefore, this alternative will not be discussed in detail as it does not meet the project's Purpose and Need. No alternatives in addition to the proposed action or no action were brought forward through the public scoping process for analysis.

Comparison of Alternatives

This section provides a summary of the effects of implementing each alternative. Information in the table is focused on activities and effects where different levels of effects or outputs can be distinguished quantitatively or qualitatively among alternatives.

	No Action	**Proposed Action**
Cultural Resources	No Effect	No Effect
Fisheries and Aquatic Resources	Non-native fish species would continue to have access into the upper Diamond Fork drainage. Long-term viability of native BCT meta-population would decline. Possible local extripation of native BCT populations in the upper Diamond Fork drainage.	Temporary increase in turbidity, localized increase in sedimentation, and displacement of resident fish. Decreased access for non-native fish species into the upper Diamond Fork drainage. Maintain viable meta-population of BCT in the upper Diamond Fork drainage.
Hydrology	No Effect	Short-term impacts to the stream channel, and water quality would occur during and immediately after construction. Effects to floodplains and wetlands would be limited to the barrier location and a short segment (<100 feet) of stream channel.

Recreation	No Effect	Short-term impacts due temporary road closure to provide for safety while barrier is being constructed. Over time, tishing opportunities for native fish would improve and fishing opportunities for GBT and RBT would decline or be eliminated upstream of the barrier.
Visuals	No Effect	Minor and short-term disturbance of up to 100 $ft.^2$ of vegetation and streambank will result in very minor, short-term impacts.
Livestock Grazing	No Effect	No measureable effect
Vegetation	No Effect	Short-term impacts to vegetation in less than 100 $ft.^2$ feet of streambank may occur. Sowing native bunchgrass seed would minimize the opportunity for noxious weed infestations. No effect to threatened, endangered, or sensitve plant species..
Wildlife	No Effect	Construction of a fish barrier will have no affect on TES species including the bald eagle, Yellow-billed cuckoo, Canada lynx, and Western big-eared bat. There will be no, or negligible impacts to other wildlife species including beaver.
Soils	No Effect	Disturbance to less than 100 feet of streambank may occur.

Roads	No Effect	Temporary disruption of traffic flow due to road closure. Mitigation measures restricting point loading from heavy equipment supports and requiring unloading of material on a turnout will avoid potential adverse impacts to the asphalt surface. Selection of the project site and application of riprap will prevent the road from being undercut and/or flooded by the stream.

Table 1. Comparison of project related effects for the No Action and Proposed Action Alternatives.

AFFECTED ENVIRONMENT/OENVIRONMENTAL CONSEQUENCES

This section summarizes the physical, biological, social and economic environments of the affected project area and the potential changes to those environments due to implementation of the alternatives. It also presents the scientific and analytical basis for comparison of alternatives presented in Table 1.

Heritage Resources

Affected Environment

The project area has little potential to contain cultural resources due to the constricted nature of both the canyon and the creek. This project area is very steep and rocky and is an active stream channel. Most of the project area is directly adjacent to FS Road 70029 (Diamond Fork Road) and has been highly disturbed, as the road had to be cut into the canyon slope in this location. As a result, the likelihood of finding heritage resources in this area is extremely low.

A complete heritage resources inventory of the project area was completed in the spring of 1981 as part of Central Utah Project Completion Act Planning (Merrill and Nielson 1981; Uinta Cultural Resource Project No. UN-81-52). No sites of any kind were found.

No known traditional plant gathering is carried out in Diamond Fork by members of the Northern Ute Tribe. The project area itself is sufficiently small and rocky and there are no specific plant populations that might be important to plant gatherers in the future.

In addition, there are no known traditional fishing activities done in the Diamond Fork area by Northern Ute Tribal members. The Northern Utes (like all Utah Tribes) do not have any treaty rights to fish, and so any fishing done by Tribal members would be conducted under the fishing regulations that apply to all fishermen in the state.

Environmental Consequences

No heritage sites of any kind exist in the project area, and no potential traditional Northern Ute plant gathering activities would be affected by the project. As a result, there will be no direct or indirect effects to heritage resources under either alternative.

Fisheries and Aquatic Resources

Affected Environment

The action area is defined as the area directly or indirectly affected by the proposed action. The area of analysis includes the upper Diamond Fork watershed which extends from the confluence of Sixth Water Creek at Three Forks to the headwaters of the upper Diamond Fork watershed. The upper Diamond Fork watershed contains Halls Fork, Shingle Mill Creek, Chase Creek, and the middle and upper reaches of Diamond Fork

located within the Diamond Fork Management Area in the Spanish Fork Ranger District of the Uinta National Forest.

Fish Populations

The upper Diamond Fork watershed is located within the Northern Bonneville GMU for BCT. Drainages within the upper Diamond Fork watershed were historically inhabited by BCT and some genetically pure populations still reside in isolated stream reaches and drainages. Bonneville cutthroat trout are a USFS Region 4 and State of Utah listed sensitive species and conservation agreements between the USFS and the UDWR have been developed for this species. Although persistence and conservation populations for BCT have been identified in tributaries of Diamond Fork, no persistence or conservation populations of BCT have been designated within Diamond Fork itself (UDNR 1997).

The 2003 LRMP for the Uinta National Forest includes a sub-goal (G-2-20, page 2-7) to protect and maintain conservation populations in Halls Fork, Shingle Mill Creek, and Chase Creek, and to protect and maintain a metapopulation that includes these streams. Consistent with this, the *Conservation Agreement and Strategy for BCT in the State of Utah* (UDNR 1997) also identifies a goal to protect and maintain a meta-population within the Utah Lake/Provo River drainage of the Northern Bonneville Geographic Management Unit (GMU) (UDWR 1997a, p. 52). As a meta-population, the BCT populations in the upper Diamond Fork watershed are critical to the identified restoration and recovery goals and objectives for BCT populations throughout the region.

Fish populations in the upper Diamond Fork watershed are monitored using Habitat Quality Index (HQI) modeling techniques (Binns 1982), standard electrofishing multiple pass removal depletion protocols (Ricker 1975), headwater surveys, and snorkel count survey protocols (Thurow 1994). These surveys currently span the time period between 1979 through 2005 and are cataloged for reference and review in *Fisheries and Aquatic Resources Data of the Uinta National Forest* (Smith and Smith 2005). Specific sampling protocols for fish populations on the Uinta National Forest are detailed in the *Cutthroat Trout Monitoring Plan and Protocols for the Uinta National Forest* (Smith and Lyman 2004a).

In addition to BCT, other native fish species present within the upper Diamond Fork watershed include mottled sculpin (*Cottus bairdi*), mountain sucker (*Catostomus platyrhynchus*), and speckled dace (*Rinichthys osculus yarrowi*) (Sigler and Sigler 1996).

Non-native fish species include GBT and RBT. GBT are present throughout Diamond Fork but are most prevalent in the lower and mid reaches of the drainage. Although RBT have historically been stocked within the Diamond Fork drainage their numbers have been greatly reduced and they are not frequently observed.

Middle Diamond Fork – Salmonid populations in middle Diamond Fork consist predominately of GBT. During the 2005 electrofishing surveys GBT accounted for approximately 95 percent of the salmonid population in middle Diamond Fork. Estimates of GBT densities in middle Diamond Fork have historically averaged 0.35 fish/m and range from 0.15 fish/m during 1997 to 0.48 fish/m during 2004. Estimates using indices of overall condition (K Factor) show that the condition of the GBT

population in middle Diamond Fork has historically averaged 1.11 and ranged from 1.07 during 2004 to 1.14 during 1997. (Smith 2006a)

Rainbow trout populations in middle Diamond Fork are relatively low with no individuals being observed during the 2005 electrofishing surveys and only accounting for two percent of the salmonid population during the 2004 surveys. Estimates of RBT densities in middle Diamond Fork have historically averaged 0.07 fish/m and range from 0.01 fish/m during 2004 to 0.13 fish/m during 1997. Estimates using indices of overall condition (K Factor) show that the condition of the RBT population in middle Diamond Fork has historically averaged 1.05 and ranged from 1.04 during 1997 to 1.06 during 1991. (Smith 2006a)

Upper Diamond Fork – Until 2004, salmonid populations in middle Diamond Fork consisted predominately of BCT. However, during the 2004 electrofishing surveys this changed with GBT accounting for 98 percent of the salmonid population in upper Diamond Fork. Estimates of GBT densities in upper Diamond Fork have historically averaged 0.22 fish/m and range from 0.04 fish/m during 1997 to 0.55 fish/m during 2004. Estimates using indices of overall condition (K Factor) show that the condition of the GBT population in upper Diamond Fork has historically averaged 1.07 and ranged from 0.99 during 1997 to 1.07 during 2004. (Smith 2006a)

Rainbow trout populations in upper Diamond Fork are relatively low with no individuals being observed during the 2004 electrofishing surveys and only accounting for three percent of the salmonid population during the 1991 surveys. Estimates of RBT densities in middle Diamond Fork have historically averaged < 0.01 fish/m. Estimates using indices of overall condition (K Factor) show that the condition of the RBT population in upper Diamond Fork has historically averaged 1.12 and ranged from 1.05 during 1991 to 1.18 during 1997. (Smith 2006a)

Chase Creek – During 2005 GBT accounted for approximately 24 percent of the salmonid population in Chase Creek and were most prevalent in the lower and mid reaches of the drainage. Estimates of GBT densities in Chase Creek have historically averaged 0.05 fish/m and range from 0.02 fish/m during 1976 to 0.09 fish/m during 2004. Estimates of GBT condition have historically averaged 1.18 and range from 1.11 during 2005 to 1.29 during 1992. Although rainbow trout have historically been stocked within the Diamond Fork watershed as of 2005 they have not been observed within the Chase Creek drainage. (Smith 2006b)

Halls Fork – Non-native fish species include GBT and RBT. During 2005 GBT accounted for approximately 96 percent of the salmonid population in Halls Fork and were most prevalent in the lower and mid-reaches of the drainage. Estimates of GBT densities in Halls Fork have historically averaged 0.41 fish/m and range from 0.05 fish/m during 1997 to 0.84 fish/m during 2004. Estimates of GBT condition have historically averaged 1.12 and range from 1.05 during 1976 to 1.16 during 1997. (Smith 2006c)

Rainbow trout populations in Halls Fork are relatively low with no individuals being observed during the 2004 or 2005 electrofishing surveys and only accounting for six percent of the salmonid population during the 1997 surveys. Estimates of RBT densities in Halls Fork have historically averaged 0.01 fish/m and ranged from < 0.01 fish/m during 1976 to 0.01 fish/m during 1997. Estimates using indices of overall condition (K

Factor) show that the condition of the RBT population in Halls Fork has historically averaged 1.07 and ranged from 1.oo during 1976 to 1.14 during 1997. (Smith 2006c)

Shingle Mill Fork – Non-native fish species include GBT. During 2005 GBT accounted for approximately 33 percent of the salmonid population in Shingle Mill Fork and were most prevalent in the lower reaches of the drainage. Estimates of GBT densities in Shingle Mill Fork have historically averaged 0.03 fish/m and range from 0.02 fish/m during 1976 to 0.04 fish/m during 2005. Estimates of GBT condition have historically averaged 1.20. Although rainbow trout have historically been stocked within the Diamond Fork watershed as of 2005 they have not been observed within the Shingle Mill Fork drainage. (Smith 2006d)

The introduction and subsequent naturalization of populations of non-native GBT and RBT presents a risk to the future viability of BCT populations throughout the Diamond Fork watershed. Historically, upper Diamond Fork was isolated from lower Diamond Fork by a bridge culvert at Springville Crossing. This barrier no longer exists and GBT and RBT now have access to the upper Diamond Fork watershed. Recent population surveys have noted an increase in GBT distribution and abundance in the upper Diamond Fork watershed. The continued presence of GBT in the upper Diamond Fork watershed presents a serious threat to the continued viability of the BCT meta-population in the upper drainage.

Amphibians

Results from the Utah GAP Analysis (USDI 1997) indicate that the Diamond Fork drainage contains high value habitat for Great Basin spadefoot toad (*Spea intermontana*), and substantial value habitat for boreal chorus frog (*Pseudacris maculate*), boreal toad (*Bufo boreas boreas*), northern leopard frog (*Rana pipiens brachycephala*), tiger salamander (*Ambystoma tigrinum*), and Woodhouse's toad (*Bufo woodhousii*). There is one record of boreal toad from Rays Valley in 1976 (UDNR 2002).
The Columbia spotted frog (*Rana luteiventris*) are known to occur within the Diamond Fork watershed, but not within or close to the action area. The stream in and adjacent to the project area is deeply incised and relatively steep, and therefore, the aquatic habitats present are not suitable for boreal toad or Columbian spotted frog. In 2002 a population of Columbia spotted frog was discovered in the lower Diamond Fork watershed several miles downstream from the project area. The Columbia spotted frog ranges from southeast Alaska through Alberta, Canada, and into Washington, Idaho, Wyoming, Montana, and disjunct areas of Nevada and Utah. In Utah, isolated Columbia spotted frog populations exist in the West Desert and along the Wasatch Front. Unfortunately, habitat degradation and loss have led to declines in many of these populations, especially those along the Wasatch Front, precipitating the inclusion of the species on the *Utah Sensitive Species List*. The Columbia spotted frog is also a USFS Region 4 listed sensitive species. A Conservation Agreement between federal and state natural resources agencies in Utah was signed in 1998. The Conservation Agreement called for protection measures including habitat acquisitions, negotiation and purchase of conservation easements with private landowners, and habitat improvements. Several government agencies are working cooperatively under a Conservation Agreement to eliminate or significantly reduce the threats facing the species. (UDWR 2005)

Additional information relative to the life history and distribution of amphibian species on the Uinta National Forest is presented in *Native Amphibians of the Uinta National Forest* (Smith 2005).

Rare Aquatic Invertebrates

Observations of aquatic macroinvertebrates considered by the UDWR to be rare or imperiled on the Forest are scattered and in many cases relatively outdated. Although not known to be present in the Diamond Fork watershed, three species, coarse rams-horn (*Planorbella binneyi*), creeping ancylid (*Ferrissia rivularis*), and taiga bluet (*Coenagron resolutum*) have been documented on the Forest or in waters immediately adjacent to the Forest and have the potential to be present within the Diamond Fork Management Area (NatureServe 2005). Invertebrate species collected in the lower Diamond Fork drainage as part of the Uinta National Forest water quality monitoring program are identified in *Fisheries and Aquatic Resources of Diamond Fork, Utah* (Smith 2006a) additional invertebrate data for the Chase Creek drainage are presented in *Fisheries and Aquatic Resources of Chase Creek, Utah* (Smith 2006b). Additional information relative to aquatic invertebrates on the Uinta National Forest is presented in *Aquatic Invertebrate Report for Samples Collected by the Uinta National Forest 2002* (Vinson 2005).

Threatened, Endangered, and Sensitive (TES) Species

Bonneville cutthroat trout and Columbia spotted frog are the only TES aquatic species known to currently inhabit the Diamond Fork watershed. Although the Diamond Fork drainage is located within the historic range of the Utah valvata snail (*Valvata utahensis*), the species is believed to have been extirpated from Utah and does not occur within the drainage (NatureServe 2005). Diamond Fork Creek in and adjacent to the project area is deeply incised and relatively steep, and therefore, the aquatic habitats present are not suitable for boreal toad or Columbian spotted frog. The drainage is also outside the historic range of Colorado River cutthroat trout (*Oncorhynchus pleuriticus*) and June sucker (*Chasmistes liorus*) and these species are currently not found in the area.

Bonneville cutthroat trout populations in the upper Diamond Fork watershed are assessed at stations located in the middle and upper reaches of Diamond Fork, Chase Creek, Halls Fork, and Shingle Mill Fork. The middle reach of Diamond Fork begins at Three Forks and extends to Springville Crossing; while the upper reach starts at Springville Crossing and extends to the confluence with Shingle Mill Fork and Halls Fork.

Middle Diamond Fork – Populations of BCT in middle Diamond Fork have not been identified as either persistence or conservation populations. Although BCT are present in middle Diamond Fork, they do not occur in numbers sufficient to be considered a distinct or locally viable population.

Population data, using indices of overall condition (K Factor) for BCT in middle Diamond Fork, show no statistically observable change in the average overall condition of cutthroat trout during the period between 1991 and 2005. Estimates of cutthroat trout condition have historically averaged 0.91 and range from and average of 0.81 during 1997 to an average of 1.03 during 2005. (Smith 2006a)

Population data, using the abundance of BCT in middle Diamond Fork, show no statistically observable change in the overall abundance of cutthroat trout during the period between 1991 and 2005. Estimates of cutthroat trout densities in middle Diamond Fork have historically averaged 0.04 fish/m and range from 0.02 fish/m during 2005 to 0.05 fish/m during 1997 and 2004. (Smith 2006a)

Upper Diamond Fork – Populations of BCT in upper Diamond Fork have not been identified as either persistence or conservation populations. Although cutthroat trout are present in upper Diamond Fork, they do not occur in numbers sufficient to be considered a distinct or locally viable population.

Population data, using indices of overall condition (K Factor) for BCT in upper Diamond Fork, show no statistically observable change in the average overall condition of cutthroat trout during the period between 1976 and 2004. Estimates of cutthroat trout condition have historically averaged 0.96 and range 0.83 during 1997 to 1.08 during 2004. (Smith 2006a)

Population data, using the abundance of BCT in upper Diamond Fork, show a decline in the overall abundance of cutthroat trout during the period between 1991 and 2004. This decline is judged to be the result of increased predation and competition with GBT populations that have become established in upper Diamond Fork. Estimates of cutthroat trout densities in upper Diamond Fork have historically averaged 0.25 fish/m and range from 0.01 fish/m during 2004 to 0.55 fish/m during 1997. (Smith 2006a)

Chase Creek – Population data, using indices of overall condition (K Factor) for BCT within the Chase Creek drainage, show no statistically observable change in the average overall condition of cutthroat trout during the period between 1976 and 2005. Estimates of cutthroat trout condition have historically averaged 1.09 and range from 0.96 during 1997 to 1.31 during 1976. (Smith 2006b)

Population data, using the abundance of BCT within the Chase Creek drainage, show no statistically observable change in the overall abundance of cutthroat trout during the period between 1976 and 2005. Estimates of cutthroat trout densities in the drainage have historically averaged 0.20 fish/m and range from 0.04 fish/m during 2004 to 0.44 fish/m during 1997. (Smith 2006b)

Halls Fork – Population data, using indices of overall condition (K Factor) for BCT within the Halls Fork drainage, show no statistically observable change in the average overall condition of cutthroat trout during the period between 1976 and 2005. Estimates of cutthroat trout condition have historically averaged 1.02 and range from 0.87 during 1976 to 1.13 during 2005. (Smith 2006c)

Population data, using the abundance of BCT within the Halls Fork drainage, show a decline in the overall abundance of cutthroat trout during the period between 1976 and 2005. This decline is the result of increased predation and competition with GBT populations that have become established in the lower reaches of the Halls Fork drainage. Estimates of cutthroat trout densities in the drainage have historically averaged 0.12 fish/m and range from 0.02 fish/m during 2005 to 0.26 fish/m during 1997. (Smith 2006c)

Shingle Mill Fork – Population data, using indices of overall condition (K Factor) for BCT within the Shingle Mill Fork drainage, show an increase in the average overall condition of cutthroat trout during the period between 1981 and 2005. Estimates of cutthroat trout condition have historically averaged 1.05 and range from 0.70 during 1981 to 1.32 during 1997. (Smith 2006d)

Population data, using the abundance of BCT within the Shingle Mill Fork drainage, show a decrease in the overall abundance of cutthroat trout during the period between 1976 and 2005. This decline is the judged to be the result of increased predation and competition with GBT populations that have become established in the lower reaches of Shingle Mill Fork. Estimates of cutthroat trout densities in the drainage have historically averaged 0.23 fish/m and range from 0.08 fish/m during 2005 to 0.40 fish/m during 1997. (Smith 2006d)

Aquatic Habitat

Aquatic habitat in the upper Diamond Fork watershed is monitored using water quality data and Habitat Quality Index (HQI) modeling techniques (Binns 1982), USFS R1/R4 habitat surveys (Overton et al. 1997) and Habitat Suitability Index (HSI) surveys (Hickman and Raleigh 1982). Water quality information is discussed in the hydrology section of this document and is not repeated here. These surveys currently span the time period between 1979 through 2005 and are cataloged for reference and review in *Fisheries and Aquatic Resources Data of the Uinta National Forest* (Smith and Smith 2005). Specific sampling protocols for fish habitat on the Uinta National Forest are detailed in the *Cutthroat Trout Habitat Monitoring Plan and Protocols for the Uinta National Forest* (Smith and Lyman 2004b).

Middle Diamond Fork – Habitat data for middle Diamond Fork consists of Habitat Quality Index (HQI) surveys (Binns 1982) conducted by UDWR during 1991 and 1997, and R1/R4 habitat surveys (Overton et al. 1997) and Habitat Suitability Index (HSI) surveys (Hickman and Raleigh 1982) conducted by the USFS during 2004 and 2005.

Results of the 2005 R1/R4 and HSI surveys indicate that the habitat suitability for cutthroat trout in middle Diamond Fork is good with a combined HSI score of 0.86. The most limiting factor identified for middle Diamond Fork in the 2005 HSI analysis was percent riffle fines < 3.0 mm with a score of 0.50 and percent pools with an HSI score of 0.60. (Smith 2006a)

Aquatic habitat in middle Diamond Fork consists of low gradient riffle (57%), pool (29%), and run (14%) habitat types with stable (92%) but few undercut banks (22%). Pools are typically moderate in size and depth. Pool depth and size are sufficient to provide a low velocity resting area for a few adult trout. Between five and 30 percent of the pool bottom is obscure due to surface turbulence, depth, and/or the presence of structure. Available concealment cover is 83 percent for adult and 90 percent for juvenile salmonids. Available winter habitat is approximately 21 percent. Riparian vegetation consists primarily of riparian tree (37%) followed by grass/forbs (27%), riparian shrub (21%), sedge/rush (9%), upland shrub (1%) and upland tree (1%). Channel substrate consists of rubble, gravel, boulders, and fines in approximately equal amounts. Percent fines < 6.35 mm in spawning gravels is 48 percent. (Smith 2006a)

Upper Diamond Fork – Habitat data for upper Diamond Fork consists of Habitat Quality Index (HQI) surveys (Binns 1982) conducted by UDWR during 1997 and R1/R4 habitat surveys (Overton et al. 1997) by the USFS during 2004.

Habitat Suitability Index (HSI) surveys have not been completed for upper Diamond Fork and HSI scores are currently not available. Results of the 2004 R1/R4 survey indicate that the habitat for cutthroat trout in upper Diamond Fork consists primarily of glide (59%) and low gradient riffle (43%) habitat types with relatively stable (78%) but few undercut banks (8%). Pools are scarce and typically small and/or shallow but are sufficient to provide a low velocity resting area for one to very few adult trout. Pool cover, where present, is in the form of shade, surface turbulence, and/or very limited structure. Riparian vegetation is similar to that present in middle Diamond Fork and consists primarily of riparian tree followed by grass/forbs, riparian shrub, sedge/rush, upland shrub, and upland tree. Channel substrate consists of rubble, gravel, boulders, and fines in approximately equal amounts. (Smith 2006a)

Chase Creek – Habitat data for Chase Creek consists of Habitat Quality Index (HQI) surveys (Binns 1982) conducted by UDWR during 1992 and 1997, and R1/R4 habitat surveys (Overton et al. 1997) and Habitat Suitability Index (HSI) surveys (Hickman and Raleigh 1982) conducted by the USFS during 2004 and 2005.

Results of the 2005 R1/R4 and HSI surveys indicate that the habitat suitability for cutthroat trout in Chase Creek is fair with a combined HSI score of 0.70. The most limiting factor identified for Chase Creek in the 2005 HSI analysis was percent fines < 3 mm in riffle-run habitat with an HSI score of 0.25 followed by pool quality with a score of 0.30 and percent pools with an HSI score of 0.40. (Smith 2006b)

Aquatic habitat in Chase Creek consists of low gradient riffle (95%) and pool (5%) habitat types with stable but few undercut banks. Pools are typically small and/or shallow but are sufficient to provide a low velocity resting area for one to very few adult trout. Pool cover, where present, is in the form of shade, surface turbulence, and/or very limited structure. Available concealment cover is 56 percent for adult and 81 percent for juvenile salmonids. Available winter habitat is approximately 28 percent. Riparian vegetation consists primarily of riparian shrub (60%) followed by grass/forbs (20%), riparian tree (15%), and upland tree (5%). Channel substrate consists of rubble, gravel, boulders, and fines in approximately equal amounts. Percent fines < 6.35 mm in spawning gravels is 66 percent. (Smith 2006b)

Halls Fork – Habitat data for the Halls Fork drainage consists of Habitat Quality Index (HQI) surveys (Binns 1982) conducted by UDWR during 1997, and R1/R4 habitat surveys (Overton et al. 1997) and Habitat Suitability Index (HSI) surveys (Hickman and Raleigh 1982) conducted by the USFS during 2004 and 2005.

Results of the 2005 R1/R4 and HSI surveys indicate that the habitat suitability for cutthroat trout in Halls Fork is fair with a combined HSI score of 0.78. The most limiting factor identified for Halls Fork in the 2005 HSI analysis was percent pools with an HSI score of 0.38 followed by pool quality with a score of 0.60 and percent fines < 3 mm in riffle-run habitat with an HSI score of 0.61. (Smith 2006c)

Aquatic habitat in Halls Fork consists of low gradient riffle (45%), run (37%), and high gradient riffle (18%) habitat types with stable (88%) but few undercut banks (33%). Pools are typically moderate in size and depth. Pool depth and size are sufficient to provide a low velocity resting area for a few adult trout. Between five and 30 percent of the pool bottom is obscure due to surface turbulence, depth, and/or the presence of structure. Available concealment cover is 62 percent for adult and 82 percent for juvenile salmonids. Available winter habitat is approximately 24 percent. Riparian vegetation consists primarily of grass/forbs (41%) followed by riparian shrub (32%), riparian tree (13%), upland shrub (12%), and upland tree (2%). Channel substrate consists of rubble, gravel, boulders, and fines in approximately equal amounts. Percent fines < 6.35 mm in spawning gravels is 48 percent. (Smith 2006c)

Shingle Mill Fork – Habitat data for the Shingle Mill Fork drainage consists of Habitat Quality Index (HQI) surveys (Binns 1982) conducted by UDWR during 1997, and R1/R4 habitat surveys (Overton et al. 1997) and Habitat Suitability Index (HSI) surveys (Hickman and Raleigh 1982) conducted by the USFS during 2004 and 2005.

Results of the 2005 R1/R4 and HSI surveys indicate that the habitat suitability for cutthroat trout in Shingle Mill Fork is fair with a combined HSI score of 0.77. The most limiting factor identified for Shingle Mill Fork in the 2005 HSI analysis was percent pools with an HSI score of 0.37 followed by percent fines < 3 mm in riffle-run habitat with an HSI score of 0.48 and pool quality with a score of 0.60. (Smith 2006d)

Aquatic habitat in Shingle Mill Fork consists of low gradient riffle (64%), run (25%), high gradient riffle (9%), and pool (2%) habitat types with stable (92%) but few undercut banks (4%). Pools are typically moderate in size and depth. Pool depth and size are sufficient to provide a low velocity resting area for a few adult trout. Between five and 30 percent of the pool bottom is obscure due to surface turbulence, depth, and/or the presence of structure. Available concealment cover is 60 percent for adult and 85 percent for juvenile salmonids. Available winter habitat is approximately 26 percent. Riparian vegetation consists primarily of riparian shrub (39%) followed by grass/forbs (30%), riparian tree (25%), upland tree (5%), and upland shrub (1%). Channel substrate consists of rubble, gravel, boulders, and fines in approximately equal amounts. Percent fines < 6.35 mm in spawning gravels is 50 percent. (Smith 2006d)

The habitat survey information summarized in the preceding paragraphs indicate that aquatic habitat in the Diamond Fork watershed is sufficient to support existing populations of fish and other aquatic species at their present levels. Additional information used in this review relative to the life history and habitat requirements of cutthroat trout and aquatic habitat conditions on the Uinta National Forest is available in *Bonneville Cutthroat Trout Populations of the Uinta National Forest* (Smith 2004).

Environmental Consequences

Alternative A – No Action

Under the No Action Alternative, current management plans would continue to guide management of fish populations in the action area. The fish barrier will not be built. Non-native fish populations will continue to have access into the upper Diamond Fork drainage. The long-term viability of BCT populations in the upper Diamond Fork

drainage will decline and the risk of extirpation of these populations will increase. The area does not currently, and would not in the future, provide suitable habitat for boreal toad and Columbian spotted frog.

Not implementing the proposed project will result in **continued negative long-term impacts** to BCT, and will have **no impact** on boreal toad, Columbian spotted frog, or other TES species. Implementing the No Action Alternative will benefit GBT and RBT fisheries, and is **not anticipated to affect** other aquatic resources within the upper Diamond Fork watershed.

Alternative B – Proposed Action

Following review of the proposed Three Forks Fish Barrier project and potential effects of project implementation, it was determined that the greatest direct impacts to fisheries and aquatic resources within the action area would result from displacement and mortality of individual aquatic organisms, physical habitat disruption, increased turbidity and sedimentation during project implementation. These effects would be temporary and extend through the end of active project implementation.

Additional indirect impacts following implementation include the isolation of upper Diamond Fork from the lower Diamond Fork. The presence of the fish barrier will prevent the movement of some aquatic organisms, particularly GBT and RBT, from lower Diamond Fork into upper Diamond Fork. However, this is not believed to be an issue for populations of aquatic organisms (other than BCT, GBT and RBT) found within the Diamond Fork drainage. Should issues of isolation and population viability for aquatic organisms arise and a determination that the presence of the fish barrier is no longer needed, the barrier could be removed and connectivity between the upper and lower Diamond Fork drainage would be restored.

Development of a fish barrier will back water up above the structure. This will be relatively shallow, and will fill within a year or two with sediment. As a result, no aquatic habitat suitable for boreal toads or Columbian spotted frogs will develop within the project area. Consequently, this alternative will have no direct or indirect impacts to these species.

Following review of the recommended conservation measures and applicable Uinta National Forest LRMP direction for aquatic and riparian habitat management, it is anticipated that implementation of the Three Forks Fish Barrier project within the identified operational guidelines and mitigation measures will not result in any long-term detrimental effects to existing aquatic resources other than GBT and RBT. GBT and RBT are non-native and widely distributed throughout the Forest, and other parts of the Diamond Fork drainage. Halting the upstream migration of these species will have minimal affect on their distribution and populations, and no affect on their viability.

It is determined that the overall impact **direct** and **indirect effects** of this project will be beneficial for fisheries and aquatic resources and that there will be **no negative long-term impacts** to aquatic species or their habitat resulting from implementation of the Three Forks Fish Barrier project.

Additional information used in determining the effects of the proposed action relative to fisheries and aquatic resources is presented in *Fisheries and Aquatic Resources of*

Diamond Fork, Utah (Smith 2006a), *Fisheries and Aquatic Resources of Chase Creek, Utah* (Smith 2006b), *Fisheries and Aquatic Resources of Halls Fork, Utah* (Smith 2006c), *Fisheries and Aquatic Resources of Shingle Mill Fork, Utah* (Smith 2006d), *Three Forks Fish Barrier Environmental Effects for Fisheries and Aquatic Resources* (Smith 2006e), and *Biological Assessment and Evaluation Fisheries and Aquatic Resources Three Forks Fish Barrier* (Smith 2006f).

Additional information relative to the direct and indirect effects of the proposed action relative to fisheries and aquatic resources is included in *Soils Specialist Report for the Three Forks Fish Barrier Project* (Davidson 2006) and *Hydrology Report – Three Forks Fish Barrier Project* (Jarnecke 2006).

Hydrology

Affected Environment

Diamond Fork Creek is a tributary of the Spanish Fork River and has a drainage area of 156 square miles. The Project Analysis Area is defined as the main stem of Diamond Fork Creek from Three Forks to Sawmill Hollow. Streams within this area include Diamond Fork, Hall's Fork, Shingle Mill, and Chase Creeks for a total of approximately 25 miles of stream. Elevations in the analysis area range from 9400 feet on the headwaters ridgeline to 5600 feet at Three Forks confluence area. Precipitation ranges from 22 to 30 inches per year.

Stream Channel Morphology

Using the classification system developed by Rosgen (1998), the segment of Diamond Fork Creek affected by installation of the fish barrier is A3; a sinuous, alluvial channel with a 4% slope with a deeply entrenched and confined channel. The stream bed materials are predominantly comprised of cobble to boulder substrate; stream bank materials are a mixture of boulder, cobble, and gravels. The A3 develops a sediment supply from steep unstable banks and corresponding high bedload transport rates. This stream-type occurs as a step-pool, cascading channel that often stores large amounts sediment in pools associated with debris jams. Analysis of flood frequency for the culvert crossing at Three Forks resulted in a bankfull streamflow of approximately 100 cubic feet per second (cfs) and 100-year streamflow of 750 cfs. (USDA 2000)

The riparian habitat from Three Forks to Sawmill Hollow consists of a narrow corridor of cottonwood, box elder, and water birch in this stream segment. The stream channel in this reach has been straightened by road construction. As a result of this, channel degradation in the form of increased gradient, channel incision, and reduction in woody debris, and a reduction of active beaver dams (USDA & URMCC 2000).

Water Quality

The Utah Department of Environmental Quality – Division of Water Quality designated beneficial use Classification for all waters in the State of Utah. Spanish Fork River and tributaries (including Diamond Fork River), from diversion at Moark Junction to

headwaters are Classified to support 2B, 3A, and 4. These designations are defined as follows[1]:

Class 2B: Protected for secondary contact recreation such as boating, wading, or similar uses.
Class 3A: Protected for cold water species of game fish and other cold water aquatic life.
Class 4: Protected for agricultural use including irrigation of crops and stock watering.

Waters within the Project Analysis Area are assessed by the State of Utah to be fully supporting their designated beneficial uses (UDEQ 2004). Water quality data for sampling locations within the project area is available in the EPA's STORET Database.

Site # 4995760 – Diamond Fork at Rays Valley Road Crossing (i.e. Springville Crossing)
Data from this site is available from 1993 through 2005. Water quality parameters including Total Suspended Solids, Total Dissolved Solids, Turbidity, Total Phosphorous, Conductivity, and alkalinity all exhibit stable to improving conditions. Dissolved phosphorous is the only parameter sampled during this time period to show increases, but values are still within Utah Water Quality Standards.

Site # 4995770 – Halls Fork above Confluence with Chase/Shingle Mill Creeks
Data from this site is available from 1993 through 2003. Sampling resulted in no exceedances of Utah Water Quality Standards (USDA 2002).

Site # 4995710 – Three Forks above confluence with Sixth Water
Water sampling data is available for this site from the early 1990's through present. Sampling results show that pH and Dissolved Oxygen have remained stable. Hardness and calcium levels climbed following emergence of the springs, but are currently stable (USDA 2005).

In 2000, the Central Water Conservancy District and the Bureau of Reclamation began construction on a tunnel and pipeline to convey irrigation water from the Strawberry Reservoir to Spanish Fork River and southern Utah Valley. Beginning in spring of 2002, a portion of the tunnel was sealed, and alternative facilities design for the Upper Diamond Fork System was completed. The alternative pipeline construction was completed and became operational in the summer of 2004. (CUWCD 2005) Completion and operation of the pipeline has largely eliminated streamflow augmentation in Sixth Water and Diamond Fork Creeks.

Sealing of the tunnel led to the emergence of a number of new springs within the Upper Diamond Fork watershed. Sampling of the emergent springs was completed in fall of 2004 by the Forest Service. These springs typically yield waters high in calcium (Ca) and magnesium (Mg), and produced a Ca/Mg precipitate throughout the spring area and stream immediately below spring confluences. Water in Diamond Fork Creek is impacted by the springs primarily in the form of elevated turbidity and hardness (~2-3

[1] Utah Department of Environmental Quality – Division of Water Quality, Beneficial Use Categories are available online at http://www.waterquality.utah.gov/watersheds/jordan/jordan_ben_use_class.htm#utah

times increase) immediately below the springs (USFS 2004). By the time this water reaches Three Forks area, hardness levels are elevated, but generally close to those found above the springs.

Environmental Consequences

Alternative A - No Action

The No Action Alternative would have no direct or indirect on water resources.

Alternative B – Proposed Action

Installation of the fish barrier would have direct effects on water quality only during and immediately after the construction phase. During construction there would be an increase in stream sedimentation and water turbidity. However, after construction, sediment inputs would decrease and water turbidity would decline to normal levels. In order to minimize stream sedimentation and impacts to water quality, construction will be completed during low streamflow.

The proposed fish barrier would have minimal direct or indirect effects on floodplains and wetlands. Those effects would be limited to the barrier location and a short segment (<100 feet) of stream channel above and below the structure. Compliance with regulations governing alteration of stream channels would occur, and approval from the State Engineer and/or Army Corps of Engineers would be obtained prior to construction of the fish barrier and streambank stabilization measures.

Vegetation

Endangered, Threatened and Sensitive Plants

Affected Environment

There are three federally listed endangered plants occurring within the Spanish Fork River drainage. Both clay phacelia (Phacelia argillacea) and Deseret milkvetch (Astragalus desereticus) are endemic. Clay phacelia is found only on particular slopes of Green River Shale and is known from only 3-4 sites above Mill Fork. Deseret milkvetch is known from a single population occurring on sandy soils derived from sandstone outcrops of the Moroni Formation near Birdseye, along Highway 89. Habitat does not exist for either of these species in or near the project areas. There is potential habitat for clay phacelia within the Diamond Fork drainage (Campellone, 2001, Heaton 2001), but it is well upstream and beyond this project's areas and any areas potentially affected by this project.

The Ute ladies'-tresses orchid (*Spiranthes diluvialis,* ULT), federally listed as "threatened", is found along the main stem of Diamond Fork from the mouth of the canyon to the general area of Three Forks. The closest known colony to the fish barrier project is about one mile downstream. ULT occurs as scattered populations, or colonies, in riparian areas generally within the river's 100 year floodplain. Inventory efforts have identified more than 77 acres with populations. The total number of flowering plants fluctuates greatly from year to year. In 1998, a record number of plants were noted: counts estimated over 16,000 flowering individuals. In recent years, populations along

Diamond Fork have received only minimal impacts from human-related activities (occasional trampling by fishermen, researchers, and livestock) which have not appeared to be detrimental. Herbivory from rodents is considered as perhaps the most limiting current impact (Jordan, 2003), followed by fluctuations in the water table. The plant is believed to be dependent on disturbances such as flooding to create suitable habitat to establish seedlings. It is considered to be an early seral species, colonizing on relatively recently-deposited surfaces within active river channels (USFWS, 1995). Many of the colonies in Diamond Fork occur on depositional surfaces created by the floods of 1983-84. ULT reproduction depends on insects, particularly a few species of native bees and the honeybee. Bees have apparently been declining throughout the western United States, and indications are this has also occurred in the Diamond Fork drainage (Pierson and Tepedino, 2000).

Sensitive Species

Of the six sensitive plant species known to occur on the Forest, or to have potential habitat within the Forest, none is believed to occur along or near Diamond Fork Creek. Garrett's bladderpod (*Lesquerella garrettii*) and rockcress draba (*Draba globosa)* are high-elevation species (subalpine and alpine), known in the Wasatch Mountains from only the highest ridges and peaks. Barneby woody aster (*Aster kingii var barnebyana*) is known only from Mount Nebo in the Wasatch Range, but the taxonomically similar King woody aster occurs throughout the Wasatch. However, it is known only from limestone cliffs. The cliffs in lower Diamond Fork are primarily sandstone and none occur within proposed project sites. Wasatch jamesia (*Jamesia americana var. macrocalyx*) is also restricted to cliff habitats, but has not been found in the lower Diamond Fork drainage (Van Keuren, 2002). Like the Aster, this Jamesia seems to prefer limestone cliffs to other types. Dainty moonwort (*Botrychium crenulatum*) is known in Utah from less than five locations, and on the Uinta N. F. from a single location, a wet meadow at 9400 feet elevation on the southwest flank of the Uinta Mountains. A possible second population was discovered three years ago a few miles from the known population, but its species identity has not yet been confirmed. That second population was found at about 8800 feet elevation.

Environmental Consequences

Alternative A – No Action

There would be no direct or indirect impacts to Endangered, Threatened, or Sensitive plant species under the No Action Alternative.

Alternative B – Proposed Action

There would be no direct impacts from construction of the fish barrier on existing ULT and its habitat, as there are no populations or suitable habitat in the immediate area. The nearest ULT population to the project area is about one mile downstream. The project would result in less than about 100 square feet of soil disturbance and bare soil at or near the creek water line on the north side of the creek (Van Keuren 2006). This could open up a brief (1-2 years) establishment opportunity for Ute ladies'-tresses orchid seeds, but is so small in area and so likely to see large fluctuations in water table that the chance of successful establishment is very low.

Indirect impacts on Ute ladies'-tresses and its habitats would be so small as to be unnoticeable. The method of constructing the barrier, with equipment staying on the road out of the stream, would minimize sediment production. The project would result in a small amount of sediment going into the water. A very small percentage of this sediment, the smallest, lightest particles, would be eventually carried downstream, but according to hydrologist Jeremy Jarnecke, would be highly unlikely to be enough to have any effect on streamside ULT colonies along Diamond Fork Creek, or suitable or developing habitat in that stream (Van Keuren, 2006). Sediment deposits, if not excessive, are likely to be beneficial to habitat under development from bare gravel bars and perhaps to established colonies as well.

Determinations

Construction of the fish barrier project will have **no effect** on the Ute ladies'-tresses orchid, Deseret milkvetch, or clay phacelia, because there is no habitat for these species in the project area.

Construction of the fish barrier will have **no impact** on dainty moonwort, slender moonwort, Barneby woody aster, Garrett bladderpod, Rockcress draba and Wasatch jamesia, because no habitat for these species occurs in the project area. (VanKeuren, 2006a)

Vegetation and Noxious Weeds

Affected Environment

The elevation of the project area is about 5500 feet. The dominant vegetation type at the immediate project site is cottonwood-dominated riparian, with juniper-oak to the north and oak/mountain brush to the south. The immediate project site is a location where Diamond Fork Creek flows through a bedrock outcrop connected to cliffs on the south bank.

The riparian zones in the project area are dominated by narrowleaf cottonwood *(Populus angustifolia)*. Coyote willow *(Salix exigua)*; other willows, red-osier dogwood *(Cornus sericea)*, western birch *(Betula occidentalis)* and skunkbush *(Rhus aromatica var. trilobata)* also inhabit this area. The herbaceous layer is dominated by non-native grasses like redtop (*Agrostis stolonifera)*, Kentucky bluegrass *(Poa pratensis)* and smooth brome *(Bromus inermis)*.

Vegetative communities immediately adjacent to the riparian area in the project zone are typically dominated by oakbrush, and less often by juniper *(Juniperus osteosperma)* or mountain big sagebrush *(Artemisia tridentata var. vaseyana)*. The herbaceous layer commonly contains a mix of introduced and native perennial bunchgrasses, and a wide variety of forbs.

In riparian areas, the primary weeds of concern in the Diamond Fork drainage are Canada thistle, tamarisk, and perennial pepperweed at the lower end. Canada thistle is well established in the canyon and expanding in portions of it. It forms dense to sparse patches in and adjacent to riparian areas, and appears to be increasing in density in recent years. Tamarisk is common along the lower Spanish Fork River and is beginning to establish from the mouth up to about Three Forks, with many seedlings in the lower

reaches. Perennial pepperweed is also prevalent along Spanish Fork River, but has only been found in the lowermost areas of Diamond Fork, primarily around the old farm at the mouth of the canyon, and the pond. It is difficult to treat these weeds because of their occurrence near live water, which limits the methods authorized to treat weeds.

Musk thistle (*Carduus nutans*) is the most common noxious weed in the Diamond Fork drainage uplands. It has formed large, dense patches in the lower canyon for many years, especially in the old agricultural fields along the creek bottom. Concentrated treatment efforts by the Forest Service and Utah County over the last dozen years have greatly reduced its abundance in the road corridor and along bottomlands adjacent to the main stem of the creek. Whitetop (*Cardaria draba*) is found in scattered infestations along roads and at dispersed campsites throughout the drainage. It has recently expanded in areas disturbed during construction of the Central Utah Project pipeline and is proving difficult to control, even along roadsides. Jointed goat grass (*Aegilops cylindrica*) is also present along the main Diamond Fork road and in the old agricultural fields, and appears to be expanding. Field bindweed (*Convovulus arvensis L.*) occurs in the old fields as well. Several other species have been found within the Spanish Fork River/Highway 6/Union Pacific Railroad corridor, but have not yet become established in the lower Diamond Fork drainage, including Russian knapweed (*Centaurea repens*), squarrose knapweed (*Centaurea squarrosa*) and Scotch thistle *(Onopordum acanthium)*. A patch of dyer's woad (*Isatis tinctoria*), approximately 50 acres in size, occurs near Sterling Hollow in Spanish Fork Canyon.

Cheatgrass (*Bromus tectorum*), although not designated in Utah as "noxious", is an invasive exotic plant species that has dramatically impacted drier sites in the lower canyon, and has the potential to expand into all upland acres in the watershed. It has expanded across steep, dry lower-elevation slopes, often where fires have burned. The early-drying litter cheatgrass produces facilitates unnaturally high fire frequency, putting sagebrush at risk. Blue spurge (*Euphorbia myrsinites*) has been found in very small numbers at two sites in the lower canyon. It is an ornamental species which has escaped at many sites along the foothills of the Wasatch Front and has formed extensive patches. Bulb bluegrass *(Poa pratensis)* and Japanese brome *(Bromus japonicus)* are also commonly found in the uplands of the Diamond Fork drainage.

Environmental Consequences

Alternative A– No Action

Under the No Action alternative, no fish barrier would be constructed and there would be no direct impacts or indirect effects to vegetation from construction activities. There would be no potential for invasion or spread of noxious weeds through project-related activities.

Alternative B– Proposed Action

Construction of the fish barrier, particularly the "keying in" of the barrier into the streambank, would result in less than about 100 square feet of soil disturbance, destroyed existing vegetation and bare soil at or near the creek water line on the north side of the creek (Van Keuren 2006). The most likely vegetation to fill in this newly-bared soil is one or more non-native weed species. Canada thistle and cheatgrass are the most likely

invaders. Above the water line the small disturbed area would be revegetated by sowing native bunchgrass seed, to minimize space for new weeds.

Recreation

Affected Environment

The proposed structure lies directly adjacent to the Diamond Fork Road (FS 70029). Recreation in Diamond Fork includes hiking, fishing, and camping (outside the camping closure area in Diamond Fork). There are dispersed camping areas in the upper Diamond Fork, a developed dispersed site at Saw Mill Hollow, and several motorized and non-motorized trails up canyon from this proposed Fish Barrier site. Forest visitors pass by this proposed fish barrier site on there way to enjoy these recreational activities.

Environmental Consequences

Alternative A – No Action

Under the No Action alternative, current management plans would continue to guide management of fish populations in the action area. The fish barrier will not be built. There would be no direct impacts to Recreation under the No Action Alternative. Many fishermen consider fishing for native trout a desirable experience over fishing for non-native species. This opportunity would be lost over time, in upper Diamond Fork Creek drainage, with implementation of this alternative.

Alternative B - Proposed Action

There would be minor direct or indirect impacts to Recreation under this alternative. All impacts would be temporary in nature and are for the most part mitigated (see description of Alternative B - Proposed Action). Temporary impacts are associated with construction of the fish barrier and include disruption of traffic flow. Recreationists would be delayed in reaching their destinations, and fishing quality immediately upstream and downstream of the fish barrier may be effected for some time Visitors, including non-anglers, would benefit from viewing and/or having the opportunity to catch native trout.

Visuals

Affected Environment

The project area lies directly adjacent to FSR 70029. This road lies in a narrow valley and receives considerable recreational use. The project area has a visual quality objective (VQO) of *retention*. Retention means in general that human activities are not evident to the casual forest visitor. Much of Diamond Fork area is seen from the foreground (330 to one-half mile) and middle ground (one-half mile) because it is mainly viewed from roads and trails. With the high amount of recreational use, public concern for scenery is moderate to high. Red Ledges and the hot springs in Fifth Water are special natural places. The existing landscape is slightly altered by the presence of fences, roads, pipeline structures and vehicles, but the scenic attractiveness is quite beautiful; based on topography, water, vegetation and geology and the natural appearance.

Environmental Consequences

Alternative A - No Action

Under the No Action alternative, the fish barrier will not be built and there would be no change in the visual quality of the area in the short- or long-term. There would be no direct or indirect impacts to visual quality under the No Action Alternative.

Alternative B – Proposed Acton

The proposed structure will have minor short-term affects to visual quality. Only a very small area will be affected by construction (about 100 square feet or less). The structure would be placed in the river with using native boulders and vegetation that one would encounter else where in the Diamond Fork River landscape. The appearance to the casual visitor will appear as natural rock cropping. The area disturbed is located below the road in an inferior viewing position. Due to the incised channel, steep banks, and dense vegetation in the project area, it receives little foot traffic or fishing use. Viewer observations of the small area disturbed will be casual and brief. Disturbed areas will be revegetated following construction (see description of the Proposed Action). Considering the limited disturbance area, use of native materials, and inferior viewing position, the Proposed Action will meet the visual quality objectives of retention. There would be no direct or indirect long-term impacts to visual quality under the Proposed Action. The landscape will be slightly altered but still naturally appearing.

Livestock Grazing

Affected Environment

The Upper Diamond Fork is used as a water source for cattle grazed on the Diamond fork and Hobble Creek Allotments. The project area is steep and contains little forage suitable for use by livestock. Therefore the area receives minimal grazing use.

Environmental Consequences

Alternative A - No Action

There would be no direct or indirect impacts to livestock grazing from the No Action Alternative.

Alternative B – Proposed Action

Construction activities will be brief, about 100 ft.2 or less of vegetation will be disturbed, and disturbed areas will be revegetated following construction. Consequently, there would be no or negligible direct or indirect impacts to livestock grazing from the Proposed Action.

Wildlife

Threatened and endangered species are managed under the authority of the Federal Endangered Species Act (PL 93-205, as amended). The United States Fish and Wildlife Service (USFWS) list the following federally protected Endangered (E), Threatened (T), and Candidate (C) wildlife species with the potential to occur in the project area: bald

eagle (*Haliaeetus leucocephalus*) (T), Western yellow-billed cuckoo (*Coccyzus americanus occidentalis*) (C), and Canada lynx (*Lynx Canadensis*) (T) (USDI 2006).

The Forest Service established the sensitive species list on a regional basis to ensure species of concern are protected from potentially becoming listed under the Endangered Species Act. The following designated Forest Service sensitive species have the potential to be located on the Uinta National Forest (USDA 2003): Townsend's big-eared bat (*Corynorhinus townsendii pallescens*), spotted bat (*Euderma maculatum*), fisher (*Martes pennanti*), greater sage-grouse (*Centrocercus urophasianus*), flammulated owl (*Otus flammeolus*), Northern goshawk (*Accipiter gentilis*), peregrine falcon (*Falco peregrinus*), Northern three-toed woodpecker (*Picoides tridactylus*),

Management Indicator Species (MIS) are listed in Appendix B of the 2003 Land and Resource Management Plan (USDA 2003a). Species selected as MIS are used to monitor the effects of management activities on wildlife in a particular habitat type. This is accomplished by assessing the habitat conditions and population changes of the species that occupy each habitat. Management Indicator Species (wildlife) for the Uinta National Forest includes beaver (*Castor canadensis*), Northern goshawk, and Northern three-toed woodpecker.

Neo-tropical migratory birds are protected by a variety of Federal laws, including the Migratory Bird Treaty Act (16 USC 703-712). While an emphasis is placed on riparian area protection for neo-tropical migratory birds, most bird species found in Utah are considered neo-tropical migratory birds. They occupy a wide range of habitat types. The Utah Ornithological Society lists 425 species of birds in the *Field Checklist of the Birds of Utah* (2004). Of those 425 species, only 20 are not considered neo-tropical (USDI 1995). Consequently, all habitat types have the potential to have a neo-tropical bird associated with it.

Neo-tropical migratory birds are represented by the following species identified during surveys conducted along Diamond Fork Creek (USDA 2006): broad tailed hummingbird *(Selasphorus platycercus)*, red-naped sapsucker *(Sphyrapicus varius)*, golden eagle *(Aquila chrysaetos)*, and Virginia's warbler *(Vermivora virginiae)*. These species were selected for discussion due to their inclusion on the Partners in Flight Priority Species list and/or inclusion on the USDI Fish and Wildlife Service Birds of Conservation Concern list. Partners in Flight, a coalition of Federal and State government agencies, non-governmental organizations, universities, and private interests, developed a list of "species of concern" (Parrish 2002). Birds on the Birds of Conservation Concern list are placed there after an assessment of concerns, such as population trends, threats to habitat, distribution, abundance, and area importance. The purpose of the list is to "stimulate coordinated and proactive conservation actions among Federal, State and private partners" (UDSI 2002).

The following table is a summary of the wildlife species encompassing all of the above categories.

TERRESTRIAL WILDLIFE SPECIES Common Name (*Scientific Name*)	**Presence/ Absence in Project Area**	**Suitable Habitat in Project Area**	**Presence/ Absence in Cumulative Effects Area**	**Suitable Habitat in Cumulative Effects Area**	**DISTRIBUTION/ HABITAT ASSOCIATION/ PRIMARY DIET***
Bald eagle *(Haliaeetus leucocephalus)* Threatened	No – have not been seen in this area	Yes – No roosting habitat or nesting habitat, but the stream and surrounding area provides potential foraging habitat.	Yes – are winter residents.	Yes – primarily sighted in the lower 8 miles of Diamond Fork Creek.	Typically congregated around rivers, lakes and marshes. In north-central Utah, occurs in desert valleys. Primarily a winter resident. No breeding bald eagles have been documented on the Forest. Piscivore
Canada lynx (Lynx Canadensis) Threatened	No	No	Yes – 2 lynx passed through the Diamond Fork drainage above the project area in 2004; no recent sightings.	Yes – linkage route along Strawberry Ridge.	Inhabit boreal and subalpine coniferous forests. Carnivorous
Western yellow-billed cuckoo (*Coccyzus americanus occidentalis*) Proposed	No	No	No documented sightings.	Yes – limited habitat exists along Diamond Fork Creek downstream from the proposed project area	Found almost exclusively in low-elevation (below 7000-7500 feet) dense riparian forests. Insectivorous
Spotted bat (*Euderma maculatum*) Sensitive	No documented sightings.	Yes – rocky cliffs near the project area.	No documented sightings.	Yes – rock outcrops within the drainage.	Occur in a variety of habitats from desert to montane coniferous forests (ponderosa pine, pinyon/juniper woodlands), and canyon bottoms. Roosts in cracks and crevices in rocky outcrops, cliffs and canyons. Insectivorous
Western big-eared bat (*Corynorhinus townsendii pallescens*) Sensitive	No	No – Monks Hollow adits about 2.5 miles downstream.	Yes – population found in 1999 in the Monks Hollow adits.	Yes – adits at Monks Hollow.	Occurs in desert shrub, pinyon/juniper, sagebrush steppe, mountain brush, mixed forests, and ponderosa pine forests. Generally located in caves, mines or buildings.

					Insectivorous
Fisher *(Martes pennanti*) Sensitive	No	No	No	No	Typically in late-successional forests (will avoid non-forested areas) Carnivorous
Northern goshawk (*Accipiter gentiles*) Sensitive - MIS	No	No	No – last documented sighting in the Timber Mountain territory was in 2000 – Radio-collared female was found dead in 2001 – no activity since.	Yes – limited habitat on Timber Mountain.	Nest in a wide range of forests – coniferous, deciduous, and mixed. In Utah, primarily nest in conifer and aspen stands on northerly aspects and near permanent water. Carnivorous
Peregrine falcon (*Falco peregrinus anatum*) Sensitive	No	No	No documented sightings.	Yes – limited suitable habitat within the Diamond Fork drainage.	Occupy a wide variety of habitats – often nests on cliffs, but also on river banks, large stick nests from other species, tree cavities and human-made structures. Carnivorous
Flammulated owl (*Otus flammeolus*) Sensitive	No	No	No documented sightings.	Yes – limited suitable habitat within the Diamond Fork drainage.	Mature and old growth ponderosa pine and Douglas-fir with open stand structure. Nests typically found in cavities in stable or seral aspen. Insectivorous
Northern three-toed woodpecker (*Picoides tridactylus*) Sensitive - MIS	No	No	No documented sightings.	Yes – limited suitable habitat within the Diamond Fork drainage.	Occurs throughout mountainous areas of Utah – frequently detected in spruce/fir forests Insectivorous
Greater sage grouse *(Centrocercus urophasianus)* Sensitive	No	No	No documented sightings.	Yes – limited suitable habitat within the Diamond Fork drainage.	Sagebrush dominated habitat- Strawberry Valley and the Vernon Unit on the Uinta National Forest Vegetarian/ Insectivorous

Beaver (*Castor Canadensis*) MIS	No	No – stream too incised for dam building – no food source on banks	Yes – found throughout the Diamond Fork Mgmt Area	Yes – 98 miles of perennial streams within the Diamond Fork drainage.	Riparian habitat with cottonwood, willow or aspen. Vegetarian
Broad-tailed hummingbird *(Selasphorus platycercus)* Partners in Flight Priority Species (PIF)	No	No – area with steep, rocky banks – no habitat present	Yes	Yes	Riparian habitat within meadows and aspen Insectivorous
Red-naped sapsucker *(Sphyrapicus varius)* Fish and Wildlife Service Bird of Conservation Concern (BCC)	No	No – area with steep, rocky banks – no habitat present	Yes	Yes	Riparian habitat Sapsucker
Golden eagle *(Aquila chrysaetos)* Fish and Wildlife Service Bird of Conservation Concern (BCC)	No	Yes – No roosting habitat or nesting habitat, but the area provides potential foraging habitat.	Yes – golden eagles frequently noted along lower Diamond Fork Creek	Yes – Red Mountain South, Lower Diamond Fork, and West of Brimhall Canyon historic territories in the Monks Hollow area. (Keller 2002)	Rocky cliffs Carnivorous
Virginia's warbler *(Vermivora virginiae)* Partners in Flight Priority Species (PIF) and Fish and Wildlife Service Bird of Conservation Concern (BCC)	No	No – area with steep, rocky banks – no habitat present	Yes	Yes	Scrubby brush interspersed with pinyon-juniper Insectivorous

*As described in the Final Environmental Impact Statement for the 2003 Land and Resource Management Plan (USDA 2003a)

The project area does not contain any populations of or suitable habitat for the following species: Canada lynx, Western yellow-billed cuckoo, Western big-eared bat, fisher, goshawk, peregrine falcon, flammulated owl, Northern three-toed woodpecker, greater sage grouse, and beaver. There will be **no direct impacts** to these species. The impacts of the project will be limited in intensity and duration, and will generally be largely confined to the immediate project area. The Proposed Action will not impact suitable habitat for these species and **will not result in any indirect impacts** to them.

The Northern goshawk and northern three-toed woodpecker (MIS species) have limited suitable habitat within the Diamond Fork Management Area and do not occur or have suitable habitat within the project area. Neither the proposed action nor the no action

alternative will directly or indirectly affect habitats for or populations (or population trends) of these species. Population trends are described in the 2005 Goshawk Monitoring Report (USDA 2005) and the 2005 Three-toed Woodpecker Monitoring Report for the Uinta National Forest (USDA 2005a).

The habitat surrounding the proposed fish barrier does not supply the necessary habitat needed for nesting/feeding needs for neo-tropical migratory birds including broad-tailed hummingbird, red-naped sapsucker, and Virginia's warbler. These birds may be found passing through the area on their way to preferred habitat types, but will not be affected (either directly or indirectly) by the Proposed Action due to its limited scope, duration, and absence of suitable habitat within the project area.

Environmental Consequences

Alternative A – No Action

Under the No Action Alternative the Three-Forks Fish Barrier would not be constructed and there would be no direct or indirect impacts from construction activities. All species will continue to use the area as they currently do.

Alternative B - Proposed Action

Construction of a fish barrier will have no affect on the bald eagle, Western big-eared bat, or beaver. Bald eagles are winter migrants that utilize the Diamond Fork drainage in the winter, but not in the summer when construction activities will occur. No suitable roosting or nesting habitat occurs within the project area. Wintering bald eagles likely occasionally fly over the project area while foraging. The proposed action will have no effect on this use as the project will be implemented in the summer when bald eagles are absent from the area, and the proposed action will have minimal impacts to habitat utilized by species the wintering eagles might prey on.

The population of Western big-eared bats in the Monks Hollow adits is located approximately two and a half miles downstream from the location of the proposed fish barrier. Although the bats are sensitive to human disturbance at their roost sites (Bosworth 2003), the roost site location is far enough downstream to not be subjected to disturbance during construction of the fish barrier.

The beaver (MIS species) has ample habitat within the Diamond Fork Management Area. The location of the proposed fish barrier is fairly steep and deeply incised and lacks the necessary cottonwood and willows needed to sustain a beaver population. Construction of the fish barrier will not result in a loss of any beaver or their habitat, and will not effect the Forest-wide trend discussed in the 2005 Beaver Monitoring Report (USDA 2005b),

Golden eagles utilize the Diamond Fork drainage year-round. The project area does not contain suitable nesting or roosting habitat. Golden eagles likely occasionally fly over the project area while foraging. The proposed action will have no effect on this use as the project will be implemented over a very short period (2-4 days), and the proposed action will have minimal impacts to habitat utilized by species the foraging eagles might prey on.

While there is habitat for the spotted bat within the project area, there will be no detrimental effects. There will be no disturbance to the rocky cliffs surrounding the project as the project is limited to construction within the stream channel.

Other wildlife species including deer, elk, moose, and wild turkeys will experience very minor short-term impacts due to disturbance. No long-term impacts to these species are anticipated.

Soils

Affected Environment

Geologic formations in the analysis area include the Uinta, Green River, Flagstaff, North Horn, and Price River Formations. (USDA & URMCC 2000) The project area lies within the Stream Canyon 7 landtype association characterized by steep stream canyon sidewalls with rock outcrops, and shallow, poorly developed soils. Soils between FSR 70029 and the stream are disturbed, and have overburden material sidecast during road construction. Soils across the stream are undisturbed. These fluvial and colluvial soils are thin, poorly developed, highly influenced by the stream and adjacent steep hillsides, and in a constant state of change.

Environmental Consequences

Alternative A - No Action

There would be no soil disturbance; therefore, no direct or indirect impacts to soil quality.

Alternative B – Proposed Action

The proposed action would disturb a very small area of soils (< 100 $ft.^2$), about half of which have been disturbed in the past during road construction and road maintenance. Impacted soils will be riprapped during or reseeded following construction. Construction equipment will be generally be confined to FSR 70029, and thus will not cause detrimental compaction. The very limited area of soil disturbance, coupled with the application of riprap and/or seeding will minimize erosion. Impacts to soil quality will be negligible.

Roads

Affected Environment

The project area lies directly adjacent to the Diamond Fork Road (FSR 70029). This is a narrow, two-lane, asphalt surface, maintenance level IV, arterial road. (USDS Forest Service 2001) This road receives heavy recreational use, and provides access for grazing permittees and CUWCD operations.

Environmental Consequences

Alternative A - No Action

No construction activities will occur and there will be no direct or indirect effects to roads and public safety.

Alternative B – Proposed Action

Implementation of this alternative could disrupt traffic flow, impact the asphalt surface, and cause erosion/undercutting of the road embankment. Impacts to traffic were discussed in the Recreation section and are not repeated here. Mitigation measures (see description of the Proposed Action) restricting point loading from heavy equipment supports and requiring unloading of material on a turnout will avoid potential adverse impacts to the asphalt surface. Selection of the project site and application of riprap (see description of the Proposed Action) will prevent the road from being undercut and/or flooded by the stream. With application of the design and mitigation measures incorporated into this alternative, no impacts to roads and public safety will occur.

CUMULATIVE EFFECTS

Overview

This section describes other interrelated projects that may contribute to cumulative impacts. Cumulative impacts are the incremental impact of an action when added to other past, present, and reasonably foreseeable future actions. Cumulative effects can result from individually minor but collectively significant actions taking place over a period of time. For the purposes of this analysis, the cumulative effects analysis area, excluding rare plants and soils, will be defined as the Upper Diamond Fork (160202020306) 6th Level HUC and includes Diamond Fork Creek watershed above Three Forks. (see Cumulative Effects Analysis Area Map). Due to the wet meadow habitat of Utes Ladies Tresses', the cumulative impact analysis area for rare plants is defined as the Diamond Fork watershed from the junction with Soldier Creek to 500 feet upstream of the project. The cumulative impact analysis area for soils and roads is defined as the project area.

Description of Past, Present and Future Projects

Past Interrelated Projects

Strawberry Tunnel, Syar Tunnel and Inlet, Sixth Water Aqueduct

Construction on the Strawberry Valley Project began in 1906 and was completed in 1922 when the Strawberry Tunnel was put into operation. The project captures water in the Uintah Basin and transports it for irrigation use in the Bonneville Basin via Diamond Fork. The Strawberry tunnel diverted an annual average of 61,500 acre-feet of water from Strawberry Reservoir into Sixth Water and Diamond Fork Creeks resulting in artificially high flows during the summer irrigation season. The high flows have caused extensive deterioration of natural stream channels and have resulted in severely limited

fish production, loss of riparian and wetland habitat, and reduced recreational experiences along Sixth Water and Diamond Fork Creeks.

In 1956, Congress authorized the construction of the Central Utah Project (CUP). The CUP, when fully implemented, will transport up to an additional 101,900 acre-feet of Bonneville Unit water on top of Strawberry Valley Project water through Diamond Fork. The additional diversions of the Bonneville Unit required the construction of a conveyance facility with greater capacity than the Strawberry Tunnel. Consequently, the Syar Tunnel and Sixth Water Aqueduct were constructed to convey Strawberry Valley Project and Bonneville Unit water. The Strawberry Tunnel, which is higher in the system, will still be used to convey in-stream flow deliveries to Sixth Water Creek and would deliver irrigation supplies (up to a maximum of 200 cfs) during emergencies when Syar Tunnel/Sixth Water Aqueduct are inoperable. Strawberry Valley Project and CUP water deliveries through the Syar Tunnel began in the spring of 1996.

Diamond Fork Pipeline and Road Construction

To mitigate for the anticipated impacts resulting from the additional diversions of CUP water into Diamond Fork and to reduce the impacts from Strawberry Valley Project deliveries, a 510 cfs capacity pipeline was constructed from Monks Hollow to the mouth of Diamond Fork Canyon. The pipeline will carry a portion of the imported water, allowing for a more natural hydrograph in Diamond Fork Creek. The pipeline has been reconstructed primarily in the existing road corridor from the mouth of Diamond Fork Canyon to Monks Hollow and a seven mile 24-foot-wide asphalt-surfaced road has been constructed over the top of the pipeline. Construction of the pipeline and road were completed in 1997. The Diamond Fork Pipeline was put into operation in June 2004.

Diamond Fork Campground Reconstruction

The Forest Service and Mitigation Commission reconstructed the Diamond Fork Campground in 1999. The new facility has a capacity approximately 33 percent smaller than the original facility. This reduction in capacity was achieved by removing group-site facilities from the campground and single family campsites from the active floodplain of Diamond Fork Creek. The purpose for the reduction in campground capacity was to minimize impacts on riparian vegetation and to maximize the opportunities for stream restoration afforded by the construction of the Diamond Fork Pipeline. The group-site facilities removed from the Diamond/Palmyra campground had a capacity of approximately 330 PAOT. The total reduction in campground capacity was approximately 190 PAOT.

Angler-Access and Wildlife Mitigation Land Acquisitions

As described in greater detail in this Chapter, lands have been acquired in Diamond Fork to partially mitigate for the impacts on fish and wildlife resources from the construction and operation of CUP. The lands include the *Lower Diamond Fork Mitigation Lands,* approximately 168 acres at the mouth of Diamond Fork; the *Redford Mitigation Lands* approximately 617 acres on the north side of Diamond Fork road near the mouth of Diamond Fork; and *Red Hollow (also referred to as the Diamond Properties)* approximately 640 acres. These lands will be managed for fish and wildlife purposes and public access.

Historic Land Use Practices

American Indians utilized Diamond Fork as a travel route, plant gathering, and hunting area, but had no long-term effects on its ecology. Diamond Fork's proximity to Utah Valley means that it has seen considerable use since European-American settlement in the mid 1800s. Some logging and stone quarrying was done, but the primary use of the canyon was for water conveyance (described above), homesteading, recreation, and livestock grazing. Recreational use of the area really began after 1906, when the canyon's road was improved enough to encourage hunters, fishers, and campers to visit the area with increasing frequency each decade. Like most areas in northern Utah, the Diamond Fork watershed was added to the Uinta National Forest in the early 1900s primarily to protect it from further overgrazing. The Forest responded by working with livestock operators to reduce the number of livestock and seasons of use. They also did large-scale reseeding projects in the heads of several Diamond Fork tributaries in the 1950s and 60s.

Considerable land clearing for homesteads occurred in Diamond Fork and its tributaries during the late 1800s and early 1900s. Sage, oak, and riparian plant communities on relatively level terraces along and above perennial streams were replaced by crops that included wheat and potatoes. Most families also grazed livestock on adjacent lands. Many of these farms failed in the 1930s, and were placed under Forest Service management. Since these abandoned fields were prone to wind and water erosion, the Uinta National Forest reseeded these farms with crested wheatgrass and smooth brome in the 1940s and 50s.

Over the past century there have been many locations on Diamond Fork Creek where the stream bank has been hardened. These efforts were to serve a variety of purposes such as flood control, protecting infrastructure (roads, campgrounds, water conveyance facilities etc.) from lateral migration of Diamond Fork Creek and for agriculture production.

Red Hollow Prescribed Fire

*An environme*ntal assessment and decision for the Diamond Fork Prescribed Fire project were completed and issued in 2001. The decision called for the treatment, by burning, of six units within the Diamond Fork watershed. Approximately six percent of the vegetation within the watershed is to be treated by burning. The Red Hollow Unit was burned in the spring of 2003. The objective of this burn was to regenerate oak and aspen. Prescribed fire was applied to 1,200 acres within this burn unit. The objective of burning 40% of the oak was met. Limited success was obtained in regenerating the few, isolated clones of aspen in this unit.

Halls Fork Prescribed Fire

This burn unit is part of the Diamond Fork Prescribed Fire project described above. The Halls Fork Unit was burned in October 2004. The objective of this burn is to regenerate aspen and oak on 40 to 60 percent of the acres where these vegetation types occur. Prescribed fire is to be applied to approximately 2,400 acres in this burn unit.

Red Bull Wildfire Burned Area Response

In July and August of 2004 the Red Bull Wildfire burned about 1,836 acres in Upper Spanish Fork Management Area. None of this burn occurred within the project area or Diamond Fork Creek drainage, but the burn did cross part of the Rough Hollow Trail which connects to the proposed Monks Hollow ATV trails. A Burned Area Emergency Response (BAER) Plan was prepared for this burn in August of 2004. This plan called for replacement of some culverts on the Rough Hollow Trail to accommodate anticipated increases in runoff from the burned area, but did not identify a need to restrict or otherwise affect ATV use. The BAER was implemented in September and October of 2004.

Reconstruction of Three Forks and Monks Hollow Trailheads
These trailheads were reconstructed in 2001 and 2003 respectively. Improved parking facilities and vault toilets were provided to reduce the adverse impacts of heavy recreation use to riparian resources at these locations.

Springville Crossing-Rays Valley Road Reconstruction
A segment of the Rays Valley road was moved from its old location along a riparian zone to an upland site in 2003. The old road was reshaped, resurfaced with gravel, and seeded to provide safer and better all-weather access and protection against erosion.

Stream Bank Hardening
Many locations on Diamond Fork Creek have undergone stream bank hardening for flood control, to protect adjacent infrastructure, and for agricultural purposes.

Angler Access and Private Land Acquisition
Lands have been acquired in Diamond Fork to be managed for wildlife habitat and public access for fishing. These lands include the Lower Diamond Fork Mitigation Lands (approximately 168 acres), the Redford Mitigation Lands (approximately 617 acres), and Red Hollow (approximately 640 acres).

Watershed Protection Fencing
Historically, high irrigation flows in Diamond Fork Creek served as a barrier for cattle movement. High flows were removed from the creek as a result of the Diamond Fork System and cattle movement is no longer restricted. In 2003 fencing was completed at the upper end of the Right Fork of Hobble Creek near the Diamond Fork Creek junction. Several acres have been fenced for stream bank vegetation rehabilitation.

Redford Fencing
In an effort to improve wildlife habitat on CUP wildlife mitigation lands in lower Diamond Fork, the Mitigation Commission completed construction of a four-strand barbed wire fence to exclude cattle grazing in this section of the river corridor in November 2003. The four-strand barbed wire fence is approximately 3.25 miles in length on the south side of Diamond Fork Creek. Wire spacing will allow for wildlife passage.

Present Interrelated Projects

Diamond Fork System Completion

The Diamond Fork System, an integral component of CUP, is presently being completed by constructing a number of water delivery facilities in Diamond Fork. The system would take water from the Syar Tunnel and deliver it to the Diamond Fork Pipeline through a series of tunnels and pipelines. The system was completed in June 2004 and will allow for the removal of a portion of the high irrigation flows in Sixth Water and Diamond Fork Creek thereby allowing for a more natural hydrograph. The completed delivery system, along with mandates from CUPCA, will also provide minimum stream flows in Sixth Water and Diamond Fork Creek. The recently completed components of the Diamond Fork System in the cumulative impacts analysis area include the Sixth Water Connection, Tanner Ridge Tunnel, Upper Diamond Fork Pipeline, Upper Diamond Fork Tunnel, Diamond Fork Outlet and connection to the Diamond Fork Pipeline.

Dispersed Camping Management

Over the past three years the Spanish Fork Ranger District has inventoried dispersed camping sites across the District. The purpose of the inventory is to identify sites that should be closed for resource protection or hardened for continued dispersed use. In the Diamond Fork drainage all dispersed camping has been prohibited in the lower 12 miles. Red Ledges, Dry Canyon, and Sawmill Hollow, and a site near Indian Creek Road are managed for day use or dispersed camping. A primary consideration in the design of these sites was the need to protect riparian resources and wet meadows.

Monks Hollow Motorized Trail

In the spring of 2005, the Forest Service constructed 1.2 miles of new trail that would be suitable for motorized use (ATV's and trail bikes), as well as foot, horse, and mountain bike travel. The trail would connect the Teat Mountain and Monks Hollow trail systems. The trail responds to a need to provide additional designated ATV trails, where ATV can be controlled and managed.

Dip Vat Fish Barrier

The Dip Vat Fish Barrier will be constructed in 2006 at the confluence of Dip Vat Creek and Sixth Water. The barrier will keep brown trout out of the upper reaches of the Sixth Water Creek so they are no longer competing with Bonneville Cutthroat Trout. The barrier will be approximately 10 feet wide and five feet high.

Three Forks Culvert Replacement

In the spring of 2005 the culvert at the parking lot crossing washed out. The Parking area has been closed since this time. The culvert is planned for replacement in the fall of 2006, dependent on funding.

Diamond Fork Youth Forest

The Diamond Fork Youth Forest covers the 100,000 acre watershed on the Spanish Fork Ranger District. The mission of the Youth Forest is to create an enjoyable and challenging learning environment for youth to stimulate discovery, awareness, and understanding of natural resources. The Youth Forest provides physical activity, while

developing skills in communication, planning, presentation, and data gathering. The Youth Forest also serves as a model conservation education project. About 1500 students from kindergarten to 12th grade visit from local school districts.

The Forest is in the early stages of planning Phase III of the Discovery Interpretive Trail that would go from the campground into the Red Ledges area.

Continuation of Livestock Grazing

The Diamond Fork cattle allotment and part of the Hobble Creek cattle allotment are within the cumulative effects area.

Other Land Uses

The Diamond Fork drainage contains some private lands. In general, these lands are located some distance down-drainage from the project, and are grazed by livestock and used by their owners for recreational purposes. Several of these properties have homes or other improvements constructed on them. These uses are expected to continue in the future.

Permitted facilities including overhead utility lines and a transmission site occur within the Diamond Fork Management Area. Special Use Permits authorize the permit holders to maintain these existing facilities.

Oil and gas parcels have been leased in the Diamond Fork drainage. Prior to any surface disturbance, an application for permit to drill would need to be filed and additional environmental analysis completed.

Illegal ATV use in the drainage is also an ongoing activity in the drainage.

Future Projects

Restoration of Bonneville Cutthroat Trout Populations

The UDWR has proposed to implement a project to restore the native BCT population in the upper Diamond Fork drainage above the proposed fish barrier by the removal of all non-native fish species through the use of rotenone.

Sixth Water and Diamond Fork Creek Restoration and Monitoring

A key element to Central Utah Project mitigation in Diamond Fork is the restoration and Sixth Water and Diamond Fork Creeks. With the completion of the Diamond Fork System, a portion of the high irrigation flows has been removed from Sixth Water and Diamond Fork creeks along with the provision of minimum stream flows. A monitoring program will be developed and implemented to measure the response to flow changes resulting from the operation of the Diamond Fork System. A conceptual aquatic and riparian habitat restoration plan for Diamond Fork from Diamond Fork pipeline outlet to the Spanish Fork River will be developed. Monitoring was initiated in 2005; there has not been any restoration work completed to date.

Utah Lake Drainage Basin Water Delivery System (ULS) Power plants

The EIS for the Utah Lake Drainage Basin Water Delivery System was completed in September 2004. A Record of Decision which includes the two power plants was signed

on December 22, 2004. No design or construction work has yet commenced at the power plant sites. Land withdrawal of forest service lands for the ULS occurred in 2005 and excess prior withdrawn forest service lands by the CUP were revoked.

As part of the ULS two hydroelectric generating plants would be constructed on the Diamond Fork System. The Sixth Water Power Facility would consist of a 45 megawatt (MW) generator located at the Sixth Water Aqueduct outlet. Power would be generated from water flowing through the Syar Tunnel and down the aqueduct located adjacent to the Sixth Water Flow Control Structure. The fenced power facility building and surrounding area would cover 0.7 acre. The Upper Diamond Fork Power Facility would consist of a 5 MW generator located adjacent to the Upper Diamond Fork Flow Control Structure. Power would be generated from water flowing through the Tanner Ridge Tunnel and Upper Diamond Fork Pipeline. The fenced power facility building and surrounding area would cover 0.3 acre. The construction period for the ULS will span a period of at least 10 years, so construction of the power plants is anticipated not to start for a few years at this time.

Diamond Fork Recreation Facilities

The Diamond Fork System not only included the construction of water conveyance facilities but also construction of recreation features to benefit the public. The Forest Service, in cooperation with the Mitigation Commission, developed a plan in 2002 identifying a conceptual list of recreation features that would complete the recreation commitments of the Diamond Fork System. The plan tiered to the Diamond Fork Area Assessment completed in 2000. The projects include the following: The reconstructed Diamond Campground; a group-site campground which is the focus of this environmental assessment, angler-access parking areas and restrooms, a day use area at Red Ledges, education and interpretive sites, and trailhead improvements at Sawmill Hollow and Fifth Water. Also included in the plan are non-Diamond Fork System recreation features that the Forest Service planned as part of their own program including trailhead improvements at Three Forks (completed) and Monks Hollow, and inventory and management of dispersed camping sites (in progress, see discussion above).

Range Improvements

Historically, high irrigation flows in Diamond Fork Creek served as a barrier for cattle movement. Now that the *Diamond Fork System* is operational and high flows are removed from Diamond Fork Creek, cattle movement will not be restricted as before. Additional fencing may be required in some locations to keep cattle in the appropriate grazing units.

Other Diamond Fork Prescribed Fires

Monks Hollow, 1st through 4th Waters, Fifth and Sixth Waters, Billies Mountain – These burn units are part of the Diamond Fork Prescribed Fire project described earlier. Approximately 300 acres of 1st through 4th Water was burned October 2005 the remainder of the four units are scheduled to be burned between 2006 and 2010. Units range in size from approximately 1,100 to 6,800 acres in size. The vegetation management objectives of these burns are similar to those described for Red Hollow and Halls Fork.

Mechanical Fuels Treatment

Mechanical treatment of vegetation to reduce fire hazard is being contemplated on National Forest System Lands adjacent to private property in the Little Diamond and Wanrhodes watersheds. These are tributary to Diamond Fork. The predominant vegetation type that would be treated is Gambel oak and associated mountain brush species. Approximately 1,000 acres would be treated in Little Diamond; implementation is planned for 2007. It is estimated that approximately 500 acres would be treated at Wanrhodes in 2008.

Bureau of Reclamation Lands

The Forest Service manages approximately 168 acres of BOR lands at the mouth of Diamond Fork Canyon. A potential project under consideration would be to reseed the existing hay fields using native vegetation.

Range Improvements

As mitigation for the Rays Valley Road project that affected livestock distribution, range improvements such as troughs and fencing may be needed.

Description of Cumulative Effects

The following sections describe the potential cumulative impacts of each alternative when combined with the past, present and reasonably foreseeable interrelated projects as described above. If the interrelated project is not identified in the discussion of the issue, then there are no potential cumulative impacts associated with that interrelated project.

Heritage Resources

No heritage sites of any kind exist in the project area, and no potential traditional Northern Ute plant gathering activities would be affected by the project. Therefore, there will be no cumulative effects to heritage resources.

Any future treatment of non-native fish above the proposed fish barrier using piscicides is an activity that does not have the potential to affect heritage resources (36 CFR Part 800.3.a.1). This includes both the application of the piscicides and the chemicals themselves.

Fisheries and Aquatic Resources

Past and historic activities that have influenced fisheries and aquatic resources in the upper Diamond Fork watershed include upland and riparian grazing, recreation use, roads and trails, timber harvest, timber health treatment projects, fuels reduction programs, and gravel mining.

Present day activities that continue to influence fisheries and aquatic resources in the upper Diamond Fork watershed include upland and riparian grazing, recreation use, roads and trails, timber health treatment projects, and fuels reduction programs.

Foreseeable future activities that may influence fisheries and aquatic resources in the upper Diamond Fork watershed include upland and riparian grazing, recreation use, roads and trails, timber health treatment projects, fuels reduction programs and may include fisheries restoration projects involving the removal of non-native fish species.

The presence of non-native GBT presents a risk to the future viability of BCT populations in the upper Diamond Fork watershed. In order to maintain the viability of these BCT populations it is likely that populations on non-native fish will need to be controlled and/or removed from the upper drainage in the future. The USFS has no jurisdiction over the management of fish and wildlife populations in the State of Utah, the management of these resources fall under the purview of the UDWR. Control and removal of fish populations usually involves the use of rotenone and UDWR has proposed to implement a rotenone treatment to remove the non-native GBT population from the upper Diamond Fork drainage. This insures the continued viability of threatened BCT populations.

The piscicide rotenone (McClay 2000; McClay 2002) is often used to restore native fish populations by enabling eradication of non-native fishes with minimum impact to non-target wildlife (Rinne and Turner 1991). Typically, streams targeted for native trout restoration are inventoried to determine, the size, structure, and density of fish populations present; characterize the macroinvertebrate community; and assess the habitats present. Although procedures vary with on-site considerations and species targeted for removal, the general approach is to chemically treat stream reaches isolated by barriers, either natural or artificial, and subsequently stock the stream with native fish from existing wild or hatchery populations. (American Fisheries Society 2005)

In stream renovations, piscicide is normally dispensed from drip cans and/or backpack sprayers. Stream reaches and fish populations are then treated, working downstream with successive chemical treatments. The system is generally considered fishless and ready for reintroduction of native fish when a subsequent treatment or survey fails to find target fish. Restored systems may then be stocked and supplemented with desirable fish species until the population is self-sustaining. (American Fisheries Society 2005)

Rotenone is a natural substance contained in the stems and roots of certain tropical plants, such as the Jewel Vine or Flame tree (*Derris spp.*), Lacepod (*Lanchocarpus spp.*), or hoary pea (*Tephrosia spp.*) (Sousa et. al. 1987). Rotenone works by blocking important biochemical pathways of cell metabolism (Lindal and Oberg 1961, Oberg 1962). Rotenone inhibits the respiration of mitochondria by blocking the reduced nicotinamide adenine dinucleotide (NADH)-dehydrogenase segment of the repiratiory chain in fish and aquatic insects (Fukami, et. al. 1969). Because of this nonspecific poisoning, non-target species such as certain aquatic macroinvertebrates can also be eliminated from the ecosystem. (Mangum and Madrigal 1999)

Rotenone is applied as a powder, a wettable powder, or a liquid containing from 2.5 to 5.0 percent rotenone. A powdered form looses its toxicity when exposed to air and is more difficult to apply; generally, the wettable powders and liquid formulations are easier and safer to use. Liquid formulations can be stored in sealed containers for periods up to one year without loss of efficacy. Rotenone toxicity is primarily a function of the species, size of fish, and water temperature, although pH, oxygen concentration, and the presence of suspended matter also affect toxicity. (Davies and Shelton 1983).

Use of piscicides for recovery of native trout populations could have direct environmental impacts on aesthetics (i.e., sight of dead fish), air quality (i.e., smell of solvents), biological resources (i.e., invertebrates, amphibians, and fish), hydrology and water

quality (i.e., violation of water quality standards and introduction of piscicide diluents and surfactants), hazards and hazardous materials (i.e., potential spill of piscicides), and recreation (i.e., loss of angling opportunity). The magnitude of these impacts is often dependent on the piscicide used, treatment rate, project size, and site-specific variables. Typically, these impacts are short duration, can be mitigated to a level of insignificance, and are more than off-set by long-term benefits resulting from recovery of a listed species (CDFG 1994; AFS 2000). (American Fisheries Society 2005)

Aquatic species that are susceptible to rotenone (besides fish) include invertebrates and juvenile amphibians. The invertebrates are mainly insects, and many of these are only the larval stages of species that are terrestrial as adults. If larval amphibians were present, they would likely be killed by the rotenone (Fontenot et al. 1994). This is because larval amphibians respire more similarly to fish than they do to air-breathing adults. To minimize effects on invertebrates and larval amphibians, treatment is typically timed to avoid the most critical periods of vulnerability. Treatment would most likely be conducted during the fall when most young-of-the-year amphibians would have developed to more terrestrial stages and are less vulnerable to rotenone.

Following review of the recommended conservation measures and applicable Uinta National Forest LRMP standards and guidelines for aquatic and riparian habitat management, it is anticipated that implementation of the Three Forks Fish Barrier project within the identified operational guidelines and mitigation measures will not result in any long-term detrimental effects to existing aquatic resources.

It is determined that the overall impact **direct** and **indirect effects** of this project will be beneficial for fisheries and aquatic resources and that there will be **no negative long-term impacts** or to aquatic species or their habitat resulting from implementation of the Three Forks Fish Barrier project.

Additional information used in determining the effects of the proposed action relative to fisheries and aquatic resources is presented in Fisheries and Aquatic Resources of Diamond Fork, Utah (Smith 2006a), Fisheries and Aquatic Resources of Chase Creek, Utah (Smith 2006b), Fisheries and Aquatic Resources of Halls Fork, Utah (Smith 2006c), Fisheries and Aquatic Resources of Shingle Mill Fork, Utah (Smith 2006d), Three Forks Fish Barrier Environmental Effects for Fisheries and Aquatic Resources (Smith 2006e), and Biological Assessment and Evaluation Fisheries and Aquatic Resources Three Forks Fish Barrier (Smith 2006f).

Additional information relative to the direct and indirect effects of the proposed action relative to fisheries and aquatic resources is included in *Soils Specialist Report for the Three Forks Fish Barrier Project* (Davidson 2006) and *Hydrology Report – Three Forks Fish Barrier Project* (Jarnecke 2006).

Hydrology

There would be short-term effects to water quality within Diamond Fork Creek and tributaries due to the application of rotenone. The primary effect would be the toxicity of rotenone to aquatic organisms including fish and some invertebrates (Bradbury 1986).

Rotenone is non-toxic to mammals, including humans. At the concentrations used to kill fish, it has been estimated that a 132-lb person would have to consume over 60,000 liters

of treated water at one sitting to receive a lethal dose (Sousa et al., 1987). Using a safety factor of 1,000X and the most conservative safe intake level, a person could still drink 14 liters of treated water per day. In addition, extensive testing has not shown rotenone to be carcinogenic (Bradbury 1986). Even though rotenone has been shown to be safe to humans, as a matter of policy, the EPA does not set tolerances for pesticides in potable water. At the same time, the EPA has exempted rotenone from tolerance requirements when applied intentionally to raw agricultural commodities. The State of California (California Department of Fish and Game 1994) and the National Academy of Science (1983) have computed "safe" levels of rotenone in drinking water, which are roughly equivalent to the detection level of rotenone in water (0.005 ppm pure rotenone). Municipal drinking water supplies have been treated with rotenone in at least seven states including Utah. In some cases, rotenone treatment has been used to protect or improve drinking water quality (Hoffman and Payette 1956; Barry 1967).

Regardless of the compatibility between rotenone and human safety, it is highly unlikely that contaminated water would have effects below Diamond Fork confluence with Sixth Water. This is for two reasons. First, the DWR would operate a potassium permanganate detoxification station just below the fish barrier. Potassium permanganate neutralizes the effects of rotenone, and would degrade to non-toxic, common compounds (carbon dioxide and water) within an hour of application at the concentrations used. It is so safe that it is commonly used to treat drinking water systems to remove organic contaminants (Sousa et al., 1987).

First, the rotenone would dilute at Diamond Fork confluence with Sixth Water and Cottonwood Creeks at Three Forks, and become even less toxic. Toxicity would also naturally decline over time, because rotenone is an unstable organic compound that rapidly breaks down in the presence of light, heat, and oxygen and alkaline water (Sousa et al., 1987). Second, as rotenone traveled downstream, it would become more and more dilute as additional springs and tributaries feed into Diamond Fork Creek.

It is also highly unlikely that rotenone would contaminate groundwater. The mobility of rotenone in soil is low. In fact, the leaching distance of rotenone is only 2 cm in most types of soils. This is because rotenone is strongly bound to organic matter making it unlikely that it would enter ground water. At the same time, rotenone breaks down quickly into temporary residues that would not persist as pollutants of ground water. Ultimately, rotenone breaks down into carbon dioxide and water. Roetnone does not affect aquatic or riparian vegetation.

Rotenone is approved by the EPA for the use intended in this project and would be applied according to label instructions by personnel certified as Non-Commercial Pesticide Applicators. Changes in water quality during the project would not impair other uses. The EPA has concluded that there is no reason to restrict the use of rotenone in waters intended for livestock consumption and recreational swimming purposes. Rotenone will not affect plants and would still be of suitable quality for use by livestock, other mammals and birds.

Potassium permanganate would be used to detoxify rotenone during treatments at some of the project waters. Potassium permanganate would degrade to nontoxic, common compounds within an hour of application at the concentrations which would be used.

There would be no **cumulative effects** to water quality to waters within or below the project area due to construction and rotenone treatment. Design features incorporated into the proposed action will be implemented to minimize impacts to water quality during installation of the fish barrier. The rotenone would be neutralized with potassium permanganate below the fish barrier site, approximately 0.5 miles above confluence with Sixth Water Creek. The proposed fish barrier, administrative use of the roads and trails by motorized vehicles are not expected to have any cumulative effects on water quality.

Vegetation

Plowing that occurred historically in agricultural fields would have directly damaged ULT plants if the fields had been orchid habitat. The agricultural/private land and grazing history of the Diamond Fork drainage, combined perhaps with timber cutting activities and fire, have played a part in accelerating stream erosion and downcutting of Diamond Fork creek. The stream downcutting had the effect of moving ULT habitat away and below the level of the hay fields, making those fields no longer suitable as habitat but creating a certain amount of new habitat for this early seral species.

The greatest effect on ULT population levels in the Diamond Fork drainage has been the addition for several decades of a large amount of additional water from the Strawberry watershed, for irrigation purposes off-Forest. The resulting stream instability and bank erosion created a continual unnaturally high acreage of early seral riparian habitat that the ULT colonized to the point of becoming one of the largest populations of the species in the western United States. This effect has now largely disappeared since 2004 with the completion of the pipe carrying the excess water down the Diamond Fork drainage, and the expected water table drop has occurred. Flows are being regulated at reduced levels, more like the natural levels. While the new flows are expected to improve the overall health and resilience of the riparian and aquatic systems, some reduction in suitable habitat for Ute ladies'-tresses and some shifting of colony locations are expected, up to a 25% reduction. Even so, the U. S. Fish and Wildlife Service's Determination of Effect in their Biological Opinion was that the Central Utah Project with the associated cumulative impacts and project design conservation measures "may effect, but is not likely to jeopardize the continued existence" of the species (USFWS 1999).

Soon after completion of the fish barrier, replacement of a large culvert/bridge is projected to occur about one quarter mile upstream of the barrier, at the Three Forks Trailhead. This project will occur in the same area and with the same effects as the original culvert, which was determined to have somewhere between no effect and a beneficial effect on the ULT (Uinta N. F. 2004).

Unauthorized horses from adjacent private land, and cattle, both authorized and unauthorized, can graze or walk through ULT populations in some years. There seems to be little effect on the plants, unless the impacts occur during the flowering/fruiting period, when fruit losses from trampling would be additive to those caused by vole herbivory (Sipes & Tepedino, 1996). Humans occasionally walk through populations, though most are located in areas too wet for long occupancy. It is believed that implementation of the new flow regime will probably result in an improved fishery, which could result in increased fishing pressure and subsequent slight increase in

trampling and trailing by fishermen within Ute ladies'-tresses colonies. Motorized recreation has been increasing in the Diamond Fork watershed in recent decades, and is projected to keep increasing. The Forest Service has taken action to harden parking sites, designate trails and otherwise keep impacts to soil and vegetation resources to a minimum, but a slight increase in OHV-related sedimentation into Diamond Fork Creek can occur. This is likely to be small enough not to affect the ULT.

In recent years the federal government has acquired private land parcels encompassing all of the lower Diamond Fork streamcourse, and so virtually all the current and potential ULT habitat. This helps ensure long term management favoring ULT, which is not required on private land under the Endangered Species Act for plants.

Presently, plant succession may be reducing the overall suitability of existing habitat for ULT along Diamond Fork. Invasion by coyote willow, a natural successional pattern, results in shading in many colonies. ULT is believed to prefer more open habitats on newly developed flood surfaces and plant densities have been observed to be lower where the species is shaded. The development of new habitat, which results primarily from larger flood events, may not occur for years or decades. Plant succession may begin reducing Ute-ladies'-tresses densities causing a temporary decline in Ute ladies'-tresses populations until the next major flood event. Weeds also pose a threat to Ute ladies'-tresses, with aggressive exotic species such as tamarisk (*Tamarix ramosissima*), perennial pepperweed (*Lepidium latifoluim*), Canada thistle (*Cirsium arvense L.*) and Russian olive (*Elaeagnus angustifolia*) present in the drainage. Each of these four species has the potential to dominate riparian plant communities as seen along the lower Spanish Fork River and throughout the western U.S. The orchid can be negatively affected both by competition for space and resources, and from shading.

For the past several years the Central Utah Project has conducted extensive construction and road alteration activities within and just uphill from the Diamond Fork riparian area. This has resulted in varying amounts of sediment and other deposits into the water, though mitigation activities have minimized the quantities. If anything, added sediment may have added to habitat formation for ULT. The proposed upcoming Utah Lakes Project of CUCWD would cause construction of three new small powerhouses along the existing pipeline and reconstruction of parts of the existing powerlines in Diamond Fork drainage. We would not expect these smaller construction activities to have any major impacts on ULT habitat or plants.

Popular developed and dispersed campsites would continue to be used by large groups and/or sustained occupancy and the impacts associated with such activity would continue, such as trampling and resultant death of vegetation, active removal of vegetation for firewood, and soil compaction. Popular sites receive frequent enough use that forbs, grasses and smaller shrubs do not regenerate. Many of these dispersed sites are located in sensitive riparian areas. As recreation demands increase with the growing population along the Wasatch Front, the impacts from large groups have been observed to expand (i.e. existing sites become larger as sites traditionally used by smaller groups are expanded to accommodate larger groups.) This trend is expected to continue. The recently approved Diamond Fork Dispersed Campground project is expected to mitigate some of these impacts at selected locations in the Diamond Fork drainage.

Agricultural conversion soon after Anglo settlement resulted in loss of most Basin big sagebrush community acreage, and probably loss also of drier riparian vegetation communities in the lower part of the Diamond Fork drainage. Recent federal acquisition of the private land parcels through which the creek flows has shifted future management of these parcels as wildland ecosystems rather than agriculture or subdivisions. The potential now exists for a substantial restoration of appropriate native vegetation in those parcels.

The greatest effect on riparian vegetation in the Diamond Fork drainage has been the inclusion for several decades of a large amount of additional water from the Strawberry watershed, for irrigation purposes off-Forest. The resulting continual, unnaturally high stream instability, bank erosion and high summer water resulted in large acreage of early seral riparian habitat, with cottonwoods largely undercut and few trees reaching late maturity near the stream. Upon completion of the Diamond Fork tunnel and pipeline, the Central Utah Project has implemented a new reduced flow regime in Diamond Fork Creek since 2005. The new flows are expected to improve the overall health and stability of the riparian systems over time. There will be a contraction of the wet zone of the riparian area, affecting mostly the herbaceous plants. Deeper-rooted trees and shrubs are expected to survive, but have much less opportunity for new establishment after the first few years of stream adjustment.

Cattle and horses, both authorized and unauthorized, graze and walk through riparian areas and adjacent uplands, but their current numbers and management result in little adverse effect on the vegetation. Human trailing in the wetter riparian areas also occurs, but affects very little acreage. It is believed that implementation of the new flow regime will result in an improved fishery, which could result in increased fishing pressure and subsequent slight increase in trampling and trailing by fishermen in the wetter zone. Motorized recreation has been increasing in the Diamond Fork watershed in recent decades, and is projected to keep increasing. The Forest Service has taken action to harden parking sites, designate trails and otherwise keep impacts to soil and vegetation resources to a minimum, but a slight increase in OHV-related vegetation trampling, erosion and sedimentation into Diamond Fork creek can be predicted. This is likely to have localized effects, but not to be a great problem to vegetation in the overall watershed.

Lightening or man-caused wildfire combined with increasing presence of cheatgrass is likely to put increasing pressure on sustainability of sagebrush communities. The oakbrush and other communities are not at the same level of risk to species sustainability.

UDWR has proposed to put rotenone into Diamond Fork Creek and possibly tributaries to Diamond Fork upstream of the barrier, in order to eradicate non-native fish above the barrier. Rotenone has been shown to affect plant cell processing of oxygen and their sensitivity to sunlight, but so slightly in normal use that it is a commonly used insecticide on food and ornamental plants (Zhang et al, 2001; Morris and Powell, 2000).

The rotenone would be inactivated as soon as it was carried downstream of the fish barrier by potassium permanganate that UDWR would place just below the barrier. Potassium permanganate neutralizes the effects of rotenone by altering it chemically and would degrade to relatively nontoxic, common compounds within a few hours by

oxidizing whatever unprotected organic matter it encounters. Potassium permanganate is commonly used for pest control in the ornamental aquarium fancy. Fish and plants are put into a dilute potassium permanganate solution for several minutes to a few hours to be cleaned of their external parasites. It is more hazardous to bacteria and algae than to larger water plants, and more hazardous to invertebrate animals than to fish. A few fish and tropical water plant species (cichlids, Vallisneria plant) are noted as being more susceptible to damage from potassium permanganate than most. (Francis-Floyd and Klinger, 2002; Hurley et al. 1993) The potassium permanganate and derivative chemicals would flow downstream through the remainder of Diamond Fork Creek, and into Spanish Fork River, becoming progressively more and more diluted by incoming groundwater and water from tributaries. Fish Biologist Ron Smith believes that by the time the treated water reaches beyond Sixth Water Creek's junction about one third mile downstream of the project site, the combination of chemicals would be so diluted as to have no adverse effect on spotted frogs or any other species including ULT, even though the chemicals would be passing by any one spot in the stream for several days (Van Keuren, 2006).

There is suitable habitat and known populations of ULT in the cumulative effects analysis area, but the fish barrier project in addition to other projects within the analysis area will have no noticeable effect on the downstream populations or habitat. Construction of the fish barrier will have no impact on dainty moonwort, slender moonwort, Barneby woody aster, Garrett bladderpod, Rockcress draba and Wasatch jamesia because no habitat for these species occurs, therefore there will be no cumulative impact.

Recreation

Rotenone treatment would have a short-term adverse impact on recreational fishing in the treatment area. The treatment would eradicate fish upstream of the project area and thereby, eliminate this as a GBT and RBT fishing opportunity. UDWR has proposed to close Diamond Fork and its tributaries upstream of the 3-Forks confluence to fishing. . Fishing opportunities and angler success would likely be reduced for approximately one year following treatment. The quality of the cutthroat trout fishery would likely be restored within three years. Fishing regulations are decided through a process outside of this document, but would likely be set to allow angling to occur without causing substantial mortality to native trout (e.g., catch and release practices, and use of flies and lures only). This anticipated change in regulations is expected to have limited impacts to recreational fishing patterns or angler satisfaction, mainly because heavy fishing pressure is mostly focused on other stream reaches and streams, and current regulations are restrictive as well. The rotenone treatment could restrict fishing on as much as 10-15 miles of stream. This represents a loss of about 15% of the fishing opportunity in the Diamond Fork drainage. A high quality GBT fishery is found nearby in Sixth Water Creek, and lower Diamond Fork Creek. With proper public notification about other fishing opportunities, the impact on fishermen will be minor since only 1% of the stream fishing opportunity on the Forest would be impacted. The proposed closure would occur similtaneously and following construction activity. This may actually reduce recreational vehicle travel on the Diamond Fork Road, and further reduce the direct effects of construction on traffic and public safety. Other projects that will be under construction in

the canyon (downstream from the fish barrier project site) include Diamond Fork Group Sites and Three Fork Trailhead Culvert. The short term impacts will be temporary and are not considered significant.

In the long-run, a native trout fishery would be established in stream reaches upstream of the fish barrier. Native trout fisheries are valued for their uniqueness by many in the fishing community. This would be a beneficial non-significant impact to recreation.

Visuals

There would be minor cumulative impacts to visual quality. The rotenone treatment would result in "dead" fish in the stream, a visual deterrent. However, it is anticipated UDWR would gather most of these as part of their treatment effort thereby mitigating this potential impact. Other projects that will be under construction in the canyon include Diamond Fork Group Sites and Three Fork Culvert. These projects are not visible from the fish barrier sight and would not add to visual impacts generated by the very minor amount of temporary disturbance resulting from the fish barrier project. In addition, impacts from these projects is anticipated to be temporary in nature and largely mitigated. Considering the minimal and temporary impacts from the fish barrier project and proposed rotenone treatment, and the fact that other activities within the drainage are generally not visible from the fish barrier project site, the cumulative impacts to visual quality will be minor and temporary.

Livestock Grazing

Rotenone is not toxic to livestock and the EPA has stated that there is no need to restrict livestock consumption of treated waters. Rotenone has been used as an insecticide on plants and to control grubs on cattle. There would be no cumulative impacts to livestock grazing.

Wildlife

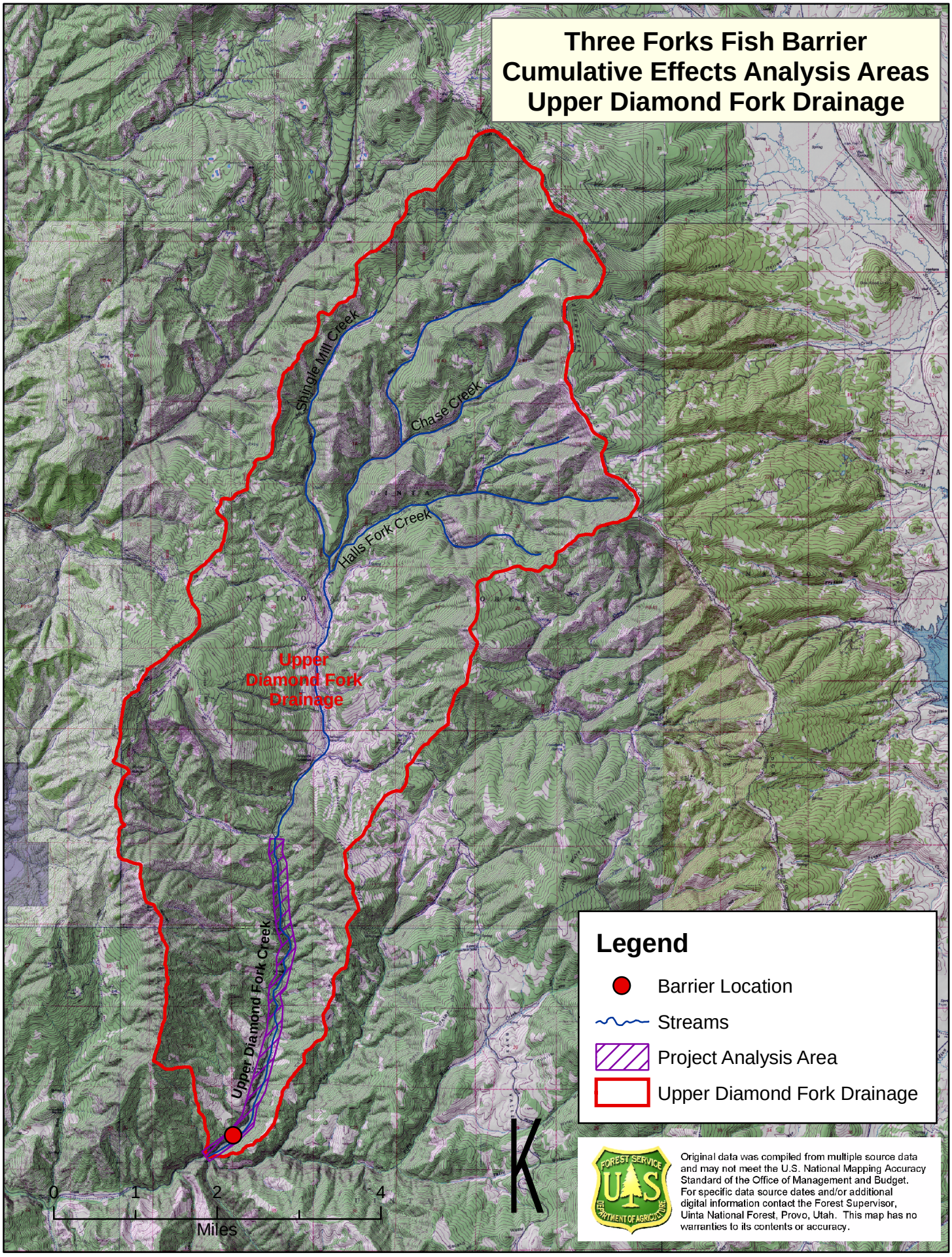
There will be no additional cumulative impacts to wildlife from the construction of the Three Forks Fish Barrier in terms of loss of habitat or increased disturbance. While there will be no additional effects, there will still be cumulative effects from the increasing recreation demands placed on the area. Loss of habitat and human disturbance, especially in the riparian habitat types, is the greatest threat to wildlife within the Diamond Fork Management Area.

The proposed removal of game fish with rotenone will have no effect on the wildlife species using the Diamond Fork Creek. Rotenone affects aquatic organisms only. The only piscivorous species discussed is the bald eagle. The bald eagles are winter residents who will not be present until well after the rotenone has dissipated in the creek.

The other species discussed includes 5 carnivores (Canada lynx, fisher, Northern goshawk, peregrine falcon, and golden eagle) and 2 vegetarians (sage grouse and beaver). The remaining species are all insectivorous, feeding on non-aquatic insects. Rotenone will have no affect on these species.

Soils and Roads

There would be no additional cumulative effects beyond was described for indirect and direct effects in the environmental consequences because there are no other future activities within the project area.


Three Forks Fish Barrier
Cumulative Effects Analysis Areas
Upper Diamond Fork Drainage
Shingle Mill Creek
Chase Creek
Halls Fork Creek
Upper
Diamond Fork
Drainage
Upper Diamond Fork Creek
Legend
Barrier Location
Streams
Project Analysis Area
Upper Diamond Fork Drainage
0
1
2
4
Miles
Original data was compiled from multiple source data and may not meet the U.S. National Mapping Accuracy Standard of the Office of Management and Budget. For specific data source dates and/or additional digital information contact the Forest Supervisor, Uinta National Forest, Provo, Utah. This map has no warranties to its contents or accuracy.

CONSULTATION AND COORDINATION

The Forest Service consulted the following individuals, Federal, State, and local agencies, tribes and non-Forest Service persons during the development of this environmental assessment:

FEDERAL, STATE, AND LOCAL AGENCIES

Utah Division of Wildlife Resources
U.S. Fish and Wildlife Service
Utah Division of Water Resources
Bureau of Reclamation, Provo
U.S. Army Corp of Engineers
Utah County
Utah Department of Natural Resources

TRIBES

Northern Ute tribe

OTHERS

Utah Environmental Congress
Back Country Horsemen of Utah
Save our Canyons
Central Utah Water Conservation District (CUWCD)
Utah Wildlife Federation
Spanish Fork Grazing Company
High Country Fly Fishers Chapter 599
Stonefly Society Chapter 48
Weber Basin Anglers Chapter 681
Trout Unlimited

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Charmaine Thompson – Archeologist, Uinta National Forest, Provo, Utah
Pam Jarnecke – NEPA Coordinator, Uinta National Forest, Provo, Utah

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