United States Department of Agriculture | Forest Service | Fishlake National Forest Supervisor's Office Fax: (435) 896-9347 | 115 East 900 North Richfield, UT 84701 Phone: (435) 896-9233

File Code: 1950 Date: 16 August 2006
Route To: District Rangers, Fishlake OHV Route Designation Project IDT

Subject: Watershed and Aquatics Reports for the Fishlake OHV Route Designation Project Environmental Impact Statement

To: Mary C. Erickson, Fishlake Forest Supervisor

"To protect your Rivers...
Protect your Mountains."

This report and the supplement prepared by Jim Whelan summarize our review of potential hydrologic and aquatic consequences for the Final Environmental Impact Statement of the Fishlake OHV Route Designation Project. Supporting analysis and documentation are located in the project file. Soil, watershed, and aquatic issues were identified early in the development of the proposed action. Primary issues have been identified, and have been addressed directly through route and area designations and required mitigations when feasible within the scope of the project. As you are aware, there are areas where existing roads and motorized trails need design improvements to reduce or eliminate water resource impacts. We understand that this is outside the scope of the current project, but that the forest will continue adaptive management of the motorized route system. Inventory and monitoring programs will help us identify the changes and improvements to the route system and the motorized travel plan that are needed to reduce route and use impacts to water resources over time. It is critical that these efforts continue.

We believe that the action alternatives address significant hydrologic and aquatic issues without creating new adverse impacts. This report includes Required Design Criteria that further reduce the potential to adversely impact aquatic resources. These criteria must be applied during project implementation. The proposed actions are consistent with the Fishlake National Forest Plan (see Appendix A). The No Action alternative is not consistent with the Forest Plan if carried out indefinitely. If you have questions or need further clarification or discussion of the issues evaluated or rationale provided, please let us know.

Prepared by: \s\ Dale Deiter
Fishlake Hydrologist

Prepared by: \s\ Jim Whelan
Fishlake Fisheries Biologist

Proposed Alternatives and Connected Actions

Full descriptions of the proposed actions are contained in Chapter 2 of the Fishlake OHV Route Designation Project Final Environmental Impact Statement. Tables 1 through 5 contain summary information for the proposed alternatives. Alternative 1 is the No Action alternative, which would maintain the use and management associated with the existing motorized travel plan. Alternative 2 is the proposed action that was presented to the public on June 7, 2004 with the release of the Notice of Intent and was the first alternative to address the Purpose of and Need for Action. Alternative 3 is the modified proposed action, which incorporates comments and concerns from public scoping and additional inventory and review from the 2004 field season. Alternative 4 is an alternative that provides additional protection of roadless areas and more emphasis on non-motorized recreation opportunities. Alternative 5 is the final preferred alternative that responds to additional internal evaluation and external comments received after release of the DEIS.

It is critical to understand that no new routes will be constructed as part of the Fishlake OHV Route Designation Project. Only existing routes are being designated as open or closed to motorized use. The impacts associated with existing routes and their use and from motorized cross-country travel are already occurring. The route designation project offers the prospect of reducing existing resource damage while preventing the potential for future impacts.

The proposed actions are comprised of changes to type or season of motorized use, route designation and authorization changes, and changes to travel plan rules. Table 1 provides a summary of the proposed route changes and resulting area designations for each alternative.

Table 1. Comparison of Alternatives - Area designation acreage summaries.

Area Designations		Alternative 1	Alternative 2	Alternative 3	Alternative 4	Alternative 5
Open Use Areas[1]	change	0	- 908,142	-908,146	-909,115	-908,236
	result	909,115	973	969	0	879
Designated Routes Only	change	0	+ 1,084,677	+ 1,084,681	+ 1,085,650	+ 1,084,771
	result	368,730	1,453,407	1,453,411	1,454,380	1,453,501
Seasonal Winter Closure[2]	change	0	-126,530	-126,530	-126,530	+ 9,940
	result	126,530	0	0	0	136,470
All Winter Closure[2]	change	0	- 106,894	-157,032	-157,032	- 19,068
	result	176,535	69,641	19,503	19,503	157,467

[1]includes Alternative 1 "A" area designations that are unrestricted from April 1 to December 31 but does not include distance designations for dispersed camping for any of the alternatives

[2]technically these classes have more acreage if you include restricted areas that do not get adequate snow for over-snow vehicle use and/or where terrain limits motorized winter use.

Table 2 displays a summary of the proposed changes and resulting route designations for each alternative. The table shows that the action alternatives substantially modify existing route

designations although proportionally much less than the alteration of area designations shown in Table 1.

Table 2. Comparison of Alternatives - Route designation mileage summary.

Route Designations		Alternative 1	Alternative 2	Alternative 3	Alternative 4	Alternative 5
Open Yearlong	change	0	+ 115.7	+ 158.3	- 281.8	+ 195.4
	result	1,859.1	1,974.8	2,017.4	1,577.3	2,054.5
Open Seasonally	change	0	+ 61.5	+ 52.0	- 98.0	+ 95.0
	result	328.6	390.1	380.6	230.6	423.6
Street Legal Only	change	0	+ 44.3	+ 43.4	+ 33.1	+ 38.5
	result	225.2	269.5	268.6	258.3	263.7
Administrative Use Only	change	0	+ 26.5	+ 18.1	+ 26.5	+ 48.8
	result	29.6	56.1	47.7	56.1	78.4
Undesignated Open	change	0	- 764.3	- 764.3	- 764.3	- 764.3
	result	764.3	0	0	0	0
Undesignated Closed	change	0	- 333.4	- 333.4	- 333.4	- 333.4
	result	333.4	0	0	0	0

The proposed actions change how, where, and when motorized use is authorized. Table 3 provides a summary of the outcomes that would result from proposed changes in route authorizations for each alternative.

Table 3. Comparison of Alternatives - Route type mileage summary.

Route Type		Alternative 1	Alternative 2	Alternative 3	Alternative 4	Alternative 5
Forest Roads[1]	change	0	+ 167.3	+ 160.9	- 45.3	+ 210.0
	result	1,971.5	2,138.8	2,132.4	1,926.2	2,181.5
Forest Motorized Trails	change	0	+ 221.3	+ 251.5	- 134.3	+ 308.5
	result	330.3	551.6	581.8	196.0	638.8
Forest Non-motorized Trails	change	0	+ 131.3	+ 120.9	+ 342.7	+ 110.3
	result	891.9	1,023.2	1,012.8	1,234.6	1,002.2
Unauthorized Roads	change	0	-554.4	-554.4	-554.4	-554.4
	result	554.4	0	0	0	0
Unauthorized Motorized Trails	change	0	- 684.1	- 684.1	- 684.1	- 684.1
	result	684.1	0	0	0	0
Unauthorized Non-motorized Trails	change	0	- 128.1	- 128.1	- 128.1	- 128.1
	result	128.1	0	0	0	0

[1] State, Federal, and County roads located on forest are added for completeness even though they are not Forest Roads.

Table 4 displays total miles of proposed obliteration for roads and trails by alternative.

Table 4. Comparison of Alternatives – Route obliteration mileage summary.

Route Type	Alternative 1	Alternative 2	Alternative 3	Alternative 4	Alternative 5
Forest Road	0	45.6	48.8	51.8	63.3
Forest Motorized Trail	0	1.0	1.0	9.3	9.4
Forest Non-motorized Trail	0	0.1	6.0	6.0	8.2
Unauthorized Road	0	298.5	300.2	503.0	215.2
Unauthorized Motorized Trail	0	476.9	456.0	609.6	420.2
Unauthorized Non-motorized Trail	0	24.5	21.1	23.8	21.6
Forest Totals	0	846.6	833.1	1,203.5	737.9

Barriers are an important component of the proposed actions that should improve compliance with the travel plan. Table 5 compares the number and type of proposed barriers by alternative.

Table 5. Comparison of Alternatives – Proposed barrier summary.

Use Restriction	Closure Type	Alternative 1	Alternative 2	Alternative 3	Alternative 4	Alternative 5
Closure to All Motorized Use	**Barrier**	0	163	173	237	175
Closure to Motorized Vehicles > 50 inches in width	**Barrier**	0	1	3	0	3
Seasonal Closure to All Motorized Use	**Gate**	0	17	20	13	20
Administrative Use Only	**Gate**	0	22	23	32	21

The following vehicles and uses are exempted from the prohibitions to motorized cross-country travel by 36 CFR part 212.51:

a. Aircraft;
b. Watercraft;
c. Over-snow vehicles [Note: Limited restrictions of over-snow vehicles are included in the proposed actions consistent with (§212.81)]
d. Limited administrative use by the Forest Service;
e. Use of any fire, military, emergency, or law enforcement vehicle for emergency purposes;
f. Authorized use of any combat or combat support vehicle for national defense purposes;
g. Law enforcement response to violations of law, including pursuit; and

h. Motor vehicle use that is specifically authorized under a written authorization issued under Federal law or regulations.

Cross-country travel by OHVs for game retrieval and antler shed hunting is prohibited.

The limited use of motor vehicles within 150 feet [Alternatives 3, 4, and 5 or 300 feet for Alternative 2] of roads and motorized trails would be allowed solely for the purposes of dispersed camping. The following text will be added to the motor vehicle use map to clarify the intent of the distance designations. "Where allowed on this map, motor vehicles may travel up to 150' [or 300' for Alternative 2] from designated routes, for travel to an existing dispersed campsite along an existing track. Travel within the corridor for any other purpose is prohibited. Existing campsites can be distinguished by evidence of rock fire rings, old tent sites, and tracks from earlier vehicle access. This access does not authorize creation of new campsites or travel ways. Motorized travel between multiple dispersed campsites, establishment of motorized play areas, racetracks, or travel across wet meadows or riparian areas is prohibited." Most of the distance designations will be removed over time as dispersed camping access needs are verified and designated where needed.

The action alternatives also have required design criteria that are part of the proposed actions. Those that are required regardless of which alternative is selected or that relate to other resource issues are described in the FEIS. Specific requirements for watershed and aquatic protection are described below.

REQUIRED DESIGN CRITERIA

The following specific criteria must be applied during project implementation if the proposed action is selected. These requirements also apply to connected actions. The purpose of these measures is to completely avoid, or to the fullest extent possible, minimize the potential for adverse effects to soil and aquatic resources. The effects analysis assumes their implementation. Other relevant resource protection requirements are listed in the soils, vegetation, and wildlife reports and in the FEIS. Reviews done by Gropp (2006), Seyedbagheri (1996), Forest Plan monitoring, and our own past experience have shown that the included measures are effective if applied correctly. Stream protection zones have been shown to be effective in moderating cumulative watershed effects (Belt et al. 1992, Meehan 1991). The forest hydrologist and fisheries biologist will correct or supplement these measures as needed during the course of project implementation.

Road and Motorized Trail Obliteration

Obliteration methods will include passive and active restoration techniques. Passive techniques rely on removing the human induced disturbance mechanisms and then relying on natural recovery. Active restoration techniques potentially include use of a Dixie Harrow in sagebrush or a disc or seed drill in grass vegetation types. Steeper slopes and larger prisms will typically require the use of excavators and/or dozers. Regardless of the method used, stream crossings will be restored and self-maintaining drainage will be installed where needed. All obliterations will use signs, barriers, or front-end obliteration to prevent motorized use from reestablishing on the obliterated prism. Obliteration and barrier installation within the rare plant study area will require coordination with the forest rare and invasive plants program manager, and the forest botanist. The following design criteria will be applied:

During obliteration, stream crossings will be restored using the following design criteria:

1. Timing restrictions for cutthroat and/or important recreational fisheries will be coordinated with the Division of Water Rights through the stream alteration permit process where necessary.

2. The width of the excavated channel must include the natural channel bankfull width and floodplain features as indicated above and below the crossing. This restores the natural stream hydraulics and reduces the potential for eroding and rejuvenating the channel side slopes.

3. The slope of the channel must match the stream grade that existed prior to construction of the route. The stream grade above and below the crossing, old soil organic layers and stumps, and the presence of streambed materials that are courser than the road fill can be used as indicators (to supplement topographic cues) of the original terrain. Restoring the channel gradient reduces the potential for channel downcutting (scouring) and rejuvenation of channel side slopes.

4. The channel side slopes (breaklands) to the crossing must be returned as closely as practical to natural contour. This helps promote revegetation and minimizes the potential for sediment production and delivery to the channel.

5. As much fill as possible should be removed before displacing and removing the crossing structure. This reduces the volume of fine sediment that can be entrained by the stream.

6. Silt fences, straw bales, stream diversion or pumping water around crossings should be used to minimize turbidity increases. Sediment captured by traps should be removed before dismantling the traps. This reduces the volume of sediment delivered downstream.

7. Uprooted vegetation, logs, weed-free straw, seeding and fertilization, plantings, and geotextiles (as needed) should be used to reduce surface erosion and promote revegetation on the recontoured slopes.

8. Rock or log grade control structures should be used if desired for fisheries enhancement or to prevent downcutting in situations where the original stream gradient is difficult to determine or re-establish. Log and rock structures must be keyed into the banks a minimum of 3 feet. Logs should be at least 14 inches in diameter. The top of the grade control structures should be the same elevation as the bottom of the restored channel. For log structures on perennial streams, a minimum 3-foot wide piece of filter cloth should be placed and nailed to the upstream side of the log and sealed with bed material.

Road obliteration between stream crossings will be done using the following criteria:

1. The brushing of roads and trails grown in with vegetation should avoid cutting below the route surface and should be the minimum width necessary for safe passage of support vehicles. If a dozer is used, the brush should be pushed for at least 200 feet before sidecasting to prevent creating a continuous windrow or berm of slash on the outside edge of the route.

2. Natural contours should be restored on all route segments that have unstable fill or cutslopes. The bench portion of the road (usually the inner-half of the total road width including the ditch if present) should be de-compacted by ripping to a minimum depth of

12 to 18 inches before placing excavated fill against the cutslope and on the prism. Fill material should not be stacked against seeps that are still present during the summer and fall. Though not anticipated, if end hauling of material is needed, the Forest Service will approve safe disposal sites. The topographic features of swales and draws will be reestablished if crossed by the existing route prism. These measures reduce the potential for route related mass erosion.

3. The ditchline will be drained across the road or trail by waterbars that will be no further than 50 feet apart on route segments where the route cut and fill slopes are stable. The waterbars should be constructed so that they drain the water off of the route at roughly the same grade as the ditchline and the prism. This often requires that the skew of the waterbar be greater than 30 degrees relative to a direction perpendicular to the direction of travel. The depth between the top of the berm and the bottom of the waterbar will be about 3 feet. The intent of this measure is to assure that the down slope drainage is restored and that the waterbars are self-maintaining.

4. Uprooted vegetation, and existing available logs and slash should be scattered on the road prism to reduce surface erosion and promote revegetation, but should not be placed so that it slows the drainage of waterbars.

Conversion of Motorized Routes to Non-motorized Trail

Any road or trail to be converted to non-motorized use will be made hydrologically inert prior to closing the route to motorized use. This includes installation of self maintaining drainage, stabilizing unstable cut and fill slopes, and removing structured stream crossings as described above in the BMPs for route obliteration.

Hazardous Materials

Equipment used for road and trail maintenance, obliteration and barrier installations will be inspected daily to ensure there are no leaks. When discovered, leaks will be promptly repaired. Any changing of hoses, parts, or refueling by heavy equipment will be conducted at least 300 feet away from streams, tributaries, and wetlands. Petroleum and chemical products storage containers with capacities of more than 200 gallons, stationary or mobile, will be stored far enough away to prevent leakage from reaching live water, a minimum of 300 feet. Dikes, berms or embankments will be constructed to contain the volume of petroleum and/or chemical products stored within the tanks. Diked areas will be sufficiently impervious and of adequate capacity to contain spilled petroleum and/or chemical products. In the event that any leakage or spillage enters any live water, the operator will immediately notify the Forest Service. The storage site will be determined during the pre-operational meeting. This measure is intended to minimize the potential for hazardous material spills, and infiltration into the soil or delivery to streams if a spill occurs.

All waste oil and lubricants will be collected and transported to proper disposal facilities outside of public lands. In case of unauthorized release of hazardous materials, and petroleum products, the responsible party must:

a) Stop spills,
b) Contain material,
c) Notify the authorities listed in the petroleum and chemical products spill protection plan, and
d) Collect, remove and dispose of the spilled material in a suitable location off National Forest System lands.

Invasive Plants and Aquatic Nuisance Species

Machinery used for obliteration or to install large signs, gates, and barriers will be washed and inspected before being hauled to the project area. This aids equipment inspections and helps prevent new infestations of invasive species. If the equipment works in weed-infested areas or waters with aquatic nuisance species, it will be washed in a suitable designated location prior to moving to the next site. Treatment of equipment that has been used in whirling disease positive water bodies will follow existing guidelines that have been established by the forest. These requirements will be coordinated with the forest invasive plants coordinator and fisheries biologist. Routes proposed for obliteration within 1 mile of inventoried invasive plant locations are noted in the fishlake_travel_plan_changes.mdb Microsoft Access database, which is located in the project file.

Reasonably Foreseeable Activities

Current and historic livestock grazing, invasive plant treatments, water development, collection of forest products, timber sales, mechanical and prescribed fire and fuels treatments, road and trail construction, reconstruction and maintenance, underground mining for coal, oil and gas exploration and development, geothermal development, and recreational use on federal and private lands are considered as part of the existing condition are ongoing and will continue. Wildfires will occur somewhere on the forest every year under all alternatives. Appendix C contains a list of reasonably foreseeable activities and their potential for cumulative interactions and effects with the Fishlake OHV Route Designation Project.

Beneficial Uses and Quality of Support

The State of Utah has designated beneficial uses for the streams, lakes, and reservoirs within the Fishlake National Forest, which is part of the Sevier River and Colorado River systems. These uses include protecting water quality for the following purposes:

- Domestic use with prior treatment as required by the Utah Division of Drinking Water
- Recreational Uses and Aesthetics,
- Cold water game fish and other cold water aquatic life, including the necessary aquatic organisms in their food chain,
- Waterfowl, shore birds and other water-oriented wildlife, including the necessary aquatic organisms in their food chain,
- and Agricultural uses including irrigation of crops and livestock watering.

Water quality must be maintained so that beneficial use support can be sustained consistent with anti-degradation requirements in the Clean Water Act. Water Quality Limited (WQL) streams, lakes and reservoirs are listed and analyzed for potential cumulative impacts in Appendix B. A WQL listing implies that one or more beneficial uses are not being fully supported. Where possible, the forest must reduce pollutants of concern in waters that are below State standards. National Forest System lands must also comply with the requirements of the "Proposed Water Quality Standards for Salinity including Numeric Criteria and Plan of Implementation for Salinity Control, Colorado River System, June 1975" as amended.

Available documents summarizing results from water quality sampling on the Fishlake National Forest include internal reports (such as Alma 1978, USDA Forest Service 1987, Deiter 2003) and State reports. The State of Utah Division of Water Quality prepares 303(d) and 305(b) reports every two years on water quality that include streams, lakes, and reservoirs on the forest. The

internal reports are located in the project file and State reports are available on the Internet. These documents all indicate that water quality on the Fishlake National Forest is supporting beneficial uses in most cases. Locations that are not fully supporting beneficial uses on or near the forest are discussed in Appendix B of this report. Where water quality objectives are not being fully met, it is usually due to excessive nutrients, or to a much lesser extent, total suspended solids. Surficial geology plays a significant role in nutrient exceedences, but human induced increases through livestock grazing, recreation, and accelerated erosion are also likely.

According to the Utah Division of Drinking Water, Cold Spring in Monroe Creek is the only culinary water source on or near the forest that is directly influenced by surface water quality. There are no travel routes located above this spring; however, it is located in an area that currently allows unrestricted travel. All action alternatives would prohibit such use in the future.

The forest has monitored water quality impacts at forded stream crossings since 2001 (Deiter 2006a and 2006b). The dataset collected by the forest is likely one of the largest of its kind based on the lack of published scientific literature that is available on this subject (Dissmeyer 2000, Clarkin 2006). The data show that use of forded crossings, especially where numerous, temporarily exceeds State water quality standards for turbidity for the beneficial use of cold water fisheries. Discussions with the Utah Division of Water Quality indicates that the their enforcement of this criteria is aimed more at long duration activities with equipment in streams for hours or days rather than the short duration crossings by motorized vehicles. The data reveal that elevated amounts of fine particles accumulate below forded crossings, although the sediment pulse measured by turbidity diminishes rapidly while moving downstream. The data also show a steep inverse linear relationship between maximum turbidities and size of the materials that make up the driving surface on the approaches and bed of the channel. Therefore, armoring streambeds and approaches can be an effective treatment to reduce turbidity impacts.

Petrol hydrocarbons have been detected below forded crossings. Naphthalene is the only volatile organic compound that has repeatedly been detected (3 out of 12 samples). When detected, these compounds have been at levels well below the maximum levels allowed by the Environmental Protection Agency. Gas and diesel range organics have been detected at parts per million levels, which would probably warrant treatment for water used for culinary purposes. Gas range organics have been detected in 6 of 20 samples and diesel range organics in 2 of 20 samples. There are no water quality criteria for gas and diesel range organics because they are a collection of compounds. The presence of petrol hydrocarbons appears to be short-lived. Only 1 sample out of 22 has detected hydrocarbons after Rocky Mountain ATV Jamboree events. Even though the direct and indirect impacts from forded crossings are not always significant, it is safe to assume that reducing the number of forded crossings results in less potential for cumulative impacts to water quality and aquatic habitats.

In some instances on the forest, substantial stream, soils, riparian and wetland, impacts are evident even where water quality standards are otherwise being met. This often results from motorized routes and use within riparian areas or from overgrazing by livestock. Since 2001, a contractor has surveyed 487.5 miles of streams on the forest using the Region 4 Level 2 Integrated Riparian Evaluation protocol. Roughly 409 miles of this survey are have been completed to date. The inventory has been collected forest-wide and includes the highest priority aquatic systems on the Fishlake National Forest. This inventory has helped us identify and focus on where OHV use is and is not a concern. Table 6 summarizes the OHV impacts to riparian areas found so far.

Table 6. OHV impacts to stream and riparian resources based on Level 2 Integrated Riparian Inventories.

Stream Code and Stream Name	Degree of OHV Impacts 0 (none) to 5 (severe)*	Illegal Activity Identified
A01 Beaver River	1	
A02 Jim Reed Creek	1	
A03 South Fork Baker Canyon	2	
A04 South Fork Beaver River	0	
A05 Lower Kents Lake Creek	3	
A06 Dry Hollow Creek	1	
A07 Iant Creek	1	
A08 Lebarron Creek	0	
A09 Lousey Jim Creek	4	X
A10 Wilson Creek	3	X
A11 Three Creeks	3	
A12 North Fork Three Creeks	1	
A13 Blaney Creek	0	
A14 Hi Hunt Creek	0	
A15 South Fork Three Creeks	3	
A16 West Fork Merchant Creek	1	
A17 Poison Creek	1	
A18 Merchant Creek	4	X
A19 Twin Lakes Creek	1	
A20 Little North Creek	3	
A21 Pine Creek	1	
A22 South Fork of Pine Creek	1	
A23 North Wildcat Creek	2	
A24 Wildcat Creek	2	
A25 Indian Creek	1	
A26 North Fork of North Creek	4	X
A27 Pole Creek	3	
A28 South Fork of North Creek	2	
A29 Pine Creek (South Fork of North)	0	
A30 Briggs Creek	0	
A31 South Birch Creek	2	
A32 Big Twist Creek	2	
A33 South Creek	3	
B01 Sevenmile Creek	2	
B02 Tasha Creek	3	X
B03 Sawmill Creek	4	X
B04 White Creek	2	
B05 Gottfredsen Creek	1	
B06 UM Creek	2	
B07 Left Fork	2	
B08 Right Fork	2	
B10 Fremont River	1	
B11 Lake Creek below Fish Lake	1	
C01 Salina Creek	2	

Table 6. OHV impacts to stream and riparian resources based on Level 2 Integrated Riparian Inventories.

Stream Code and Stream Name	Degree of OHV Impacts 0 (none) to 5 (severe)*	Illegal Activity Identified
C02 Dead Horse Canyon Creek	1	
C03 Browns Hole Creek	2	
C04 Water Hollow	1	
C05 Pine Hollow	0	
C06 Niotche Creek	3	
C07 Unnamed 1 North	1	
C08 Unnamed 2 South	1	
C09 Skumpah Creek	2	
C10 Horse Hollow	2	
C11 Beaver Creek	1	
C12 West Fork Beaver Creek	0	
C13 East Fork Beaver Creek	0	
C14 Picklekeg Creek	0	
C15 East Fork Picklekeg Creek	0	
C16 Pine Creek	0	
C17 Steves Creek	1	
C18 Jump Creek	1	
D01 Corn Creek	2	
D02 North Fork Corn Creek	0	
D03 Leavitts Canyon Creek	0	
D04 Second Creek	2	
D05 Middle Canyon Creek	2	
D06 Pine Hollow Canyon	0	
D07 West Corn Creek	0	
D08 East Fork Corn Creek	0	
F01 Manning Creek	4	X
F02 Barney Creek	3	
F03 Collins Creek	0	
F04 East Fork Manning Creek	0	
F05 Vale Creek	0	
F06 Straight Canyon	5	X
G01 Chalk Creek	2	
G02 North Fork Chalk Creek	1	
G03 Teeples Wash	0	
G04 Broad Canyon	0	
G05 Turner Wash	0	
G06 South Fork Chalk Creek	3	
G07 Chokecherry Creek	0	
G08 Three Forks Creek	0	
G09 White Pine Creek	0	
G10 Bear Canyon	0	
G11 Shingle Mill Creek	0	
H01 Tenmile Creek	4	X
I01 Birch Creek	3	X

Table 6. OHV impacts to stream and riparian resources based on Level 2 Integrated Riparian Inventories.

Stream Code and Stream Name	Degree of OHV Impacts 0 (none) to 5 (severe)*	Illegal Activity Identified
J01 Oak Creek	2	
J02 North Walker Canyon	2	
K01 Clear Creek	2	
K02 Sam Stowe Creek	0	
K03 North Joe Lott Creek	0	
K04 South Joe Lott Creek	1	
K05 Dry Creek	1	
K06 Mill Creek	2	
K07 Pole Creek	0	
K08 Grass Creek	2	
K09 Skunk Creek	0	
K10 Three Creeks	0	
K11 Birch Creek	1	
K12 Fish Creek	5	X
K13 Picnic Creek	3	X
K14 Trail Canyon	0	
K15 Line Canyon	2	
K16 East Fork Fish Creek	3	X
K17 Long Creek	1	
K18 Shingle Creek	3	

Key*
0 = no OHV use
1 = low OHV use
2 = moderate OHV
3 = isolated OHV damage occurring (ie. bank damage @ a single crossing in 1 or 2 reaches)
4 = numerous locations of advanced OHV damage occurring
5 = nearly continuous severe OHV damage occurring on extensive sections of stream

Table 7 tallies the number of streams in Table 6 for each of the classes that describe the degree of riparian impacts from OHV use.

Table 7. Tally of streams in each OHV / riparian impact class based on Level 2 Integrated Riparian Inventories.

Level of OHV use	Number of Inventoried Streams	Percent of Inventoried Streams
0. No OHV use.	34	31 %
1. Low OHV use.	26	24 %
2. Moderate OHV use.	25	23 %

Table 7. Tally of streams in each OHV / riparian impact class based on Level 2 Integrated Riparian Inventories.

Level of OHV use	Number of Inventoried Streams	Percent of Inventoried Streams
3. Isolated OHV damage occurring (i.e. bank damage at a single crossing in 1 or 2 reaches).	15	14 %
4. Numerous locations of advanced OHV damage occurring.	6	6 %
5. Nearly continuous severe OHV damage occurring on extensive sections of stream.	2	2 %
TOTALS	**108**	**100 %**

The primary hydrologic and aquatic concerns for the Fishlake OHV Route Designation Project are based on the need to maintain or improve conditions for soils, wetland and riparian areas, native and introduced cold-water fisheries, and for boreal toads their habitat. Table 8 lists the most important native cutthroat and recreational fisheries on the forest. The supplemental report that describes aquatic issues and other fisheries in additional detail is included as Appendix E of this report.

Table 8. Priority native cutthroat and recreational fisheries on the Fishlake Forest.

Stream / Lake / Watershed Name	Ranger District	Species of Interest	Type of Fisheries
Beaver River	Beaver	Rainbow trout Brown trout Red-sided shiner	Recreational & Non-game
Birch Creek (East)	Beaver	Bonneville cutthroat	Reintroduced
Birch Creek (West)	Beaver	Bonneville cutthroat	Remnant
Briggs Creek	Beaver	Bonneville cutthroat	Reintroduced
Corn Creek	Fillmore	Brown trout Rainbow trout Mountain sucker Mottled sculpin	Recreational & Non-game
Fish Creek	Beaver	Brown trout Rainbow trout Bonneville cutthroat*	*Future Renovation and Reintroduction
Fish Lake	Loa	Rainbow trout Splake Lake trout Brown trout Mottled sculpin Numerous non-natives	Recreational & Non-game
Manning Reservoir and Manning Creek	Richfield	Bonneville cutthroat	Reintroduced
South Fork of North Creek	Beaver	Bonneville cutthroat*	*Future Reintroduction
North Fork of North Creek	Beaver	Bonneville cutthroat Mottled sculpin	Remnant with introgression & Non-game

Table 8. Priority native cutthroat and recreational fisheries on the Fishlake Forest.

Stream / Lake / Watershed Name	Ranger District	Species of Interest	Type of Fisheries
Pine Creek	Beaver	Bonneville cutthroat	Reintroduced
Pine Creek/Bullion Canyon	Beaver	Rainbow trout Cutthroat trout Bonneville cutthroat*	*Future Renovation and Reintroduction
Pole Creek	Fillmore	Bonneville cutthroat	Remnant and Future Renovation and Reintroduced
Salina Creek	Richfield	Bonneville cutthroat Cutthroat trout Rainbow trout Brown trout Brook trout Mountain sucker Speckled dace Mottled sculpin Leatherside chub	Remnant Recreational & Non-game
Sam Stowe	Fillmore	Bonneville cutthroat	Reintroduced
Sand Creek	Loa	Colorado River cutthroat	Reintroduced
Sevenmile Creek	Loa	Brook trout	Recreational
Shingle Creek	Beaver	Brown trout Rainbow trout Bonneville cutthroat*	*Future Renovation and Reintroduction
Tasha Creek	Loa	Colorado River cutthroat*	*Future Renovation and Reintroduction
Tenmile Creek	Beaver	Bonneville cutthroat	Reintroduced
Three Creek/Pole Creek	Beaver	Brown trout Rainbow trout Bonneville cutthroat*	*Future Renovation and Reintroduction
UM Creek	Loa	Colorado River cutthroat Tiger trout Mottled sculpin	Reintroduced & Non-game
Upper Clear Creek	Beaver	Brown trout Rainbow trout Bonneville cutthroat	*Future Renovation and Reintroduction
Willow Creek	Richfield	Rainbow trout Cutthroat trout Bonneville cutthroat	*Future Renovation and Reintroduction

Table 9 lists important habitats for boreal toads and other aquatic organisms on the forest.

Table 9. Priority watersheds supporting other aquatic species of interest on the forest.

Stream / Lake / Watershed Name	Ranger District	Species of Interest
UM Creek	Loa	Chorus frogs
Sevenmile Creek	Loa	Chorus frogs

Table 9. Priority watersheds supporting other aquatic species of interest on the forest.

Stream / Lake / Watershed Name	Ranger District	Species of Interest
Greenwich Creek	Richfield	Boreal toads
Box Creek	Richfield	Boreal toads
Shingle Creek	Beaver	Leopard frogs
Three Creeks / Pole Creek	Fillmore	Leopard frogs
Manning Creek	Richfield	Boreal toads, Chorus frogs
Salina Creek	Richfield	Chorus frogs, Tiger salamanders
Upper Salina Creek	Richfield	Tiger salamanders
Gooseberry Creek	Richfield	Chorus frogs, Tiger salamanders
Upper Lost Creek above Little Lost	Richfield	Tiger Salamanders
Beaver River	Beaver	Leopard frogs

Primary Issues

The issues identified below are the primary considerations factored into the development and design of the proposed actions. Table 10 lists the hydrologic and aquatic issues and the indicators that were used to assess potential impacts. These issues are the most important and relevant considerations for water dependent resources based on current and expected impacts within the scope of the proposed actions.

Table 10. Management considerations and issues.

Management Consideration	Primary Issues	Issue Descriptions and Indicators
Soil Productivity	Motorized Cross-country Travel on Sensitive Soils	Off-route motorized travel can directly cause soil rutting and compaction, and loss of protective cover from ground vegetation and rock armor (desert pavement). This increases erosion potential and alters nutrient cycling. Indirectly, cross-country travel can introduce and spread invasive plants resulting in a loss of vegetative cover and diversity that can lead to higher erosion rates, and a greater need for chemical treatments. Indicators: • Miles of motorized routes on soils highly susceptible to geologic hazards, surface erosion, and puddling and compaction. • Acres in open use areas and within dispersed camping distance designations on sensitive soils.
Wetland and Riparian Area Condition	Amount and Proximity of Roads and Motorized Trails to Riparian Areas and Wetlands	Wetland and riparian areas are particularly vulnerable to motorized trespass because human use is concentrated in and near these areas and the terrain and gradient often provide the easiest relative access. Off-route use can modify wetland hydrology by causing headcutting or by altering or concentrating diffuse water flows. Either process induces erosion

Table 10. Management considerations and issues.

Management Consideration	Primary Issues	Issue Descriptions and Indicators
	Motorized Cross-country Travel within Riparian Areas and Wetlands	that can drain the local water table, affecting wetland and riparian condition and function. Rutting and compaction can lead to a loss of organic content of wetland soils from oxidation, which can lead to a loss of productivity and hydrologic function. Wetlands are typically sensitive to changing nutrient levels. Nutrient levels and the water chemistry can be altered by the delivery of sediment and debris from chronic or catastrophic erosion from routes and upland sources. Pollutants can also wash off or leak from vehicles at stream crossings. Indicators: • Miles of motorized route located adjacent to, or within a 300-foot riparian influence zone of, stream channels, lake margins, and wetlands. • Motorized route stream crossing frequency. • Acres in open use areas and within dispersed camping distance designations in the riparian influence zone.
Fisheries and Aquatic Organisms	Amount and Proximity of Roads and Motorized Trails to Riparian Areas and Wetlands Motorized Cross-country Travel within Riparian Areas and Wetlands and on Sensitive Soils	Delivery of sediment to streams can fill in fish spawning and rearing habitats, and the spaces between gravels, cobbles, and boulders on the streambed. Fish and the variety of aquatic organisms on which they depend use these habitats. North Horn sediments in particular are prone to accelerated surface and mass erosion once cover is lost. Other soil parent materials are also a concern (see the soils report by Michael Smith for further information). Mass erosion from slopes or structured stream crossings can introduce large volumes of sediment to streams over a short period. Elevated sedimentation can degrade water quality and habitat for fish and other organisms, and can negatively affect channel stability. Indicators: • Miles of motorized route located adjacent to, or within a 300-foot riparian influence zone of, stream channels, lake margins, and wetlands. • Miles of motorized route on sensitive soils. • Motorized route density within the cumulative effects watershed. • Motorized route stream crossing frequency. • Acres in open use areas and within dispersed camping distance designations in the riparian influence zone and within the cumulative effects watersheds.

Table 10. Management considerations and issues.

Management Consideration	Primary Issues	Issue Descriptions and Indicators
Water Quality	Amount and Proximity of Roads and Motorized Trails to Riparian Areas and Wetlands Motorized Cross-country Travel within Riparian Areas and Wetlands, on Sensitive Soils, and within CEAs	The impacts to soil productivity and riparian and wetlands described above can lead to adverse impacts to water quality. The two primary pollutants of concern from motorized use are sediment and to a lesser degree chemical pollution, primarily from petrol hydrocarbons. Indicators: • Miles of motorized route located adjacent to, or within a 300-foot riparian influence zone of, stream channels, lake margins, and wetlands. • Miles of motorized route on sensitive soils. • Motorized route density within the cumulative effects watershed. • Motorized route stream crossing frequency. • Acres in open use areas and within dispersed camping distance designations in the riparian influence zone, on sensitive soils, and within the cumulative effects watersheds.

Issue indicators are used to measure the response and expected changes to the at-risk water resources and aquatic habitats. The indicators are chosen because they directly or indirectly relate to anticipated disturbance processes, and because they are expected to reveal differences between the alternatives. The linkages between the issue indicators and the management considerations and primary issues are discussed further in the Affected Environment sections of this report.

Issues Presenting Minimal Risk to Beneficial Uses or Eliminated by Project Design

Microbial contaminant impacts to water quality: This water quality issue relates to organisms such as E. Coli and Fecal Coliform bacteria. Current levels of microbial contaminants in streams and lakes on the forest are not known. Grazing and recreation are the primary sources of concern for this issue. Management under any of the alternatives is not expected to increase the number of or potential for humans, cattle, sheep, or wildlife to defecate in or near stream courses. In fact, the action alternatives substantially reduce route mileage and acreage of open use areas in riparian influence zones in most CEAs, which should reduce the potential for contamination. Therefore, no direct, indirect, or cumulative effects of microbial contaminants to water quality are anticipated.

Radioactive contaminant impacts to water quality: Natural geologic features are usually the primary source of radioactive contaminants; although residual radioactivity from above ground nuclear testing in Nevada may be present in some locations. On the forest, natural sources of these contaminants are known to be more prominent on volcanic geologies than on the sedimentary geologies. Uranium and hard rock mines have brought radioactive substances to the surface in locations such as Indian Creek. The tailings from the Mystery Snifter uranium mine located between the road and the creek are radioactive and are sometimes driven on by ATVs.

The Street Legal Only designations in the action alternatives for Indian Creek would reduce the potential harm to humans and/or water quality by restricting the use to full sized vehicles and licensed motorcycles. The No Action alternative would not change the existing risk. The goals of reducing erosion and protecting riparian areas and wetlands using the "Required Design Criteria" and the requirements for protection of historical mines in the FEIS are consistent with preventing or reducing delivery of radioactive contaminants where natural or human related sources are present. Therefore, no significant direct, indirect, or cumulative effects are anticipated.

Decreases in stream base flows: Except for foreseeable actions, no new roads or trails, stream crossings, reservoirs, or diversions would be constructed under any alternative, so slope drainage will not be altered from its present condition. Reducing motorized cross-country travel would further reduce this possibility relative to No Action. The route obliteration associated with the action alternatives would restore natural slope hydrology, which is needed to maintain base flows. Provided the "Required Design Criteria" are applied, no direct, indirect, or cumulative effects to soil productivity, wetland and riparian area condition, aquatic organisms, or water quality from loss of base flows are expected.

Changes in stream dynamic equilibrium: No substantial change in runoff or sediment regimes is anticipated provided the "Required Design Criteria" are followed (see subsequent analyses). Floodplain connectivity would be restored when obliterating encroaching routes in an action alternative. No Action would retain existing floodplain modifications and would allow further user created encroachments by retaining most of the forest as open to motorized cross-country travel. The action alternatives would decrease the mileage of motorized routes and acres of open use areas within and adjacent to stream channels, riparian areas, lake margins, and wetlands, which would protect riparian and channel conditions. No detectable direct, indirect, or cumulative adverse effects to or from changes in stream condition are likely under any alternative, but especially if an action alternative is chosen.

Methods

The following methods, definitions and assumptions were used for the analyses presented in this report.

Sources of Information

The following sources were used to inform and support the analyses presented in this report. This information is incorporated by reference (see Referenced Cited for additional information).

- Dixie and Fishlake Roads Analysis dated January 10, 2003
- Fishlake Roads Analysis supplement prepared for the Fishlake OHV Route Designation Project
- Life History and Analysis of Endangered, Threatened, Candidate, Sensitive, and Management Indicator Species of the Fishlake National Forest (Rodriguez 2005)
- Utah Division of Wildlife publications on cutthroat and recreational fisheries status (eg. Chamberlain and Hepworth 2003, Hepworth et al. 2003, Hepworth et al. 2002)
- Level 2 Integrated Riparian Evaluations conducted across the forest (Petty 2002-2005)
- Forest Plan inventory and monitoring reports for watershed and fisheries (eg. Deiter 2003 and Whelan 2003)
- Stream crossing effects monitoring done for the Rocky Mountain and Fillmore ATV Jamborees (Deiter 2006a and 2006b)
- Watershed and Fisheries Reports for the OHV Event Environmental Assessment to permit the Rocky Mountain and Fillmore ATV Jamborees (Deiter 2001, Whelan 2001a and 2001b)

- Beaver and Fremont River Watershed Assessments (USDA Forest Service 2002 and 2004)
- Fishlake National Forest Geographic Information System maps and attribute data for soils, vegetation, watersheds, streams and lakes, travel routes and restrictions, land ownership, and dispersed recreation sites
- Additional contextual and issue indicator information for the cumulative effect watersheds is located in a spreadsheet named fishlake_ohv_route_designation_aquatics_report.xls in the project file.

Delineation of Cumulative Effects Watersheds

Cumulative effects areas (CEAs) are used to summarize potential impacts to watershed and aquatics. A cumulative effects watershed is the area above a given stream location where various distributed activities integrates – either amplifying or canceling individual impacts. The sum of the impacts can either be greater or less than the sum of the individual effects depending on the types and timing of activities and how they interact. Cumulative effects are easiest to detect at the highest point in the watershed where the individual past, present, and reasonably foreseeable effects overlap in time and space (MacDonald 1989). A "minimum bounding watershed" layer that encompasses the Fishlake National Forest was constructed for this project to facilitate cumulative effects analysis by watershed at the highest point near or below the forest boundary where detectable cumulative effects could spatially overlap. The lowest elevation "pour points" of the cumulative effects area watersheds were chosen considering the type and magnitude of impacts potentially generated by the route designation project and based on downstream management or alterations that mask or overwhelm measurable watershed responses. These features include:

Dams and Diversions: In many cases on and off the forest, dams and diversions have substantially altered streamflow and sediment transport magnitudes, distribution, timing, and rates of response. Reservoirs and diversion structures built as early as the late 1800s typically dominate streamflow and sediment regimes in the places where they occur. Their impacts are typically far greater than any other land use or watershed modification, especially on National Forest System lands. The potential for modification of streamflow and sediment regimes associated with route use or obliteration are orders of magnitude smaller in degree and shorter in time than the changes caused by dams and diversions. Lakes and reservoirs directly reduce peak spring flows by storing water during snowmelt periods and by increasing base flow during the growing season when water is released for irrigation. This manipulation alters the natural timing, duration, and volume of streamflow for each season. On and below National Forest System lands, diversions for irrigation and culinary water transfer flow from one watershed to another, reduce, or eliminate flow downstream of the structure. For the most part, the streamflow changes resulting from reservoirs and diversions tend to reduce the ability of the stream to rework, transport, and flush sediments. The alteration in streamflow and sediment transport can adversely affect riparian vegetation structure, composition, and function. The reservoirs physically trap sediments and debris that would normally move downstream. This alters floodplain development and nutrient exchange, and increases the potential for erosion by "clean" water downstream of the impoundment. Channel gradient and elevation are constantly altered immediately upstream of dams by changing water levels in the reservoir, which leads to unstable channel conditions in the affected reaches. Trapped sediment, and beaver dams on dam outlets, can be a constant maintenance problem. Flushing flows to release stored sediments or caused by quick removal of beaver dams can create significant negative consequences for water quality and support of aquatic resources downstream. Dams add an element of risk to streams due to the potential for catastrophic failure of the impoundment. These types of impacts completely mask any potential consequences that could be measured from roads and trails and their use by motorized

vehicles. Therefore, dams, diversions, and canals were used where appropriate for defining cumulative effects watersheds on and below the National Forest.

Type and Magnitude of Land Uses on Adjacent Lands: The types and magnitude of land uses below public lands is typically much more varied and intense than what occurs on National Forest System lands. Land use impacts on private lands related to agriculture, urban development, and transportation and utility corridors can overwhelm any hydrologic or aquatic response that may come from National Forest activities. Therefore, land use on adjacent lands was considered when locating the bottom elevations for cumulative effects watersheds.

Alluvial Fans and Face Drainages: Alluvial fans are stream depositional areas that tend to disperse rather than concentrate impacts and that are often very dynamic. Flow across alluvial fans can be difficult if not impossible to predict. Face drainages are slopes with an even or convex profile than tend to distribute rather than concentrate water and sediments. Therefore, the features were considered when determining the lower extent of cumulative effects areas. For example, several CEAs stop at the top of alluvial fans and some face drainages along the National Forest boundary are not included in an effects area.

Size of Parent Watersheds and Sub-basins: Typically the physical effects of runoff modifications, sediment loading, and water temperature, if they occur in projects of this scale, are immeasurable and/or not observable at large watershed, sub-basin, or basin scales. This results from desynchronization. Individual tributaries respond at different times of the year or respond slower than others to disturbance and climatic events. Watersheds are dynamic because they are created and maintained by processes that exhibit inherently large ranges of variability. The total cumulative effects areas for this project account for roughly 21.2 percent of the total drainage area of the Sevier River basin, 11.6 percent of the Beaver River sub-basin, 14.0 percent of the Fremont River sub-basin, 15.9 percent of Muddy Creek sub-basin, and 0.4 percent of the Escalante Desert sub-basin. However, forest tributaries drain to these basins and sub-basins at multiple spatially distributed locations. The receiving basins and sub-basins have drainage areas and flow and land use impacts that are orders of magnitude larger and more varied than what occurs in the individual tributaries that leave National Forest lands. Therefore, the size of National Forest tributaries relative to the parent basins was factored into the delineation of cumulative effects areas.

At-risk Resource Values: Cumulative effects watersheds were delineated at locations that allow effects to be assessed for important recreational and native cutthroat fisheries and 303(d) Water Quality Limited water bodies.

A total of 713 CEAs were needed to define the minimum-bounding watershed. Map 1 shows the broadest generalization of CEAs presented in this report, which are the portions of 5th Field watersheds that are within the minimum-bounding watershed. The tables in Appendix D refine the 5th Field delineations into 45 finer scale summaries that facilitate assessment of effects to important fisheries and Water Quality Limited stream segments and water bodies.

The proposed actions have been designed to reduce existing risks to water quality and aquatic organisms and habitats while minimizing new impacts. At some locations on forest, but certainly downstream of National Forest System and BLM lands, the abundance of reservoir storage, streamflow diversions, stream channelization, and intensive land use make it impossible to detect watershed and channel effects at broader scales. Thus, no physical response from the Fishlake OHV Route Designation Project will be measurable below the CEAs or at the scale of the Sevier River, Beaver River, Fremont River, Muddy Creek, or the Escalante Desert.

Definitions

Encroaching: For the purpose of this analysis, motorized routes within 50 feet of stream, lake, reservoir, and wetland margins are considered encroaching because of the high potential to create direct impacts. Stream, lake, reservoir, and wetland locations are based on those in the forest Geographic Information System, in particular from the USGS National Hydrologic Datatset files.

Riparian Influence Zone: This analysis uses a 300 foot buffer from stream, lake, reservoir, and wetland margins to define a zone where direct and indirect impacts have the most potential to influence water quality and riparian conditions. This distance is commonly used (eg. PACFISH, INFS) and is based on the findings of the literature review by Belt et al. 1992.

Sensitive soils: The Fishlake soils resource inventory and management interpretations from the forest Soil Scientist were used to determine which soils are sensitive to surface and mass erosion. For this analysis, a soil is considered sensitive if it is rated with a moderate or higher hazard for wind or water erosion, or a medium or higher potential for puddling and compaction, or a moderate to severe inherent geologic hazard rating. A limitation of this measure is that the soils coverage only includes lands within the administrative boundary of the Fishlake National Forest.

Stream Crossings: Stream crossings were identified using a line-on-line intersection tool in ArcView. The mapped route and stream features at 1:24000 scale are supposed to be within plus or minus 40 feet of their actual location on the ground 90 percent of the time. The combined error for routes and streams is at best plus or minus 80 feet 81 percent of the time. Many routes on the forest are located closer than the margin of error for the mapping, which results in more intersections on the map than actually occurs on the ground. Therefore, the actual number of stream crossing is much less than what is given by the stream crossing frequency indicator, but the measure is still useful for relative comparisons among alternatives.

Open Use Areas: For the purposes of modeling, the distance designations for dispersed camping are analyzed in the same way as designated open use areas. This is done for simplicity, but it creates a worst-case comparison between No Action and the action alternatives. Only No Action allows unrestricted motorized cross-country travel for the purposes of dispersed camping. In the action alternatives, the distance designation states that motorized travel must occur on an existing track within the specified distance from an open designated route. The distance designation permits travel off of a designated route, but not off an existing route. The allowance does not permit creation of new routes. More importantly, most of the distance designations are temporary. The forest will inventory roughly 20 percent per year of routes that use distance designations for dispersed camping. Distance designations will be removed from routes that do not provide desireable existing dispersed camping opportunities. Most dispersed camping corridors will be removed once access routes to campsites are inventoried, properly assessed, and designated on a motor vehicle use map. Therefore, the approximation of areas potentially open to motorized cross-country travel in the action alternatives are grossly overestimated. Areas truly open to motorized cross-country travel are less than indicated by the modeling as well. On site terrain features such as dense woody vegetation, large rocks, uneven and steep slopes reduce the total amount of area where motorized vehicles can actually travel. Though it is unknowable, the actual footprint of open use areas is significantly smaller than what is indicated in the analyses tables. Even so, the relative rankings are still meaningful. [Note: The term "cross-country travel" assumes motorized rather than non-motorized travel and excludes over snow travel unless noted otherwise.]

Non-motorized trail: It is important to note that intended recreational trail use based on Forest Service designations does not always match what is occuring on the ground. There are numerous non-motorized trails that are currently used by motorized users. Much of this use is from ATVs

and motorcycles in open use areas. There are also numerous non-motorized trails that are being used by ATVs and motorcycles in closed areas. If an action alternative retains the non-motorized use designation, it will not appear to be a change on paper, even though in reality a change of use and impacts will occur. A reduction in resource impacts beyond what is suggested by the issue indicators will likely result from removing motorized use from non-motorized trails.

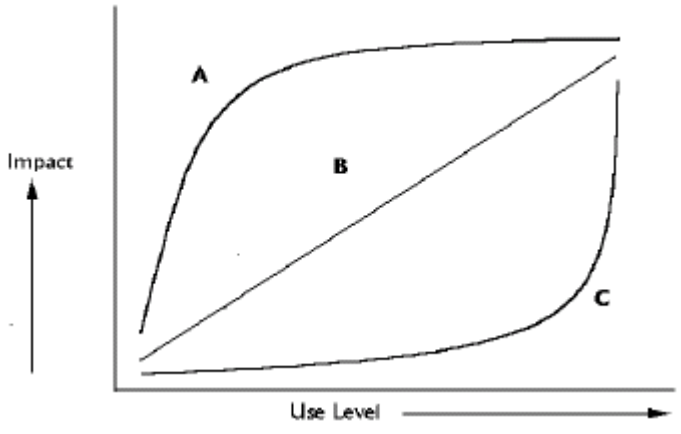
Assumptions

Required Design Criteria: The effects analysis assumes that Required Design Criteria are implemented correctly and in a timely manner, but does not make the assumption that the measures will be 100 percent effective unless a measure is designed to prevent or avoid a given risk entirely.

Implementation: The effects analysis assumes that the updated motorized travel plan, including the proposed route obliterations and installation of signs and barriers will be accomplished in the first year of implementation. However, it is recognized that the plan will take several years to implement. This means that in reality the impacts and benefits from the proposed actions will also be spread out over several years.

Motorized Travel Plan Effectiveness: Public compliance and law enforcement is necessary to create the full benefits sought for the action alternatives. However, the effects analysis recognizes and assumes that travel plan violations will still occur under the action alternatives, but that the frequency of occurrence will be some degree less than what occurs under No Action. It is reasonable to believe that switching to an explicit designated use only system that is simpler to understand and more consistent with adjoining lands should be inherently more enforceable. This is especially true because new physical closures will make more obvious which routes are open and closed. The forest accounted for existing and anticipated enforcibility considerations into all site-specific route and area designations in the action alternatives, which resulted in improvements over the current situation.

Potential for Unintended Consequences: The following considerations were factored into the route and area designation decisions that were made in the action alternatives. There are three potential relationships between use levels and the amount of resulting biophysical and social impacts that have been studied by recreation ecologists. These are displayed in the figure below that is taken from (McCool 2002).



Curve C represents a situation where use impacts could theoretically be minimized by defining and managing carrying capacity. Simply limiting use levels to below the point where the curve steepens could quickly restore degraded sites. Impacts that are directly proportional to use are displayed as Curve B. In this case, the concept of carrying capacity no longer applies. A manager would need to define a maximum acceptable level of impact and manage accordingly. Recovery of degraded sites would respond in a predictable linear fashion to reductions in use. Curve A displays the situation where most of the potential impacts are created by low to moderate levels of use. This relationship implies that the magnitude of impacts from high use is not much greater than the impacts of low to moderate use. "Settings characterized by even moderate levels of use would have to

experience significant reductions in order to reduce impacts. In many cases, such reductions would still have little effect on the level of impact" (McCool 2002).

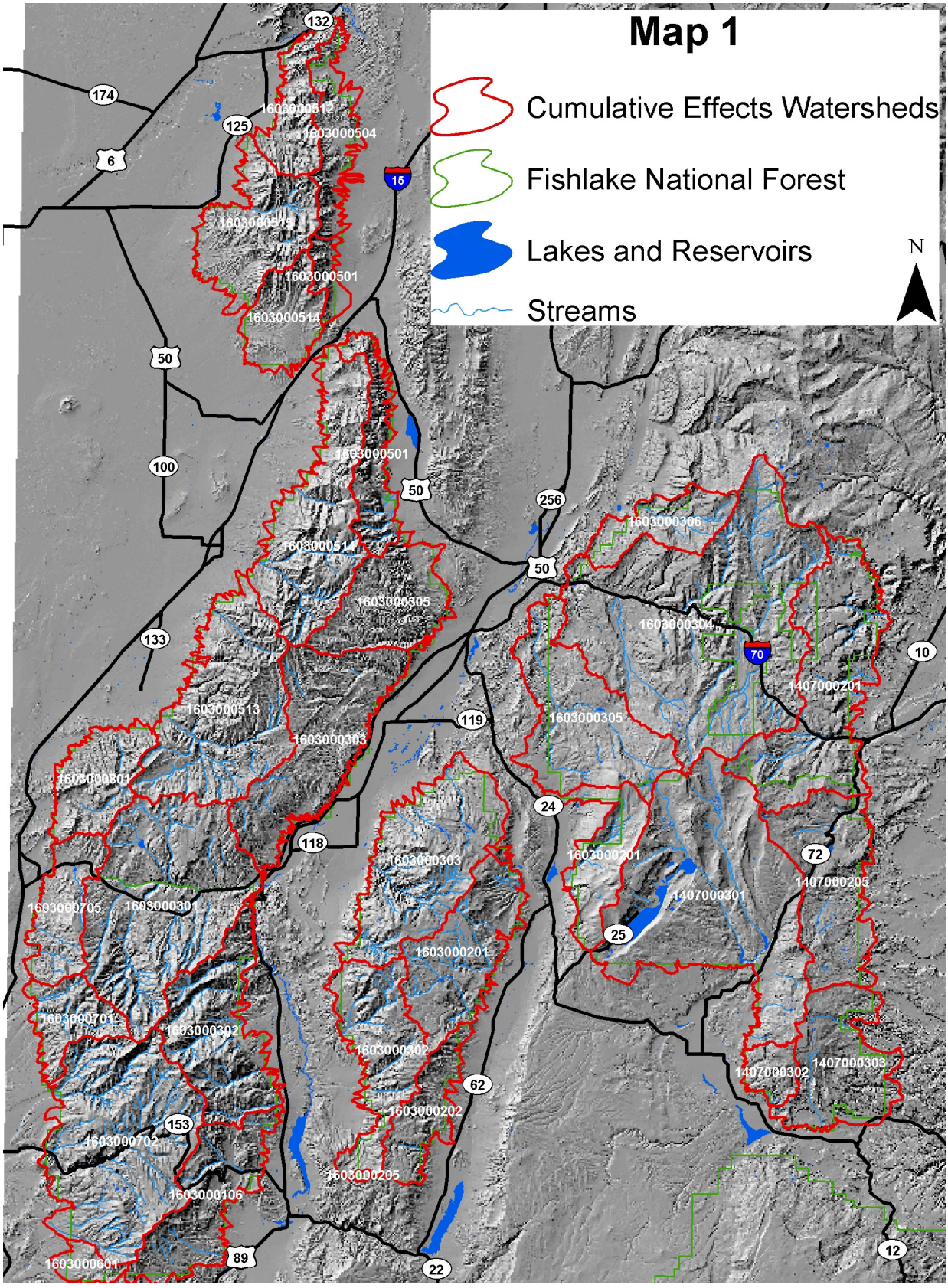
Research in both biophysical and social settings indicates that Curve A represent the most common relationship between recreation use levels and impacts, although Curve B has been observed (Marion 1996, McCool 2002). The interdisciplinary team feels that these same relationships hold true on the Fishlake National Forest. In many cases, the motorized route itself is a large or majority portion of the defined resource impacts, with use as a secondary and lesser additional impact. In other words, having the facility available for even one user creates a large portion of the total resource impact. This is certainly the case for some watershed impacts. The same is true for off-route impacts. For example, most of the compaction of soils occurs after the first few passes over previously undisturbed sites. Similarly, one seed from one pass of a vehicle spreading invasive plants is all that is needed to colonize a new area. Implications of this research include the following:

- limiting use will likely be ineffective in controlling impacts except at very low use levels,
- strategies that contain or concentrate use will be more effective at minimizing adverse biophysical and social impacts than strategies that disperse use,
- displacing existing use to new areas will create new impacts and will not likely promote recovery at the original sites given that most of the impacts occur at low to moderate levels of use.

Given the level of existing and foreseeable demand for motorized recreation opportunities on the Fishlake National Forest, there are some levels and/or locations of route and area closures that would create resource impacts through displacement of motorized use to new areas on or off the forest. This is particularly true for popular routes such as the Paiute and Great Western trails and popular dispersed camping areas (see Appendix B for a list).

Adaptive Management: The effects analysis assumes that the Forest Service will continue to monitor, assess, prioritize, mitigate and/or rehabilitate routes that create undesirable resource impacts. This is standard procedure. Route designations that cannot be effectively enforced or where mitigations cannot provide required resource protections over time will be obliterated.

The benefits and impacts to aquatic resources from No Action or any of the action alternatives will not be detectable below the lowest cumulative effects areas shown on Map 1.


Map 1
Cumulative Effects Watersheds
Fishlake National Forest
Lakes and Reservoirs
Streams
N
132
174
125
6
15
1603000504
1603000501
1603000514
50
100
133
256
70
10
119
24
118
72
25
62
153
89
22
12
1603000306
1603000305
1603000304
1603000513
1603000303
1603000201
1603000202
1603000205
1603000106
1603000601
1603000702
1603000703
1603000302
1407000201
1407000205
1407000301
1407000302
1407000303

Effects Common to All Alternatives

The following impacts will occur regardless of which alternative is chosen:

Reasonably Foreseeable Projects: The Fishlake National Forest has numerous current and planned projects that will be implemented regardless of which OHV Route Designation alternative is selected. There are also several potential transportation related projects that are not addressed in the OHV Route Designation Project because they are complicated enough to warrant separate NEPA analysis. These are listed in Appendix B of the FEIS. General effects and changes to relevant issue indicators from reasonably foreseeable activities in combination with the OHV Route Designation Project are described in Appendix C.

Standard Road and Trail Maintenance: When implemented properly, road and trail brushing, blading, shaping, and ditch cleaning help maintain the structures and intended design for cross drainage. Improperly implemented maintenance can have the opposite effect. This work results in exposed soil, which can be eroded. Whether or not eroded soil will enter a stream is primarily determined by slope distance, gradient, and the type and amount of obstructions between the route and the channel. Eroded soil from routes further than 300 feet from streams and lakes will likely be detained by vegetation, debris, and topographic depressions (Ketcheson and Megahan 1996, Belt et al. 1992). Routes within the riparian influence zone will likely deliver some of the loosened soil to aquatic habitats. However, maintaining cross drainage is critical to reducing water concentration and sediment delivery to channels. Depending on the type of material at the route surface, loose soil tends to re-compact as long as adequate moisture is present.

Existing Resource Impacts: The Forest Service has used its discretionary authority to limit the scope of this project. Addressing all transportation or transportation related issues, uses, and impacts is a much larger task than is feasible to cover in one assessment. It will take decades of incremental improvement through adaptive management to meet all of the objectives and requirements for transportation planning stated in Forest Service directives and policy assuming current funding levels. Accordingly, the Forest Supervisor has limited the scope of the project to what is specified in the Purpose of and Need for Action. The most immediate and important transportation impacts and conflicts are being addressed. As such, all alternatives have unresolved resource impacts and conflicts related to the transportation system and motorized use. However, each action alternative makes substantial improvements towards reducing redundant routes, and minimizing resource impacts and user conflicts as required by 36 CFR 212.55 and Executive Orders 11644 and 11989. The amount of time for implementing each of the action alternatives will push the limit for the shelf life of the OHV route designation NEPA document even with the added priority the forest is giving to implementation. Implementation will also push the limits of available funding and personnel resources available to the forest, but this project is a top priority.

Cumulative Impacts with Adjoining Lands: The Richfield BLM Field Office is in the process of revising its Resource Management Plan (RMP). The new RMP will include greater restrictions on motorized cross-country travel and will designate a motorized travel network. Based on ongoing coordination, the new travel plan will be more consistent across lands managed by both agencies than what exists currently. This should make the travel plans from both agencies easier for the public to understand and for the agencies to enforce. The RMP should improve on dated management direction for all or most of the resources managed by the respective BLM offices. This should reduce land use impacts to some degree as the new plans are implemented. Since BLM lands adjoin National Forest System lands managed by the Fishlake National Forest, this should result in a net decrease in cumulative impacts over

time. The same reasoning can be applied to the revision of the Forest Plans for the Dixie and Fishlake National Forests.

Effects Common to All Action Alternatives

The action alternatives include only changes to route and area designations, route classification, and travel plan rules. The changes to the existing route system are a primary focus of the effects analysis for each resource. However, the effects of all routes and open use areas within the cumulative effects areas, including routes or rules that are not changing in any way, are included in the cumulative effects analyses. All routes being evaluated in the OHV Route Designation Project currently exist and are being used to varying degrees. As such, the impacts to the various resources described in the FEIS are already occurring. Rather than creating new effects, the proposed actions primarily result in maintaining or reducing existing cumulative impacts associated with the route network and motorized use.

Potential for Cumulative Impacts: Closing the Forest to motorized cross-country travel will have the effect of reducing the potential for direct and indirect off-route interactions and impacts with other land uses. By definition, this will have the effect of reducing actual and potential cumulative impacts to nearly all other resource values and uses on the forest.

Barrier Installation: The installation of barriers is not expected to generate enough site disturbances to affect hydrologic or aquatic resource values. In fact, physical barriers are expected to reduce impacts by improving compliance with the motorized travel plan.

Obliteration of Stream Crossings: Route obliterations would create short-term disturbances that could deliver sediment to channels, lakes, or wetlands, especially the first year after completion. Most of the crossings to be recontoured are low water fords, but structured crossings would also be removed. Throughfill currently situated over structured crossings would be removed and safely stored outside the channel floodplain, which would make it unavailable to the stream network. The risk of massive sediment delivery from either washouts or fill failures would immediately be eliminated at these sites. Most of the crossings are intermittent or have base flows less than 0.5 cubic feet per second. Only a minimal amount of sediment (or none if the channel is dry) would be entrained and transported at these crossings during the obliteration activities. Perennial crossings would entrain and transport sand or smaller sized sediment for a very short distance because the work would occur during base flow conditions. Turbid water from smaller particles would be visually evident for a few to several hundred feet as the stream channel and floodplain are restored (see turbidity decay curves and discussion in Deiter 2002b, 2006a, and 2006b). Sediment would be generated from the moment that restoration of natural stream banks is started in the case of low water fords or as soon as the pipe is removed. In either case, turbidity would decrease minutes after the recontouring is completed. Route fill over structured crossings would be moved away from the stream prior to pulling the culvert. Standard erosion control measures such as temporarily diverting flow into a culvert, a plastic or rock lined channel, pumping water below the site, or use of silt fences or hay bales would be used to minimize sediment transport downstream. All crossings would flush a minimal amount of fine sediment to parent streams during first summer thunderstorm or spring snowmelt following the channel restoration. The small amount of sediment input during and after obliteration would occur over a span of minutes to several hours. Provided that the "Required Design Criteria" are followed, the stream channel restoration is not expected to exceed turbidity or other water quality standards for domestic water quality and cold-water biota, and is inconsequential relative to the resulting reduction in sediment risk. The "Required Design Criteria" would reduce, to acceptable levels, the risk of spilling and delivering contaminants to the stream network during obliteration. Reducing the number of

stream crossings would lower the risk that hydrocarbons and other chemicals might be spilled or washed from motorized vehicles.

Obliteration between Crossings: Most of the obliteration between stream crossings would involve cross draining the route with waterbars on roughly 50 feet spacing, and removing relief culverts when present. Dixie harrow treatments would also be used for some routes with minimal or non-existent cut and fill slopes when in grass and sage vegetation types. Less than three percent of the obliterated routes would need to be fully recontoured in order to stabilize unstable cut and fill slopes. Under any of the obliteration scenarios, a large percentage of the route prisms would be disturbed. Vegetation often becomes re-established on the disturbed soil by the end of the next growing season following obliteration. Until the vegetation does re-establish, the disturbed soil would be more susceptible to erosion. The frequent cross ditching would significantly reduce the volume of water that could entrain and transport soil from the excavated sites, and would promote re-infiltration of surface water down slope. Eroded soil would no longer be moved once the water re-infiltrated the undisturbed slopes below the route. Additional filtering or buffering potential is provided by down slope vegetation, downed wood, and distance from the channel network (Ketcheson and Megahan 1996). Roughly 88 to 93 percent of the proposed obliterations are further than 50 feet from channels and wetlands, depending on alternative. About 55 to 71 percent of the proposed obliterations are greater than 300 feet from channels and wetlands, depending on alternative. The obliterated routes would no longer concentrate and re-route water to naturally unstable slopes or other roads and trails so gullying and landslide potential would be reduced where the potential exists currently. Recontouring would stabilize unstable route segments by restoring the natural slope that is less steep than constructed cut and fill slopes, by buttressing the cutslopes with the soil excavated from the fill slopes, and by promoting the natural dispersion of water. Reducing the potential for roads and trails to cause surface and mass erosion translates into an immediate reduction in sediment risk within the project watersheds. As a result, and provided that the "Required Design Criteria for All Action Alternatives" are followed, obliteration between crossings is expected to reduce the short and long-term production and delivery of sediment to streams.

Designation of Additional Routes to Dispersed Campsites: During implementation of an action alternative there may be existing routes that are not in the GIS coverage, that are needed to access existing dispersed campsites, and that are further than either the 150 or 300 foot travel distance designation. Especially for Alternatives 2, 3, and 4, there are inventoried campsites where the forest travel layer shows no access route. The same situation exists for some campsites that are not yet inventoried. Most, though not all of these situations are already addressed through the route designations in Alternative 5. Adding existing motorized access routes to existing dispersed campsites would not likely affect hydrologic or aquatic resources if the routes are not located within riparian influence zones or wetlands or on soils sensitive to erosion. Any route that could affect the above watershed and aquatic issue indicators should be evaluated on a case-by-case basis with additional analysis and documentation completed if necessary.

Effects from Roads and Motorized Trails and Open Use Areas on Stream Channels, Riparian Areas, and Wetlands

Affected Environment

Encroaching routes are defined in this analysis as roads and trails, within 50 feet of stream channels, lake margins, and wetlands. Encroaching roads and trails risk filling of natural floodplains, lake fringes, or wetlands. Routes within 300 feet of stream channels, lakes, and wetlands are considered to be within the "riparian influence zone". Facilities such as roads, road

fills, landings, and other encroachments in close proximity to channels have great potential to directly and indirectly modify streams (Gucinski 2001, Belt et al. 1992, Meehan 1991). In addition to being a mechanism of disturbance, encroaching and riparian roads and trails are also instrumental in providing access to and concentrating use within riparian areas (including wetlands) and streams by livestock and humans. This is especially true in areas that are open to wheeled motorized cross-country travel as often occurs around and between undeveloped dispersed campsites. Many channel disturbances and in-channel failures, or evidence of instability on the forest, can be attributed to one or a combination of these circumstances. Whether due to improper location, inadequate design or construction methods, lack of maintenance, or simply due to the inevitability of failure over time, some facilities have either failed catastrophically or are chronic sediment sources. In addition, airborne particulates from motorized use are more likely to settle out in streams and lakes when the route is in close proximity to them.

Road and trail crossings can fragment aquatic habitats by creating migration barriers. All stream crossings, but especially those that are forded create an elevated risk of contamination with hydrocarbons (Deiter 2002a, 2002b, 2006a, 2006b), and for introducing or spreading aquatic nuisance species such as whirling disease (Deiter 2003, Whelan 2003). Much of the risks associated with direct delivery of bed load materials are directly associated with stream crossings. The most efficient sediment delivery occurs when the eroded materials are delivered directly to the stream course. This happens when the erosion source is essentially adjacent to the water. Throughout the forest, especially in the tributary areas with higher channel densities, this efficient delivery situation is apparent. Facilities, (primarily roads and motorized trails) sometimes encroach on stream channels or their active flood prone areas and low terraces, often over long lineal distances. This proximity to the streams not only assures the immediate and efficient delivery of eroded soil, but it often creates the erosion mechanism in the first place. The extent of this form of erosion and mechanism of sediment delivery is widespread on the Fishlake National Forest. All of the channel network, not simply flowing streams, are important to consider. Material delivered to dry channels ultimately is delivered to perennial waters. Based on the discussion above, it is evident that reducing miles of travel routes within riparian areas and along streams and wetlands reduces actual and potential impacts to watershed and aquatic resource values. Table 11 shows, by alternative, the miles of roads and motorized trails within 50 feet of stream channels, lakes and wetlands within each cumulative effects watershed that encompasses the forest.

Table 11. Encroaching motorized route cumulative effects indicator.

HUC Number	Cumulative Effects Watershed	Miles of Motorized Route Encroaching on Channels, Lakes, and Wetlands				
		Alt 1	Alt 2	Alt 3	Alt 4	Alt 5
1407000201	**Ivie Creek - Upper Colorado River**	11.1	9.7	9.7	8.4	9.9
1407000205	**Salt Wash**	5.8	4.3	4.6	4.2	5.1
1407000301	**Headwaters Fremont River**	21.9	14.0	14.2	12.1	17.7
1407000302	**Pine Creek-Fremont River**	0.6	0.5	0.5	0.3	0.5
1407000303	**Deep Creek-Fremont River**	3.1	2.0	2.2	2.0	2.6
1603000106	**City Creek-Sevier River**	9.3	6.7	7.0	6.7	7.1
1603000201	**Upper Otter Creek**	14.3	11.7	12.7	5.6	12.7
1603000202	**Lower Otter Creek**	8.2	7.4	6.8	2.8	6.8
1603000205	**Lower East Fork Sevier River**	0.0	0.0	0.0	0.0	0.0
1603000301	**Clear Creek**	21.3	17.1	17.1	15.9	16.5
1603000302	**Beaver Creek-Sevier River**	12.8	10.0	9.5	8.7	9.6

Table 11. Encroaching motorized route cumulative effects indicator.

HUC Number	Cumulative Effects Watershed	Miles of Motorized Route Encroaching on Channels, Lakes, and Wetlands				
		Alt 1	Alt 2	Alt 3	Alt 4	Alt 5
1603000303	Cottonwood Creek-Sevier River	35.6	23.7	23.3	12.6	22.3
1603000304	Salina Creek	20.2	17.0	17.3	11.6	18.0
1603000305	Lost Creek-Sevier River	15.7	11.5	10.3	6.9	11.3
1603000306	Willow Creek-Sevier River	1.6	1.0	1.0	0.7	1.1
1603000501	Ivie Creek - Lower Sevier River	3.1	2.5	2.4	1.7	3.0
1603000504	Upper Sevier River	1.2	1.0	1.0	0.7	0.9
1603000512	Middle Sevier River	5.7	5.4	5.5	2.7	4.8
1603000513	Corn Creek	8.6	9.1	9.1	4.5	9.2
1603000514	Chalk Creek	21.3	19.2	19.5	12.1	19.7
1603000515	Oak Creek	12.5	11.7	11.5	8.4	10.7
1603000601	Fremont Wash	1.7	1.6	1.6	1.6	1.7
1603000701	Indian Creek	4.9	4.5	5.3	4.5	5.4
1603000702	South Creek-Beaver River	16.5	14.4	14.1	11.9	14.6
1603000705	Cove Creek	5.0	3.6	3.6	3.5	4.6
1603000801	Pahvant Valley	5.1	4.8	6.5	2.4	6.0
CEA - FOREST TOTALS		**267.2**	**214.4**	**216.3**	**152.6**	**221.6**

Table 12 shows, by alternative, the miles of roads and motorized trails within 300 feet of stream channels, lakes and wetlands within each cumulative effects watershed that encompasses the forest.

Table 12. Riparian motorized route cumulative effects indicator.

HUC Number	Cumulative Effects Watershed	Miles of Motorized Route in the Riparian Influence Zone				
		Alt 1	Alt 2	Alt 3	Alt 4	Alt 5
1407000201	Ivie Creek - Upper Colorado River	63.7	53.0	52.8	47.3	53.9
1407000205	Salt Wash	38.8	29.6	31.2	28.8	34.1
1407000301	Headwaters Fremont River	110.3	79.2	82.2	68.1	91.7
1407000302	Pine Creek-Fremont River	3.4	2.7	2.8	2.3	3.1
1407000303	Deep Creek-Fremont River	23.9	15.7	17.5	15.0	18.8
1603000106	City Creek-Sevier River	40.0	27.8	28.1	26.8	29.2
1603000201	Upper Otter Creek	62.5	52.6	55.3	35.6	55.6
1603000202	Lower Otter Creek	21.8	19.2	17.1	9.9	17.1
1603000205	Lower East Fork Sevier River	0.1	0.1	0.1	0.1	0.1
1603000301	Clear Creek	96.0	80.7	80.7	75.2	79.6
1603000302	Beaver Creek-Sevier River	70.5	57.1	57.0	51.0	57.5
1603000303	Cottonwood Creek-Sevier River	128.8	91.3	91.9	58.0	90.2
1603000304	Salina Creek	155.8	134.1	135.4	113.7	139.0
1603000305	Lost Creek-Sevier River	71.9	56.3	51.9	38.1	54.4
1603000306	Willow Creek-Sevier River	13.4	10.7	10.6	8.3	11.1
1603000501	Ivie Creek - Lower Sevier River	16.8	14.0	13.7	11.6	16.2
1603000504	Upper Sevier River	10.3	8.9	8.6	7.8	8.3
1603000512	Middle Sevier River	29.9	24.8	24.9	18.7	24.6

Table 12. Riparian motorized route cumulative effects indicator.

HUC Number	Cumulative Effects Watershed	Miles of Motorized Route in the Riparian Influence Zone				
		Alt 1	Alt 2	Alt 3	Alt 4	Alt 5
1603000513	Corn Creek	49.4	51.4	51.3	35.8	52.0
1603000514	Chalk Creek	75.9	69.3	71.3	53.4	70.2
1603000515	Oak Creek	54.3	48.8	47.6	34.3	45.9
1603000601	Fremont Wash	6.2	5.5	5.5	5.5	5.7
1603000701	Indian Creek	18.6	16.2	17.5	15.9	17.9
1603000702	South Creek-Beaver River	87.8	79.8	79.6	69.8	81.8
1603000705	Cove Creek	28.0	20.6	20.6	19.1	25.2
1603000801	Pahvant Valley	24.7	22.4	23.2	11.4	21.7
CEA - FOREST TOTALS		**1302.7**	**1071.8**	**1078.2**	**861.4**	**1104.8**

Table 13 shows, by alternative, the estimated number of stream crossings per mile of stream channel within each cumulative effects watershed that encompasses the forest.

Table 13. Stream crossing frequency cumulative effects indicator.

HUC Number	Cumulative Effects Watershed	Stream Crossing Frequency (number per mile of channel)				
		Alt 1	Alt 2	Alt 3	Alt 4	Alt 5
1407000201	Ivie Creek - Upper Colorado River	0.7	0.6	0.6	0.5	0.6
1407000205	Salt Wash	1.2	1.0	1.0	0.9	1.1
1407000301	Headwaters Fremont River	1.3	0.9	0.9	0.8	1.0
1407000302	Pine Creek-Fremont River	0.3	0.3	0.3	0.2	0.3
1407000303	Deep Creek-Fremont River	0.7	0.4	0.5	0.3	0.6
1603000106	City Creek-Sevier River	0.9	0.6	0.6	0.6	0.7
1603000201	Upper Otter Creek	1.1	0.9	1.0	0.5	1.0
1603000202	Lower Otter Creek	1.3	1.1	1.1	0.4	1.1
1603000205	Lower East Fork Sevier River	0.0	0.0	0.0	0.0	0.0
1603000301	Clear Creek	0.9	0.8	0.8	0.7	0.8
1603000302	Beaver Creek-Sevier River	0.7	0.5	0.5	0.4	0.5
1603000303	Cottonwood Creek-Sevier River	0.9	0.6	0.7	0.4	0.6
1603000304	Salina Creek	0.7	0.6	0.6	0.4	0.6
1603000305	Lost Creek-Sevier River	0.5	0.4	0.3	0.2	0.4
1603000306	Willow Creek-Sevier River	0.4	0.3	0.3	0.2	0.3
1603000501	Ivie Creek - Lower Sevier River	0.4	0.3	0.3	0.3	0.4
1603000504	Upper Sevier River	0.3	0.2	0.2	0.2	0.2
1603000512	Middle Sevier River	1.2	1.1	1.1	0.6	1.1
1603000513	Corn Creek	0.4	0.4	0.4	0.2	0.4
1603000514	Chalk Creek	0.8	0.7	0.8	0.5	0.8
1603000515	Oak Creek	0.9	0.8	0.8	0.6	0.8
1603000601	Fremont Wash	0.9	0.8	0.8	0.8	0.8
1603000701	Indian Creek	0.8	0.6	1.0	0.6	1.0
1603000702	South Creek-Beaver River	0.8	0.7	0.7	0.6	0.7
1603000705	Cove Creek	1.1	0.8	0.8	0.8	1.0
1603000801	Pahvant Valley	0.8	0.7	0.9	0.5	0.9

Table 13. Stream crossing frequency cumulative effects indicator.						
HUC Number	Cumulative Effects Watershed	Stream Crossing Frequency (number per mile of channel)				
		Alt 1	Alt 2	Alt 3	Alt 4	Alt 5
CEA - FOREST TOTALS		0.8	0.6	0.7	0.5	0.7

Table 14 shows, by alternative, the acres within the 300-foot riparian influence zone that fall within open use areas and within dispersed camping distance designation areas. The data are displayed by cumulative effects watershed.

Table 14. Riparian open use area cumulative effects indicator.						
HUC Number	Cumulative Effects Watershed	Open Use Area and Dispersed Camping Distance Designations in the Riparian Influence Zone (acres)				
		Alt 1	Alt 2	Alt 3	Alt 4	Alt 5
1407000201	Ivie Creek - Upper Colorado River	10,361	2,708	1,474	1,287	1,472
1407000205	Salt Wash	5,459	1,361	788	727	697
1407000301	Headwaters Fremont River	14,962	3,694	2,090	1,639	2,365
1407000302	Pine Creek-Fremont River	192	135	71	71	81
1407000303	Deep Creek-Fremont River	1,461	826	499	430	494
1603000106	City Creek-Sevier River	8,254	1,582	861	828	863
1603000201	Upper Otter Creek	11,121	3,226	1,865	1,227	1,858
1603000202	Lower Otter Creek	4,842	1,251	605	352	605
1603000205	Lower East Fork Sevier River	27	8	5	5	5
1603000301	Clear Creek	16,950	3,972	2,215	2,033	2,115
1603000302	Beaver Creek-Sevier River	14,427	3,512	1,919	1,728	1,879
1603000303	Cottonwood Creek-Sevier River	24,323	5,178	3,153	1,870	3,025
1603000304	Salina Creek	10,488	5,078	2,838	2,129	2,884
1603000305	Lost Creek-Sevier River	18,746	3,638	1,832	1,358	1,904
1603000306	Willow Creek-Sevier River	1,444	675	363	296	377
1603000501	Ivie Creek - Lower Sevier River	5,305	849	462	388	529
1603000504	Upper Sevier River	4,552	606	311	284	298
1603000512	Middle Sevier River	5,232	1,206	654	468	611
1603000513	Corn Creek	10,332	3,114	1,756	1,227	1,769
1603000514	Chalk Creek	22,515	4,455	2,429	1,797	2,367
1603000515	Oak Creek	10,168	3,243	1,691	1,235	1,621
1603000601	Fremont Wash	1,255	350	193	193	193
1603000701	Indian Creek	3,476	968	577	522	589
1603000702	South Creek-Beaver River	13,595	4,151	2,314	1,981	2,247
1603000705	Cove Creek	7,129	1,100	587	542	626
1603000801	Pahvant Valley	7,117	1,409	805	403	753
CEA - FOREST TOTALS		233,733	58,295	32,354	25,017	32,225

For reference, Table 15 shows the existing number of individual inventoried dispersed campsites within 50 feet (encroaching) and 300 feet (riparian influence zone) of channels, lake margins, and wetlands; and, within the cumulative effects watersheds. This information is important to know because on the forest, dispersed camping and picnicking are activities are typically associated with motorized access. A particular concern with dispersed camping is when parents use ATVs

as a baby sitter, allowing children to roam freely on ATVs, but usually within earshot of camp. OHVs driven between campsites are also a concern when campsites are located within riparian areas and wetlands (see Appendix E for an example). About 84 percent of existing inventoried dispersed campsites have legal access under the current motorized travel plan although seven percent of that total are in unrestricted areas farther than 300 feet from open roads. Alternatives 2, 3, 4, and 5 would initially allow access to 77, 69, 53, and 82 percent, respectively, of the inventoried sites. A portion of the existing sites without access is in closed areas or is not desirable due to resource concerns.

Table 15. Assessment of existing dispersed camping use within riparian areas and CEAs.

HUC Number	Cumulative Effects Watershed	Existing Number of Individual Inventoried Dispersed Campsites		
		Encroaching on Channels, Lakes, and Wetlands	Riparian Influence Zone	Within CEA
1407000201	**Ivie Creek - Upper Colorado River**	8	45	161
1407000205	**Salt Wash**	21	90	184
1407000301	**Headwaters Fremont River**	47	151	515
1407000302	**Pine Creek-Fremont River**	0	0	0
1407000303	**Deep Creek-Fremont River**	2	17	60
1603000106	**City Creek-Sevier River**	8	20	50
1603000201	**Upper Otter Creek**	3	28	172
1603000202	**Lower Otter Creek**	4	11	27
1603000205	**Lower East Fork Sevier River**	0	0	0
1603000301	**Clear Creek**	24	54	83
1603000302	**Beaver Creek-Sevier River**	9	43	99
1603000303	**Cottonwood Creek-Sevier River**	9	55	155
1603000304	**Salina Creek**	33	198	444
1603000305	**Lost Creek-Sevier River**	16	60	149
1603000306	**Willow Creek-Sevier River**	14	44	83
1603000501	**Ivie Creek - Lower Sevier River**	5	10	15
1603000504	**Upper Sevier River**	0	0	0
1603000512	**Middle Sevier River**	2	8	8
1603000513	**Corn Creek**	9	36	47
1603000514	**Chalk Creek**	4	29	58
1603000515	**Oak Creek**	7	43	48
1603000601	**Fremont Wash**	4	6	11
1603000701	**Indian Creek**	6	24	30
1603000702	**South Creek-Beaver River**	55	146	221
1603000705	**Cove Creek**	7	23	29
1603000801	**Pahvant Valley**	0	4	5
CEA - FOREST TOTALS		**297**	**1,145**	**2,654**

Table 16 rates each alternative on its potential to affect soil productivity, wetland and riparian area condition, aquatic organisms, and water quality. The ratings are based on the changes seen in the issue indicators. The way the issue indicators are set up, less is better. For example, fewer miles and acres of motorized routes and open use areas within riparian areas benefits protection and restoration of hydrologic and aquatic resource values. Table 16 only indicates the trend of the issue indicators relative to existing conditions. The reader is referred to Tables 11 through 14, Table 17, and the subsequent text for the actual magnitude and significance of the potential

changes. Alternative 1 was given an adverse rating if existing motorized use or anticipated growth are expected to continue to negatively impact a given issue indicator, otherwise Alternative 1 was rated as neutral. These ratings include consideration of reasonably foreseeable activities. In fact, most of the adverse changes shown are associated with anticipated effects of no action or from foreseeable actions.

Table 16. Direction of the change in stream and riparian scale cumulative effects indicators by alternative.

● = Beneficial Change, ↔ = Neutral Change, O = Adverse Change	Motorized Routes															Open Use Areas & Distance Designations				
Cumulative Effects Watershed	Encroaching Motorized Routes					Riparian Influence Zone					Stream Crossing Frequency					Riparian Influence Zone				
	Alternative					Alternative					Alternative					Alternative				
	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5
Ivie Creek - Upper Colorado River	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	↔	●	●	●	●
Salt Wash	↔	●	●	●	●	↔	●	●	●	●	↔	●	●	●	●	↔	●	●	●	●
Headwaters Fremont River	O	●	●	●	●	O	●	●	●	●	↔	●	●	●	●	O	●	●	●	●
Pine Creek-Fremont River	↔	●	●	●	●	↔	●	●	●	●	↔	↔	↔	●	↔	↔	●	●	●	●
Deep Creek-Fremont River	↔	●	●	●	●	↔	●	●	●	●	↔	●	●	●	●	↔	●	●	●	●
City Creek-Sevier River	O	●	●	●	●	O	●	●	●	●	↔	●	●	●	●	↔	●	●	●	●
Upper Otter Creek	O	●	●	●	●	O	●	●	●	●	↔	●	●	●	●	O	●	●	●	●
Lower Otter Creek	O	●	●	●	●	O	●	●	●	●	↔	●	●	●	●	↔	●	●	●	●
Lower East Fork Sevier River	↔	↔	↔	↔	↔	↔	↔	↔	↔	↔	↔	↔	↔	↔	↔	↔	●	●	●	●
Clear Creek	O	●	●	●	●	O	●	●	●	●	O	●	●	●	●	O	●	●	●	●
Beaver Creek-Sevier River	O	●	●	●	●	O	●	●	●	●	O	●	●	●	●	O	●	●	●	●
Cottonwood Creek-Sevier River	O	●	●	●	●	O	●	●	●	●	O	●	●	●	●	O	●	●	●	●
Salina Creek	↔	●	●	●	●	↔	●	●	●	●	↔	●	●	●	●	↔	●	●	●	●
Lost Creek-Sevier River	O	●	●	●	●	O	●	●	●	●	↔	●	●	●	●	↔	●	●	●	●
Willow Creek-Sevier River	↔	●	●	●	●	↔	●	●	●	●	↔	●	●	●	●	↔	●	●	●	●
Ivie Creek - Lower Sevier River	↔	●	●	●	●	↔	●	●	●	●	↔	●	●	●	↔	↔	●	●	●	●
Upper Sevier River	↔	●	●	●	●	↔	↔	●	●	●	↔	●	●	●	●	↔	●	●	●	●
Middle Sevier River	↔	●	●	●	●	↔	●	●	●	●	↔	●	●	●	●	↔	●	●	●	●
Corn Creek	O	O	O	●	O	O	O	O	●	O	O	↔	↔	●	↔	O	●	●	●	●
Chalk Creek	O	●	●	●	●	O	●	●	●	●	↔	●	↔	●	↔	O	●	●	●	●
Oak Creek	↔	●	●	●	●	↔	●	●	●	●	↔	●	●	●	●	↔	●	●	●	●
Fremont Wash	O	●	●	●	↔	O	●	●	●	●	O	●	●	●	●	O	●	●	●	●
Indian Creek	O	↔	O	↔	O	O	●	●	●	●	↔	●	O	●	O	O	●	●	●	●

Table 16. Direction of the change in stream and riparian scale cumulative effects indicators by alternative.

● = Beneficial Change, ↔ = Neutral Change, ○ = Adverse Change	Motorized Routes															Open Use Areas & Distance Designations				
Cumulative Effects Watershed	**Encroaching Motorized Routes**					**Riparian Influence Zone**					**Stream Crossing Frequency**					**Riparian Influence Zone**				
	Alternative					**Alternative**					**Alternative**					**Alternative**				
	1	**2**	**3**	**4**	**5**	**1**	**2**	**3**	**4**	**5**	**1**	**2**	**3**	**4**	**5**	**1**	**2**	**3**	**4**	**5**
South Creek-Beaver River	○	●	●	●	●	○	●	●	●	●	↔	●	●	●	●	○	●	●	●	●
Cove Creek	○	●	●	●	●	○	●	●	●	●	↔	●	●	●	●	○	●	●	●	●
Pahvant Valley	↔	↔	○	●	○	↔	●	●	●	●	↔	●	○	●	○	↔	●	●	●	●
CEA – FOREST SUMMARY	○	●	●	●	●	○	●	●	●	●	↔	●	●	●	●	○	●	●	●	●

The values in Table 17 are an average composite score for the stream, riparian, and wetland issue indicators. The score was developed for each CEA by taking the lowest value for a given index. The alternative with the lowest value is assigned a score of 1.0. The score for the other alternatives is then determined by dividing their index value by the lowest value for the given CEA. For example, if the lowest riparian route mileage is 3 miles under Alternative 4 in a given watershed, then the score for Alternative 2 with 4 miles would be 4/3 = 1.33. This ratio is a percentage indicating that Alternative 2 has 33 percent more riparian routes than Alternative 4 that has the fewest miles for the given CEA. The data in Table 17 present composite scores for the entire forest for each of the stream and riparian scale issue indicators.

Table 17. Average composite score for the stream and riparian scale issue indicators.

Cumulative Effects Indicator	**Average Composite Scores**				
	Alternative 1	**Alternative 2**	**Alternative 3**	**Alternative 4**	**Alternative 5**
Encroaching Motorized Routes	1.9	1.5	1.5	1.0	1.6
Motorized Routes in Riparian Influence Zone	1.6	1.3	1.3	1.0	1.3
Stream Crossing Frequency	1.8	1.4	1.4	1.0	1.5
Open Use Areas / Distance Designations in Riparian	9.9	2.4	1.3	1.0	1.3
Average Composite Score for All Indicators	**3.8**	**1.6**	**1.4**	**1.0**	**1.4**

Table 18 describes actions that are being taken in addition to enhancing public education and enforcement efforts, to specifically address the OHV riparian impacts documented in Table 6. Only sites with a rating of 3 or higher are listed where 3 = isolated OHV damage occurring, 4 = numerous locations of advanced OHV damage occurring, and 5 = nearly continuous severe OHV damage occurring on extensive sections of stream.

Table 18. Actions that would reduce or eliminate existing OHV impacts to stream and riparian resources.

Stream Code and Stream Name	Degree of OHV Impacts*	Mitigations included in the action alternatives to address issues
A05 Lower Kents Lake Creek	3	Closing riparian area to unrestricted motorized cross-country travel.
A09 Lousey Jim Creek	4	Constructing barriers to motorized vehicles, closing riparian area to unrestricted motorized cross-country travel.
A10 Wilson Creek	3	Constructing barriers to motorized vehicles, closing riparian area to unrestricted motorized cross-country travel.
A11 Three Creeks	3	Closing riparian area to unrestricted motorized cross-country travel.
A15 South Fork Three Creeks	3	Constructing barriers to motorized vehicles, closing riparian area to unrestricted motorized cross-country travel.
A18 Merchant Creek	4	Constructing barriers to motorized use.
A20 Little North Creek	3	Constructing barriers to motorized vehicles, closing riparian area to unrestricted motorized cross-country travel.
A26 North Fork of North Creek	4	Route obliteration, constructing barriers to motorized vehicles, closing riparian area to unrestricted motorized cross-country travel.
A27 Pole Creek	3	Route obliteration, constructing motorized barriers, closing riparian area to unrestricted motorized cross-country travel.
A33 South Creek	3	Constructing several barriers to motorized vehicles, closing riparian area to unrestricted motorized cross-country travel.
B02 Tasha Creek	3	No specific actions planned other than enforcement. Area is already closed to motorized use and no motorized trails would be designated in areas of concerns.
B03 Sawmill Creek	4	Route obliteration.
C06 Niotche Creek	3	No specific actions planned other than routine maintenance and possible relocation of route.
F01 Manning Creek	4	Route obliteration, constructing barriers to motorized vehicles, closing riparian area to unrestricted motorized cross-country travel.

Table 18. Actions that would reduce or eliminate existing OHV impacts to stream and riparian resources.

Stream Code and Stream Name	Degree of OHV Impacts*	Mitigations included in the action alternatives to address issues
F02 Barney Creek	3	Closing riparian area to unrestricted motorized cross-country travel, route obliteration, and possible route relocation in future NEPA [see Appendix B of the DEIS & FEIS].
F06 Straight Canyon	5	Constructing barriers to motorized vehicles, closing riparian area to unrestricted motorized cross-country travel.
G06 South Fork Chalk Creek	3	Constructing barriers to motorized vehicles, closing riparian area to unrestricted motorized cross-country travel, and route relocation through other NEPA [see Appendix B and C in the DEIS and FEIS].
H01 Tenmile Creek	4	Route obliteration, constructing motorized barriers, closing riparian area to unrestricted motorized cross-country travel.
I01 Birch Creek	3	Route obliteration, closing riparian area to unrestricted motorized cross-country travel.
K12 Fish Creek	5	Route obliteration, constructing barriers to motorized vehicles, closing riparian area to unrestricted motorized cross-country travel.
K13 Picnic Creek	3	Route obliteration, constructing barriers to motorized vehicles.
K16 East Fork Fish Creek	3	Route obliteration, constructing motorized barriers, closing riparian area to unrestricted motorized cross-country travel.
K18 Shingle Creek	3	Route obliteration, constructing barriers to motorized vehicles, closing riparian area to unrestricted motorized cross-country travel, and changes in route designation.

Alternative 1 – No Action Consequences

The No Action alternative provides a baseline for comparison with the action alternatives. This alternative maintains the greatest amount of routes and open use areas that encroach directly upon or that are located within riparian areas and wetland influence zones (see Tables 11 through 14, Table 17, and Appendix D). This alternative authorizes use that would result in continued expansion of user created route networks and continued motorized use of non-motorized trails (see Appendix E for examples). No Action maintains existing risk elements within riparian areas and wetlands, and at stream crossings since no obliteration would occur and most of the forest would remain open to motorized cross-country travel. Even in the short-term, the impacts to soil productivity, riparian areas, wetlands, aquatic organisms, and water quality from motorized recreation would continue to increase because of the rapid growth in motorized use that is expected. This fact should not be used to imply that all use of motorized routes and open use areas are creating negative impacts to hydrologic and aquatic resources across the forest. As

shown in Table 6, that is not the case. However, continuing management under a motorized travel plan that has known deficiencies at current use levels should not be expected to function better with even more motorized users. The issues and management strategies identified in the Final Environmental Impact Statement for the Fishlake OHV Route Designation Project and from the forest scale Roads Analysis supplement make clear that closing the forest to cross-country travel and other measures are necessary in order to keep motorized use compatible with resource protection needs and to reduce user conflicts. Over the long-term, this alternative would accumulate significant negative impacts to soil productivity, riparian areas, wetlands, aquatic organisms, and water quality in select watersheds across the forest. This alternative has the most potential for adverse cumulative impacts with other resource uses and land management because it retains significantly more open use area than any other alternative. This alternative is least likely to maintain current support of beneficial uses as required by the Clean Water Act and the Forest Plan unless management restrictions and actions are taken at a later time.

Alternative 2 – Proposed Action Consequences

This alternative represents the first proposal by the forest to address the Purpose of and Need for Action discussed in the EIS. This alternative would result in a substantial reduction in the mileage of motorized routes and acres of open use areas adjacent to or within stream channels, riparian areas and wetlands (see Tables 11 through 14, Table 17, and Appendix D). Under Alternative 2, open use areas, including dispersed camping distance designations, within the riparian influence zone decrease by a minimum of 75 percent relative to No Action. This change is achieved by switching exclusively to travel on designated routes and areas and through road and trail obliteration. The percent reduction in open use areas will decrease further as distance designations are either dropped or replaced by designated routes to campsites. When the route and open use indicators are considered together, the net result for all watersheds is a beneficial effect for soil productivity, riparian areas, wetlands, aquatic organisms, and water quality. As discussed under "Effects Common to All Action Alternatives", the obliteration of routes within the riparian influence zone would reduce modification of channel floodplains, would allow vegetation to become reestablished, would reduce sediment production and delivery to streams, lakes, and wetlands, would restore normal slope hydrology, and would reduce the potential for spread of aquatic nuisance species and non-native trout. Relative to No Action, Alternative 2 results in improved support of aquatic beneficial uses protected under the Clean Water Act.

Alternative 3 – Modified Proposed Action Consequences

The route effects for Alternative 3 are similar to those described for Alternative 2. Alternative 2 has more obliteration than Alternative 3, but this is primarily on routes that were inventoried during the summer of 2004 after the proposed action was released to the public. There are route specific cases where the designation in Alternative 2 would be preferable from a hydrologic and/or aquatic perspective to the actions proposed in Alternative 3 and the reverse is also true (see Tables 11 through 14, Table 17, Appendix D and the route changes database). Under Alternative 3, open use areas within the riparian influence zone decrease by a minimum of 86 percent relative to No Action. This change is achieved by switching exclusively to travel on designated routes and areas and through road and trail obliteration. The percent reduction in open use areas will decrease further as distance designations are either dropped or replaced by designated routes to campsites. When the route and open use indicators are considered together, the net result for all watersheds is a beneficial effect for soil productivity, riparian areas, wetlands, aquatic organisms, and water quality. As discussed under "Effects Common to All Action Alternatives", the obliteration of routes within the riparian influence zone would reduce modification of channel floodplains, would allow vegetation to become reestablished, would reduce sediment production and delivery to streams, lakes, and wetlands, would restore normal slope hydrology, and would reduce the potential for spread of aquatic nuisance species and non-native trout. Relative to No

Action, Alternative 3 results in improved support of aquatic beneficial uses protected under the Clean Water Act. Alternative 3 is preferable to Alternative 2 overall because of having substantially less riparian areas and wetlands within open use areas and dispersed camping distance designations.

Alternative 4 – Non-motorized Emphasis Consequences

This alternative results in the lowest mileage of routes and acres of open use areas being located adjacent to or within stream channels, riparian areas and wetlands (see Tables 11 through 14, Table 17, and Appendix D). Under Alternative 4, open use areas within the riparian influence zone decrease by about 89 percent relative to No Action. This change is achieved by switching exclusively to travel on designated routes and areas and through road and trail obliteration. The percent reduction in open use areas will decrease further as distance designations are either dropped or replaced by designated routes to campsites. When the route and open use indicators are considered together, the net result for all watersheds is for a beneficial effect for soil productivity, riparian areas, wetlands, aquatic organisms, and water quality. As discussed under "Effects Common to All Action Alternatives", the obliteration of routes within the riparian influence zone would reduce modification of channel floodplains, would allow vegetation to become reestablished, would reduce sediment production and delivery to streams, lakes, and wetlands, would restore normal slope hydrology, and would reduce the potential for spread of aquatic nuisance species and non-native trout.

Alternative 4 is clearly the most beneficial proposal in terms of restoring hydrologic and aquatic condition and functionality to watersheds on the forest. However, a few qualifiers are necessary. A downside to this alternative is that it would take at least twice longer than the "typical" 5-year shelf life of a NEPA document to implement. This alternative has half again more obliteration than Alternatives 2, 3 or 5, which themselves propose more obliteration than has been done in the entire history of the Fishlake National Forest. This alternative would not be popular with motorized users because many of the routes it closes, such as side trails from the Paiute and Great Western systems, have high levels of well-established use (see analysis of public scoping comments in the project file). The amount of dispersed camping opportunities eliminated by this alternative would also be a significant concern. This risks losing motorized user acceptance, and compliance with the travel plan and creating new impacts through user displacement. Closing the motorized use areas that are proposed to be open to cross-country travel in the other action alternatives would be very difficult and costly to enforce. This would divert scarce enforcement resources for minimal gain in resource protection. Assuming that the area closure could be enforced, it would still be likely that the users who use the "play areas" and dispersed campsites would be displaced to other areas on the forest or other public or private lands, which could cause new and/or greater effects than what exists currently (remember the use impact curves discussed in the Methods section). The open use areas proposed in Alternatives 2, 3, and 5 would not respond quickly to removing all motorized use because the sites are semi-arid and much of the damage that can occur has occurred. Velvet Ridges has naturally sparse vegetation and is characterized by geologic parent material rather than developed soil. There are no perennial channels or wetlands near any of the existing open use areas that are proposed to remain open in Alternatives 2, 3, or 5 and there are debris basins and canals that eliminate the potential for adverse impacts to hydrologic or aquatic resource values downstream. Relative to No Action, Alternative 4 results in improved support of aquatic beneficial uses protected under the Clean Water Act. This alternative would result in the fewest watershed and aquatic impacts if realistic to implement and enforce.

Alternative 5 – Final Preferred Alternative Consequences

Alternative 5 addresses site-specific resource concerns by incorporating actions from all of the other action alternatives after including additional public comments and internal review. The route effects for Alternative 5 are most similar to those described for Alternative 3. Alternative 5 obliterates more of the existing authorized route network than any other alternative. Due to the routes that were added after release of the DEIS, Alternative 5 has the least amount of total obliteration of any of the action alternatives however. A large percentage of the added miles are necessary to provide access to desired dispersed campsites. Therefore, Alternative 5 requires far fewer adaptations than the other action alternatives in order to accommodate existing desired dispersed camping opportunities (see DEIS and FEIS Appendix B). Thus, much of the disparity in route obliteration mileages among Alternatives 2, 3, 4 versus Alternative 5 is nominal. There are route specific cases where the designations in the other alternatives would be preferable from a hydrologic and/or aquatic perspective to the actions proposed in Alternative 5 and the reverse is also true (see Tables 11 through 14, Table 17, Appendix D, and the route changes database). Under Alternative 5, open use areas within the riparian influence zone decrease by a minimum of 86 percent relative to No Action. This change is achieved by switching exclusively to travel on designated routes and areas and through road and trail obliteration. The percent reduction in open use areas will decrease further as distance designations are either dropped or replaced by designated routes to campsites. When the route and open use indicators are considered together, the net result for all watersheds is a beneficial effect for soil productivity, riparian areas, wetlands, aquatic organisms, and water quality. As discussed under "Effects Common to All Action Alternatives", the obliteration of routes within the riparian influence zone would reduce modification of channel floodplains, would allow vegetation to become reestablished, would reduce sediment production and delivery to streams, lakes, and wetlands, would restore normal slope hydrology, and would reduce the potential for spread of aquatic nuisance species and non-native trout. Relative to No Action, Alternative 5 results in improved support of aquatic beneficial uses protected under the Clean Water Act. Alternative 5 is preferable to Alternative 2 overall because of having substantially less riparian areas and wetlands within open use areas and dispersed camping distance designations.

Effects from Motorized Route Density and Mileage, and Open Use Areas at the Watershed Scale

Affected Environment

In mountainous watersheds, roads and trails are horizontal features that run counter to natural landscapes that are dominated by vertical, gravity driven processes and forces. Because roads and trails parallel slope contours, they can connect slope areas and channels that would otherwise function independently. This creates cumulative disturbances and interactions that would not exist otherwise. Higher route densities tend to lead to a greater potential for adverse watershed impacts, especially in mountainous terrain (Gucinski et al. 2001). Repeated motorized cross-country travel can lead to user created routes that often have greater impacts than routes that have been constructed and properly engineered to reduce interactions with the water cycle and erosional processes. Roads and trails directly and indirectly alter normal slope hydrology in a countless ways, unless the routes are properly located, designed, and maintained. The observed effects on the forest include the following:

- Concentrating and re-routing overland flow and intercepted ground water.
- Increasing the potential for surface erosion by wind and water due to the disturbed cut and fill slopes, road and trail driving surface, and ditch lines.

- ★ Adding to the density of the streams within the watershed by directly draining road and trail treads and ditchlines into the channel network. This creates a flashier streamflow response to storms and snowmelt, and provides more direct, abundant, and efficient sediment delivery than would occur on undisturbed, unchannelized, vegetated slopes.

- ★ Causing downslope gullies where too much water is drained from the road and trail surface or ditchlines to a single location.

- ★ Increasing the potential for mass erosion when water is delivered to and concentrated on naturally unstable slopes; when steep slopes are undercut or overburdened; or when channel crossings fail catastrophically.

The combinations of the first four elements are the most prominent road effects on the forest. The density and miles of motorized routes, and open use areas within the CEAs and on sensitive soils, and the number of stream crossings address the processes described above. Table 19 displays, by alternative, motorized route density in miles per square mile for each cumulative effects watershed that encompasses the forest. As with the stream and riparian scale indicators, decreases in index values are expected to reflect a reduction of impacts to watershed and aquatic resources.

Table 19. Motorized route density cumulative effects indicator.

HUC Number	Cumulative Effects Watershed	Hydrologic – Motorized Route Density (miles per square mile)				
		Alt 1	Alt 2	Alt 3	Alt 4	Alt 5
1407000201	**Ivie Creek - Upper Colorado River**	1.6	1.2	1.2	1.0	1.2
1407000205	**Salt Wash**	1.5	1.0	1.1	0.9	1.2
1407000301	**Headwaters Fremont River**	1.6	1.1	1.2	1.0	1.3
1407000302	**Pine Creek-Fremont River**	0.7	0.5	0.5	0.2	0.7
1407000303	**Deep Creek-Fremont River**	1.1	0.7	0.8	0.6	0.9
1603000106	**City Creek-Sevier River**	1.3	0.9	0.9	0.8	0.9
1603000201	**Upper Otter Creek**	2.0	1.6	1.6	1.2	1.7
1603000202	**Lower Otter Creek**	1.8	1.3	1.1	0.7	1.1
1603000205	**Lower East Fork Sevier River**	2.4	0.8	0.8	0.8	0.8
1603000301	**Clear Creek**	1.5	1.1	1.2	1.0	1.2
1603000302	**Beaver Creek-Sevier River**	1.4	1.0	0.9	0.8	0.9
1603000303	**Cottonwood Creek-Sevier River**	1.5	1.1	1.0	0.6	1.1
1603000304	**Salina Creek**	1.4	1.0	1.0	0.8	1.1
1603000305	**Lost Creek-Sevier River**	1.1	0.8	0.8	0.6	0.8
1603000306	**Willow Creek-Sevier River**	1.2	0.9	0.9	0.7	0.9
1603000501	**Ivie Creek - Lower Sevier River**	0.7	0.5	0.5	0.5	0.6
1603000504	**Upper Sevier River**	0.5	0.4	0.4	0.3	0.4
1603000512	**Middle Sevier River**	0.9	0.8	0.8	0.6	0.8
1603000513	**Corn Creek**	1.0	0.9	0.9	0.7	1.0
1603000514	**Chalk Creek**	1.1	1.0	1.0	0.8	1.0
1603000515	**Oak Creek**	1.2	1.0	1.0	0.7	0.9
1603000601	**Fremont Wash**	1.2	1.0	1.0	1.0	1.1
1603000701	**Indian Creek**	1.2	0.9	1.0	0.9	1.0
1603000702	**South Creek-Beaver River**	1.3	1.1	1.1	1.0	1.2
1603000705	**Cove Creek**	1.3	1.0	1.0	0.9	1.2
1603000801	**Pahvant Valley**	0.8	0.7	0.7	0.4	0.7

Table 19. Motorized route density cumulative effects indicator.						
HUC Number	Cumulative Effects Watershed	Hydrologic – Motorized Route Density (miles per square mile)				
		Alt 1	Alt 2	Alt 3	Alt 4	Alt 5
CEA - FOREST TOTALS		1.3	1.0	1.0	0.8	1.1

Table 20 shows the acres of open use areas within the cumulative effects watersheds, including the dispersed camping distance designations. The data are displayed by alternative.

Table 20. Open use acres cumulative effects indicator for the CEAs						
HUC Number	Cumulative Effects Watershed	Cumulative Effects Area in Open Use Area & Dispersed Camping Distance Designations (acres)				
		Alt 1	Alt 2	Alt 3	Alt 4	Alt 5
1407000201	Ivie Creek - Upper Colorado River	56,387	9,169	4,705	3,920	4,887
1407000205	Salt Wash	26,150	4,139	2,273	2,013	2,087
1407000301	Headwaters Fremont River	77,906	12,560	6,913	5,467	7,780
1407000302	Pine Creek-Fremont River	318	424	215	103	226
1407000303	Deep Creek-Fremont River	4,963	3,028	1,857	1,413	1,827
1603000106	City Creek-Sevier River	28,024	3,510	1,879	1,735	1,907
1603000201	Upper Otter Creek	51,724	13,029	6,954	4,993	6,881
1603000202	Lower Otter Creek	20,741	3,360	1,466	968	1,468
1603000205	Lower East Fork Sevier River	435	60	31	31	31
1603000301	Clear Creek	69,588	11,150	5,921	4,983	5,746
1603000302	Beaver Creek-Sevier River	67,976	9,877	5,001	4,191	4,897
1603000303	Cottonwood Creek-Sevier River	82,485	14,838	8,009	4,630	7,810
1603000304	Salina Creek	45,585	15,410	7,984	5,654	8,130
1603000305	Lost Creek-Sevier River	61,533	9,095	4,601	3,565	4,772
1603000306	Willow Creek-Sevier River	4,907	2,449	1,246	924	1,266
1603000501	Ivie Creek - Lower Sevier River	19,044	1,880	982	881	1,112
1603000504	Upper Sevier River	14,886	1,157	569	454	516
1603000512	Middle Sevier River	16,127	1,813	926	686	880
1603000513	Corn Creek	38,748	8,336	4,325	3,129	4,362
1603000514	Chalk Creek	79,210	10,768	5,634	4,234	5,543
1603000515	Oak Creek	25,348	5,173	2,603	1,937	2,439
1603000601	Fremont Wash	5,692	707	374	374	374
1603000701	Indian Creek	17,271	2,109	1,189	1,069	1,179
1603000702	South Creek-Beaver River	58,386	10,962	5,800	5,105	5,508
1603000705	Cove Creek	23,866	2,219	1,140	970	1,221
1603000801	Pahvant Valley	27,175	2,464	1,273	705	1,137
CEA - FOREST TOTALS		924,480	159,688	83,870	64,132	83,983

Table 21 shows the percentage of the cumulative effects watersheds that are open to motorized use or potentially impacted by the dispersed camping distance designations. The data are displayed by alternative.

Table 21. Open use percent cumulative effects indicator for the CEAs

HUC Number	Cumulative Effects Watershed	Cumulative Effects Area in Open Use Area & Dispersed Camping Distance Designations (percent)				
		Alt 1	Alt 2	Alt 3	Alt 4	Alt 5
1407000201	Ivie Creek - Upper Colorado River	68.3%	11.1%	5.7%	4.7%	5.9%
1407000205	Salt Wash	46.6%	7.4%	4.1%	3.6%	3.7%
1407000301	Headwaters Fremont River	55.4%	8.9%	4.9%	3.9%	5.5%
1407000302	Pine Creek-Fremont River	3.0%	4.0%	2.0%	1.0%	2.1%
1407000303	Deep Creek-Fremont River	10.3%	6.3%	3.9%	2.9%	3.8%
1603000106	City Creek-Sevier River	61.5%	7.7%	4.1%	3.8%	4.2%
1603000201	Upper Otter Creek	65.3%	16.4%	8.8%	6.3%	8.7%
1603000202	Lower Otter Creek	83.0%	13.4%	5.9%	3.9%	5.9%
1603000205	Lower East Fork Sevier River	63.0%	8.8%	4.5%	4.4%	4.5%
1603000301	Clear Creek	63.6%	10.2%	5.4%	4.6%	5.2%
1603000302	Beaver Creek-Sevier River	65.8%	9.6%	4.8%	4.1%	4.7%
1603000303	Cottonwood Creek-Sevier River	58.2%	10.5%	5.6%	3.3%	5.5%
1603000304	Salina Creek	24.9%	8.4%	4.4%	3.1%	4.4%
1603000305	Lost Creek-Sevier River	56.8%	8.4%	4.2%	3.3%	4.4%
1603000306	Willow Creek-Sevier River	19.5%	9.7%	5.0%	3.7%	5.0%
1603000501	Ivie Creek - Lower Sevier River	56.5%	5.6%	2.9%	2.6%	3.3%
1603000504	Upper Sevier River	59.2%	4.6%	2.3%	1.8%	2.1%
1603000512	Middle Sevier River	68.1%	7.7%	3.9%	2.9%	3.7%
1603000513	Corn Creek	45.7%	9.8%	5.1%	3.7%	5.1%
1603000514	Chalk Creek	79.0%	10.7%	5.6%	4.2%	5.5%
1603000515	Oak Creek	53.7%	11.0%	5.5%	4.1%	5.2%
1603000601	Fremont Wash	73.8%	9.2%	4.8%	4.8%	4.8%
1603000701	Indian Creek	77.1%	9.4%	5.3%	4.8%	5.3%
1603000702	South Creek-Beaver River	54.9%	10.3%	5.5%	4.8%	5.2%
1603000705	Cove Creek	84.3%	7.8%	4.0%	3.4%	4.3%
1603000801	Pahvant Valley	87.5%	7.9%	4.1%	2.3%	3.7%
CEA - FOREST TOTALS		**55.3%**	**9.6%**	**5.0%**	**3.8%**	**5.0%**

Table 22 shows the miles of motorized route by alternative on soils that have a moderate or greater sensitivity to surface or mass erosion within each cumulative effects watershed.

Table 22. Sensitive soils with motorized routes cumulative effects indicator.

HUC Number	Cumulative Effects Watershed	Miles of Motorized Route on Sensitive Soils				
		Alt 1	Alt 2	Alt 3	Alt 4	Alt 5
1407000201	Ivie Creek - Upper Colorado River	155.0	112.2	111.3	94.7	115.8
1407000205	Salt Wash	50.3	40.6	41.7	38.7	46.2
1407000301	Headwaters Fremont River	142.5	97.4	105.3	82.6	114.0

Table 22. Sensitive soils with motorized routes cumulative effects indicator.						
HUC Number	Cumulative Effects Watershed	Miles of Motorized Route on Sensitive Soils				
		Alt 1	Alt 2	Alt 3	Alt 4	Alt 5
1407000302	Pine Creek-Fremont River	5.2	4.1	4.1	2.1	4.7
1407000303	Deep Creek-Fremont River	47.9	30.6	33.8	26.6	36.7
1603000106	City Creek-Sevier River	58.3	43.5	45.5	41.7	46.9
1603000201	Upper Otter Creek	118.4	100.6	101.6	68.7	103.5
1603000202	Lower Otter Creek	43.0	30.4	26.3	18.4	26.4
1603000205	Lower East Fork Sevier River	0.9	0.3	0.3	0.3	0.3
1603000301	Clear Creek	151.5	121.7	120.4	105.7	118.9
1603000302	Beaver Creek-Sevier River	91.4	67.9	65.1	56.1	66.4
1603000303	Cottonwood Creek-Sevier River	171.2	120.1	120.5	75.3	123.0
1603000304	Salina Creek	320.4	252.3	253.8	197.4	261.2
1603000305	Lost Creek-Sevier River	114.0	79.1	81.6	64.8	84.8
1603000306	Willow Creek-Sevier River	33.7	25.1	25.5	17.8	26.3
1603000501	Ivie Creek - Lower Sevier River	17.5	15.3	15.6	13.7	16.4
1603000504	Upper Sevier River	6.0	6.0	5.7	5.2	4.9
1603000512	Middle Sevier River	22.0	19.8	19.9	15.8	19.3
1603000513	Corn Creek	90.3	87.9	87.9	66.1	88.9
1603000514	Chalk Creek	113.6	103.7	103.4	81.6	102.0
1603000515	Oak Creek	41.1	31.5	29.9	21.9	28.4
1603000601	Fremont Wash	13.0	10.3	10.3	10.3	11.4
1603000701	Indian Creek	25.6	20.3	22.9	20.4	23.1
1603000702	South Creek-Beaver River	138.8	118.5	120.9	107.7	125.1
1603000705	Cove Creek	47.0	35.1	35.9	32.0	42.8
1603000801	Pahvant Valley	14.8	13.4	15.6	4.9	14.2
CEA - FOREST TOTALS		**2033.2**	**1587.4**	**1604.8**	**1270.3**	**1651.5**

Table 23 shows the acres of each cumulative effects watershed where motorized use could potentially occur on soils that have a moderate or greater sensitivity to surface or mass erosion within each cumulative effects watershed.

Table 23. Sensitive soils with open use cumulative effects indicator.						
HUC Number	Cumulative Effects Watershed	Open Use Area & Dispersed Camping Distance Designations on Sensitive Soils (acres)				
		Alt 1	Alt 2	Alt 3	Alt 4	Alt 5
1407000201	Ivie Creek - Upper Colorado River	30,809	6,505	3,412	2,844	3,513
1407000205	Salt Wash	7,771	1,634	900	840	775
1407000301	Headwaters Fremont River	18,712	4,962	2,854	2,170	3,055
1407000302	Pine Creek-Fremont River	169	232	117	68	117
1407000303	Deep Creek-Fremont River	3,080	1,827	1,121	840	1,105
1603000106	City Creek-Sevier River	12,740	2,338	1,268	1,152	1,308
1603000201	Upper Otter Creek	16,672	5,708	3,239	2,290	3,257
1603000202	Lower Otter Creek	5,312	1,698	853	611	856
1603000205	Lower East Fork Sevier River	158	22	11	11	11

Table 23. Sensitive soils with open use cumulative effects indicator.						
HUC Number	Cumulative Effects Watershed	Open Use Area & Dispersed Camping Distance Designations on Sensitive Soils (acres)				
		Alt 1	Alt 2	Alt 3	Alt 4	Alt 5
1603000301	Clear Creek	30,593	6,672	3,600	3,120	3,488
1603000302	Beaver Creek-Sevier River	20,989	4,040	2,165	1,886	2,102
1603000303	Cottonwood Creek-Sevier River	35,414	7,368	4,213	2,550	4,205
1603000304	Salina Creek	25,427	11,966	6,410	4,508	6,532
1603000305	Lost Creek-Sevier River	31,258	5,181	2,821	2,250	2,901
1603000306	Willow Creek-Sevier River	2,626	1,592	865	620	882
1603000501	Ivie Creek - Lower Sevier River	9,663	1,062	555	492	577
1603000504	Upper Sevier River	8,584	433	207	188	177
1603000512	Middle Sevier River	6,890	1,118	598	458	566
1603000513	Corn Creek	17,737	5,780	3,044	2,312	3,066
1603000514	Chalk Creek	39,969	6,604	3,507	2,773	3,448
1603000515	Oak Creek	11,144	2,174	1,061	777	1,009
1603000601	Fremont Wash	3,704	614	332	332	332
1603000701	Indian Creek	9,745	1,257	745	661	728
1603000702	South Creek-Beaver River	36,433	6,948	3,757	3,332	3,713
1603000705	Cove Creek	16,654	1,743	892	750	967
1603000801	Pahvant Valley	8,377	913	544	173	498
CEA - FOREST TOTALS		410,628	90,390	49,092	38,007	49,188

Table 24 rates each alternative on its potential to hydrologic condition and function as measured by total motorized route density and soils sensitive to erosion. As with Table 16, the ratings are based on the changes seen in the issue indicators and only the trend of the issue indicators relative to existing conditions is shown. The reader is referred to Tables 19 through 23, Table 25, and the subsequent text for the actual magnitude and significance of the potential changes. Alternative 1 was given an adverse rating if existing motorized use or anticipated growth are expected to continue to negatively impact a given issue indicator, otherwise Alternative 1 was rated as neutral.

Table 24. Direction of the change in stream and riparian scale cumulative effects indicators by alternative.																					
● = Beneficial Change, ↔ = Neutral Change, O = Adverse Change	Motorized Routes										Open Use Areas & Dispersed Camping Distance Designations									
Cumulative Effects Watershed	Hydrologic Motorized Route Density					Soils Sensitive to Erosion					Within the Cumulative Effects Watershed					Soils Sensitive to Erosion				
	Alternative					Alternative					Alternative					Alternative				
	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5
Ivie Creek - Upper Colorado River	↔	●	●	●	●	O	●	●	●	●	↔	●	●	●	●	O	●	●	●	●
Salt Wash	↔	●	●	●	●	↔	●	●	●	●	↔	●	●	●	●	↔	●	●	●	●
Headwaters Fremont River	↔	●	●	●	●	O	●	●	●	●	↔	●	●	●	●	O	●	●	●	●

Table 24. Direction of the change in stream and riparian scale cumulative effects indicators by alternative.

● = Beneficial Change, ↔ = Neutral Change, O = Adverse Change	Motorized Routes										Open Use Areas & Dispersed Camping Distance Designations									
Cumulative Effects Watershed	Hydrologic Motorized Route Density					Soils Sensitive to Erosion					Within the Cumulative Effects Watershed					Soils Sensitive to Erosion				
						Alternative					Alternative					Alternative				
	1	2	3	4	5	1	2	3	4	5	1		3	4	5	1	2		4	5
Pine Creek-Fremont River	↔	●	●	●	↔	↔	●	●	●	●	↔	O	●	●	●	↔	O	●	●	●
Deep Creek-Fremont River	↔	●	●	●	●	↔	●	●	●	●	↔	●	●	●	●	↔	●	●	●	●
City Creek-Sevier River	↔	●	●	●	●	O	●	●	●	●	↔	●	●	●	●	O	●	●	●	●
Upper Otter Creek	↔	●	●	●	●	O	●	●	●	●	↔	●	●	●	●	O	●	●	●	●
Lower Otter Creek	↔	●	●	●	●	O	●	●	●	●	↔	●	●	●	●	O	●	●	●	●
Lower East Fork Sevier River	↔	●	●	●	●	↔	●	●	●	●	↔	●	●	●	●	↔	●	●	●	●
Clear Creek	↔	●	●	●	●	O	●	●	●	●	↔	●	●	●	●	O	●	●	●	●
Beaver Creek-Sevier River	↔	●	●	●	●	O	●	●	●	●	↔	●	●	●	●	O	●	●	●	●
Cottonwood Creek-Sevier River	↔	●	●	●	●	O	●	●	●	●	↔	●	●	●	●	O	●	●	●	●
Salina Creek	↔	●	●	●	●	↔	●	●	●	●	↔	●	●	●	●	↔	●	●	●	●
Lost Creek-Sevier River	↔	●	●	●	●	O	●	●	●	●	↔	●	●	●	●	O	●	●	●	●
Willow Creek-Sevier River	↔	●	●	●	●	↔	●	●	●	●	↔	●	●	●	●	↔	●	●	●	●
Ivie Creek - Lower Sevier River	↔	●	●	●	●	↔	●	●	●	●	↔	●	●	●	●	↔	●	●	●	●
Upper Sevier River	↔	●	●	●	●	↔	↔	●	●	●	↔	●	●	●	●	↔	●	●	●	●
Middle Sevier River	↔	●	●	●	●	↔	●	●	●	●	↔	●	●	●	●	↔	●	●	●	●
Corn Creek	↔	●	●	●	↔	O	●	●	●	●	↔	●	●	●	●	O	●	●	●	●
Chalk Creek	↔	●	●	●	●	O	●	●	●	●	↔	●	●	●	●	O	●	●	●	●
Oak Creek	↔	●	●	●	●	↔	●	●	●	●	↔	●	●	●	●	↔	●	●	●	●
Fremont Wash	↔	●	●	●	●	O	●	●	●	●	↔	●	●	●	●	O	●	●	●	●
Indian Creek	↔	●	●	●	●	O	●	●	●	●	↔	●	●	●	●	O	●	●	●	●
South Creek-Beaver River	↔	●	●	●	●	O	●	●	●	●	↔	●	●	●	●	O	●	●	●	●
Cove Creek	↔	●	●	●	●	O	●	●	●	●	↔	●	●	●	●	O	●	●	●	●
Pahvant Valley	↔	●	●	●	●	↔	●	●	●	●	↔	●	●	●	●	↔	●	●	●	●
CEA – FOREST SUMMARY	↔	●	●	●	●	O	●	●	●	●	↔	●	●	●	●	O	●	●	●	●

The values in Table 25 are an average composite score for the watershed scale cumulative effects indicators. The score was developed in the same way as described for Table 17 so the ratios can be interpreted as percentage differences between alternatives.

Table 25. Average composite score for the watershed scale issue indicators.

Cumulative Effects Indicator	Average Composite Score				
	Alternative 1	Alternative 2	Alternative 3	Alternative 4	Alternative 5
Total Motorized Route Density	1.7	1.3	1.3	1.0	1.4
Motorized Routes on Sensitive Soils	1.7	1.3	1.3	1.0	1.3
Open Use Areas / Distance Designations within CEAs	15.2	2.5	1.3	1.0	1.3
Open Use Areas / Distance Designations on Sensitive Soils	12.1	2.4	1.3	1.0	1.3
Average Composite Score for All Indicators	**7.7**	**1.6**	**1.3**	**1.0**	**1.3**

Alternative 1 – No Action Consequences

This alternative maintains the most motorized routes and open use areas within the cumulative effects watershed in general, and on soils sensitive to erosion in particular (see Tables 19 through 23, Table 25, and Appendix D). This alternative authorizes use that would result in continued expansion of user created route networks and continued motorized use of non-motorized trails. No Action maintains existing risk elements on soils sensitive to erosion since no obliteration would occur and much of the forest would remain open to motorized cross-country travel. Even in the short-term, the impacts to soil productivity and normal hydrologic function and water quality from motorized recreation would continue to increase because of the rapid growth in motorized use that is expected. Over the long-term, this alternative would accumulate significant negative impacts to soil productivity and normal hydrologic function across the forest. This alternative is least likely to maintain current support of beneficial uses as required by the Clean Water Act and the Forest Plan unless management restrictions and actions are taken at a later time.

Alternative 2 – Proposed Action Consequences

In most cases, this alternative would result in a substantial reduction in the mileage of motorized routes and acres of open use areas within the cumulative effects watersheds and on soils sensitive to erosion (see Tables 19 through 23, Table 25, and Appendix D). Under Alternative 2, open use areas on sensitive soils decrease by a minimum of 78 percent relative to No Action. This change is achieved by switching to travel on designated routes and areas and through road and trail obliteration. The percent reduction in open use areas will decrease further as distance designations are either dropped or replaced by designated routes to campsites. When the route and open use indicators are considered together, the net result for all watersheds is for a beneficial effect for soil productivity and normal hydrologic function. As discussed under "Effects Common to All Action Alternatives", the obliteration of all routes, but especially those on sensitive soils, would restore normal slope hydrology and would reduce sediment production and delivery to streams, lakes, and wetlands. Relative to No Action, Alternative 2 results in improved support of aquatic beneficial uses protected under the Clean Water Act.

Alternative 3 – Modified Proposed Action Consequences

The route effects for this alternative are similar to Alternative 2. There are route specific cases where the designation in Alternative 2 would be preferable from a hydrologic and/or aquatic perspective to the actions proposed in Alternative 3 and the reverse is also true (see Tables 14 through 18, Appendix D, and the route changes database). In most cases, this alternative would result in a substantial reduction in the mileage of motorized routes and acres of open use areas within the cumulative effects watersheds and on soils sensitive to erosion (see Tables 19 through 23, Table 25, and Appendix D). Under Alternative 3, open use areas on sensitive soils decrease by a minimum of 88 percent relative to No Action. This change is achieved by switching to travel on designated routes and areas and through road and trail obliteration. The percent reduction in open use areas will decrease further as distance designations are either dropped or replaced by designated routes to campsites. When the route and open use indicators are considered together, the net result for all watersheds is for a beneficial effect for soil productivity, riparian areas, wetlands, aquatic organisms, and water quality. As discussed under "Effects Common to All Action Alternatives", the obliteration of all routes, but especially those on sensitive soils, would restore normal slope hydrology and would reduce sediment production and delivery to streams, lakes, and wetlands. Relative to No Action, Alternative 3 results in improved support of aquatic beneficial uses protected under the Clean Water Act. Alternative 3 is preferable to Alternative 2 overall due to substantially less open use on sensitive soils.

Alternative 4 – Non-motorized Emphasis Consequences

This alternative results in the lowest mileage of routes and acres of open use areas being located within cumulative effects watersheds and on soils that are sensitive to erosion (see Tables 19 through 23, Table 25, and Appendix D). Under Alternative 4, open use areas on sensitive soils decrease by a minimum of 91 percent relative to No Action. This change is achieved by switching to travel on designated routes and areas and through road and trail obliteration. The percent reduction in open use areas will decrease further as distance designations are either dropped or replaced by designated routes to campsites. When the route and open use indicators are considered together, the net result for all watersheds is for a beneficial effect for soil productivity, riparian areas, wetlands, aquatic organisms, and water quality. As discussed under "Effects Common to All Action Alternatives", the obliteration of all routes, but especially those on sensitive soils, would restore normal slope hydrology and would reduce sediment production and delivery to streams, lakes, and wetlands. Relative to No Action, Alternative 4 results in improved support of aquatic beneficial uses protected under the Clean Water Act.

The same benefits and downsides of Alternative 4 described earlier for the riparian and wetland indicators apply equally with regards to the cumulative effects watersheds, and sensitive soils issue indicators.

Alternative 5 – Final Preferred Alternative Consequences

The route effects for Alternative 5 are most similar to those described for Alternative 3. Alternative 5 obliterates more of the existing authorized route network than any other alternative. There are route specific cases where the designations in the other alternatives would be preferable from a hydrologic and/or aquatic perspective to the actions proposed in Alternative 5 and the reverse is also true (see Tables 11 through 14, Table 17, Appendix D, and the route changes database). Under Alternative 5, open use areas on sensitive soils decrease by a minimum of 88 percent relative to No Action. This change is achieved by switching exclusively to travel on designated routes and areas and through road and trail obliteration. The percent reduction in open use areas will decrease further as distance designations are either dropped or replaced by designated routes to campsites. When the route and open use indicators are considered together,

the net result for all watersheds is a beneficial effect for soil productivity, normal hydrologic function and water quality. As discussed under "Effects Common to All Action Alternatives", the obliteration of all routes, but especially those on sensitive soils, would restore normal slope hydrology and would reduce sediment production and delivery to streams, lakes, and wetlands. Relative to No Action, Alternative 5 results in improved support of aquatic beneficial uses protected under the Clean Water Act. Alternative 5 is preferable to Alternative 2 overall because of having substantially less sensitive soils within open use areas and dispersed camping distance designations.

Cumulative Effects Summary

All routes being evaluated in the OHV Route Designation Project currently exist and are being used to varying degrees. As such, the impacts to the various resources described in the FEIS are already occurring. Rather than creating new effects, the proposed actions primarily result in maintaining or reducing existing impacts associated with the route network and motorized use. Closing the forest to motorized cross-country travel will have the effect of reducing the potential for direct and indirect off-route interactions and impacts with other land uses. By definition, this would reduce actual and potential cumulative impacts to nearly all resource values and uses on the forest. The reductions in mileage and open use areas in and near channels, riparian areas, lakes and wetlands, and on sensitive soils shown in Tables 26 and 27 consistently indicate that actual and/or potential impacts to hydrologic functionality and aquatic values would be reduced under the action alternatives. The greatest potential for adverse cumulative impacts is under the No Action alterative, especially given that the existing travel plan is inadequate to protect water resources and given that the technological capability of OHVs and the amount of use would continue to increase over time. Alternative 4 has the most potential to improve watershed and aquatic condition and function if it could be implemented and enforced.

Table 26. Average composite scores for all cumulative effects issue indicators by watershed CEA and by alternative

HUC Number	Cumulative Effects Watershed	Average Composite Scores for All Stream and Riparian and Watershed Scale Indicators by Alternative				
		Alt 1	Alt 2	Alt 3	Alt 4	Alt 5
1407000201	**Ivie Creek - Upper Colorado River**	5.1	1.6	1.2	1.0	1.2
1407000205	**Salt Wash**	4.7	1.4	1.1	1.0	1.1
1407000301	**Headwaters Fremont River**	5.1	1.6	1.2	1.0	1.4
1407000302	**Pine Creek-Fremont River**	2.4	2.2	1.7	1.0	1.9
1407000303	**Deep Creek-Fremont River**	2.5	1.5	1.3	1.0	1.4
1603000106	**City Creek-Sevier River**	5.6	1.4	1.1	1.0	1.1
1603000201	**Upper Otter Creek**	4.5	2.0	1.6	1.0	1.6
1603000202	**Lower Otter Creek**	7.2	2.6	1.8	1.0	1.8
1603000205	**Lower East Fork Sevier River**	5.5	1.4	1.0	1.0	1.0
1603000301	**Clear Creek**	4.9	1.5	1.1	1.0	1.1
1603000302	**Beaver Creek-Sevier River**	5.4	1.5	1.1	1.0	1.1
1603000303	**Cottonwood Creek-Sevier River**	7.1	2.2	1.7	1.0	1.7
1603000304	**Salina Creek**	3.3	1.8	1.3	1.0	1.4
1603000305	**Lost Creek-Sevier River**	6.9	1.9	1.3	1.0	1.4
1603000306	**Willow Creek-Sevier River**	3.0	1.9	1.4	1.0	1.4
1603000501	**Ivie Creek - Lower Sevier River**	7.8	1.6	1.2	1.0	1.4
1603000504	**Upper Sevier River**	13.0	1.6	1.2	1.0	1.1

Table 26. Average composite scores for all cumulative effects issue indicators by watershed CEA and by alternative

HUC Number	Cumulative Effects Watershed	Average Composite Scores for All Stream and Riparian and Watershed Scale Indicators by Alternative				
		Alt 1	Alt 2	Alt 3	Alt 4	Alt 5
1603000512	**Middle Sevier River**	7.3	1.9	1.5	1.0	1.4
1603000513	**Corn Creek**	4.5	2.0	1.5	1.0	1.5
1603000514	**Chalk Creek**	6.7	1.8	1.4	1.0	1.4
1603000515	**Oak Creek**	5.5	1.9	1.4	1.0	1.3
1603000601	**Fremont Wash**	4.8	1.3	1.0	1.0	1.0
1603000701	**Indian Creek**	5.5	1.3	1.2	1.0	1.2
1603000702	**South Creek-Beaver River**	4.5	1.5	1.1	1.0	1.2
1603000705	**Cove Creek**	8.4	1.5	1.1	1.0	1.3
1603000801	**Pahvant Valley**	14.5	2.8	2.3	1.0	2.2

Table 27. Cumulative effects indicator summary for the forest minimum bounding CEA

		Alt 1	Alt 2	Alt 3	Alt 4	Alt 5
Miles of Motorized Route Encroaching on Channels, Lakes, and Wetlands	change	0.0	-52.8	-50.9	-114.6	-45.6
	result	267.2	214.4	216.3	152.6	221.6
Miles of Motorized Route in the Riparian Influence Zone	change	0.0	-230.9	-224.6	-441.3	-198.0
	result	1,302.7	1,071.8	1,078.2	861.4	1,104.8
Stream Crossing Frequency (number per mile of channel)	change	0.0	-0.2	-0.1	-0.3	-0.1
	result	0.8	0.6	0.7	0.5	0.7
Open Use Area & Distance Designations within the Riparian Influence Zone (acres)	change	0	-175,438	-201,379	-208,716	-201,508
	result	233,733	58,295	32,354	25,017	32,225
Hydrologic – Motorized Route Density (miles per square mile)	change	0.0	-0.3	-0.3	-0.5	-0.3
	result	1.3	1.0	1.0	0.8	1.1
Miles of Motorized Route on Sensitive Soils	change	0.0	-445.8	-428.5	-762.9	-381.7
	result	2,033.2	1,587.4	1,604.8	1,270.3	1,651.5
Acres of Cumulative Effects Area Open to Motorized Use including Distance Designations	change	0	-764,793	-840,611	-860,348	-840,497
	result	924,480	159,688	83,870	64,132	83,983
Percent Cumulative Effects Area Open to Motorized Use including Distance Designations	change	0.0%	-45.8%	-50.3%	-51.5%	-50.3%
	result	55.3%	9.6%	5.0%	3.8%	5.0%
Open Use Area & Distance Designations on Sensitive Soils (acres)	change	0	-320,238	-361,536	-372,622	-361,440
	result	410,628	90,390	49,092	38,007	49,188
Average Composite Scores for All Issue Indicators	result	**5.7**	**1.8**	**1.4**	**1.0**	**1.4**

Tables 6 and 7 and the descriptions of current support of beneficial uses reflect cumulative impacts from past and current conditions. The measures used to project direct and indirect impacts in Tables 11 through 27 and in Appendix D are cumulative since they are summarized by analysis watershed and include all motorized routes, open use areas, and foreseeable activities. The descriptions and rationale contained in this report show that no physical response from the Fishlake OHV Route Designation Project would extend to or be measurable beyond the cumulative effects areas shown in Map 1. Nonetheless, the assessment of Forest Plan Consistency in Appendix A, the assessment of impacts to Water Quality Limited streams and lakes in Appendix B, the assessment of reasonably foreseeable activities in Appendix C, the issue indicators in Tables 11 through 27 and Appendix D of this report, and the forest-scale Roads Analysis supplement all indicate that the action alternatives would have a net benefit to long-term soil productivity, wetland and riparian area condition, support of aquatic organisms and their habitat, and water quality on the forest provided the "Required Design Criteria" are applied. No Action would result in impacts that are similar to what is occurring currently or that increase over time due to retaining existing route designations and inadequate travel rules while the rapid growth in motorized use on the forest continues at the same time that capabilities of the machines improve. Technological improvements in OHVs could also reduce water quality impacts from individual machines over time by reducing the potential for spilling or leaking oil, gas, and hydraulic fluids and/or by making the machines more fuel-efficient, but the absolute impact also depends on how much motorized use increases. Each of the action alternatives improve current support of aquatic beneficial uses that are protected under the Clean Water Act as amended. No Action would require future actions in order to stay consistent with the Clean Water Act.

Short-term Uses and Long-term Productivity

NEPA requires consideration of "the relationship between short-term uses of man's environment and the maintenance and enhancement of long-term productivity" (40 CFR 1502.16). As declared by the Congress, this includes using all practicable means and measures, including financial and technical assistance, in a manner calculated to foster and promote the general welfare, to create and maintain conditions under which man and nature can exist in productive harmony, and fulfill the social, economic, and other requirements of present and future generations of Americans (NEPA Section 101). This requirement essentially restates the Purpose of and Need for management action for the Fishlake OHV Route Designation Project. Each of the action alternatives addresses the need to balance short-term uses and long-term productivity. The entire watershed and aquatics report for the route designation project is a disclosure of long-term productivity issues relative to short-term motorized recreation uses.

Unavoidable Adverse Effects

There really is no natural analog for roads and motorized trails in terms of normal watershed or terrestrial and aquatic ecosystem processes and functionality. While impacts from roads and motorized trails and open use areas can be minimized, they cannot be eliminated. Properly functioning watersheds and ecosystems can still be maintained, but the natural potential is usually altered to some degree by the presence of roads and motorized trails. As illustrated in the Final EIS for the Fishlake OHV Route Designation Project and in the accompanying specialist reports, transportation issues on the Fishlake National Forest are many and complex. Not all transportation related management issues and impacts could be reconciled in one project, especially one conducted at the forest scale. Even if the project analysis and design could be done, the forest has limited human and financial resources available. The desired result from this project is to provide motorized recreational opportunities that minimize the potential for user conflicts and resource impacts, and to create a system that can be maintained over time with the resources available to the forest. The forest intends to meet these objectives, but the biophysical,

fiscal, and socio-political reality is that progress will be incremental. A route network that has developed over 130 years cannot be instantaneously transformed to meet all idealized objectives. The proposed actions represent practical and measurable progress towards the desired ends, but transportation related impacts such as those described in the Affected Environment will remain under all of the alternatives.

Irreversible and Irretrievable Commitments of Resources

Irreversible commitments of resources are those that cannot be regained, such as the extinction of a species or the removal of mined ore. Irretrievable commitments are those that are lost for a period of time such as the temporary loss of timber productivity in forested areas that are kept clear for use as a power line rights-of-way or road. Soil erosion and loss of soil productivity are the primary components of the watershed and aquatics analysis where irreversible losses are likely to occur. This potential is documented in this report and in the soils report prepared by the forest soil scientist. The impacts to water quality and aquatic organisms described in this effects analysis represent irretrievable commitments of and impacts to resources.

Consistency with the Forest Plan

All of the alternatives are consistent with the Fishlake Forest plan from the standpoint that existing support of beneficial uses will be maintained at least in the short term. Future management actions would be necessary to make Alternative 1 completely consistent with the Forest Plan since a Purpose of and Need for action has been identified. Only the action alternatives improve support of beneficial uses. Each action alternative and reasonably foreseeable action applies Forest Plan Standards and Guidelines relative to Fisheries Management, Silvicultural Prescriptions, Riparian Area Management, Water Use and Improvement, and soil Resource Management (see Appendix A). The action alternatives improve compliance with the Clean Water Act as required by law and the Forest Plan.

REFERENCES CITED

Almy, J. 1978. Summarization and analysis of water quality samples collected on the Beaver Ranger District Fishlake National Forest, 1971 – 1977. Specialist Report dated 18 April 1978. 48 p.

Belt, G.H., J.O. O'Laughlin, and T. Merrill. 1992. Design of forest riparian buffer strips for the protection of water quality: Analysis of scientific literature. http://www.uidaho.edu/cfwr/pag/pagr8.html Idaho Forest, Wildlife, Range Policy Group, Rept. 8, Univ. Idaho, Moscow, 35 pp.

Chamberlain, C. B. and D. K. Hepworth. 2003. A Study of the Lake Trout Population of Fish Lake, Utah During 1989-2002. Utah Division of Wildlife Resources. Publication No. 03-11. Salt Lake City, Utah. 25pp.

Chronic, H. 1990. Roadside Geology of Utah. Mountain Press Publishing Company. Missoula, Montana. Pg. 117

Clarkin, Kim. 2006. personal communication on a literature review she conducted for a San Dimas publication on forded crossings that is nearly completed for publishing.

Deiter, D. 2001. Watershed Report for the OHV Event Environmental Assessment. Fishlake National Forest Supervisors Office, Richfield UT. Specialist Report dated 2 March 2001. 23 p.

Deiter, D. 2002a. Watershed Monitoring Report for 2001 Fillmore ATV Jamboree. Fishlake National Forest Supervisors Office, Richfield UT. Specialist Report dated 24 September 2002. 11 p.

Deiter, D. 2002b. Watershed Monitoring Report for 2001 the Rocky Mountain ATV Jamboree. Fishlake National Forest Supervisors Office, Richfield UT. Specialist Report dated 24 September 2002. 11 p.

Deiter, D. 2002c. FY 2001 Watershed Monitoring Report. Fishlake National Forest Supervisors Office, Richfield UT 84701. Specialist Report dated 27 September 2002. 9 p.

Deiter, D. 2003. Watershed Ten-Year Monitoring Report. Fishlake National Forest Supervisors Office, Richfield UT 84701. Specialist Report dated 31 July 2003. 28 p.

Deiter, D. 2006a. OHV Stream Crossing Monitoring 2001 – 2006 – Fishlake National Forest, updated presentation from R4 – Integrated Workshop. Ogden, UT, PowerPoint Presentation.

Deiter, D. 2006b. Unpublished ATV Event Monitoring Data and Analyses for the Fillmore and Rocky Mountain Jamboree Events for 2002 through 2006. Fishlake National Forest Supervisors Office, Richfield UT 84701. located in project file.

Dissmeyer, G. 2000. Drinking water from forests and grasslands: a synthesis of the scientific literature. Gen. Tech. Rep. SRS-39. Asheville, NC : USDA Forest Service, Southern Research Station page 78

Federal Highway Administration. 2005. Environmental Assessment and Section 4(f) Evaluation for Utah Forest Highway 29/Beaver to Junction. Lakewood Colorado.

Gropp, R. 2006. Utah forest water quality monitoring guidelines audit report. Utah Department of Natural Resources – Division of Forestry, Fire, and State Lands. 40p http://www.ffsl.utah.gov/ForestryAssist/FWQG/Monitoring.php

Gucinski, H., M. Furniss, R. Ziemer, and M. Brookes. 2001. Forest Roads: A synthesis of scientific information. General Technical Report PNW-GTR-509, Portland, OR: USDA Forest Service, Pacific Northwest Research Station. 103 p. http://www.fs.fed.us/pnw/pubs/gtr509.pdf

Hepworth, D. K., M. J. Ottenbacher, C. B. Chamberlain. 2002. A review of a quarter of a century of native trout conservation in Southern Utah. Intermountain Journal of Sciences. Vol. 8, No. 3: 125-142.

Hepworth, D. K., M. J. Ottenbacher, C. B. Chamberlain, and J. E. Whelan. 2003. Abundance of Bonneville Cutthroat Trout In Southern Utah, 2001-2002, Compared to Previous Surveys. Utah Division of Wildlife Resources. Publication No. 03-18. 11pp. plus appendices.

MacDonald, L. 1989. Cumulative watershed effects: The implications of Scale. Paper presented at the 1989 Fall Meeting of the American Geophysical Union, San Francisco, CA.

Mangum, F. A. various dates. Aquatic Ecosystem Inventory Macroinvertebrate Analysis, Fishlake National Forest for 1986-1997. USDA Forest Service, Intermountain Region, National Aquatic Ecosystem Analysis Laboratory, Brigham Young University, Provo, UT.

Mangum, F. A. 1986. Macroinvertebrates, p. 661-675 *in* Cooperrider, A. Y., R. J. Boyd, and H. R. Stuart, eds. Inventory and monitoring of wildlife habitat. U.S. Dept. Inter., Bureau of Land Mange. Service Center. Denver, CO. xviii, 858 pp.

Marion, J. 1996. Recreation Ecology Research Findings: Implications for Wilderness and Park Managers. In: Proceedings of the National Outdoor Ethics Conference, April 18-21, 1996, St. Louis, MO. Gaithersburg, MD: Izaak Walton League of America. pp. 188-196. http://www.cnr.vt.edu/forestry/cpsu/rececol.html

McCool, S. 2002. Principles and Concepts for Managing Visitor Impacts in Protected Areas. In: "Conference on Carrying Capacity and Visitor Management in Protected Areas, May 31-June 1, 2002, Athens, Greece, 9 pp. http://www.cfc.umt.edu/departments/socn/publications/greece.pdf

Meehan, W - editor. 1991. Influences of Forest and Rangeland Management on Salmonid Fishes and their Habitats. American Fisheries Society Special Publication 19. Bethesda, Maryland. pages 7, 43-44, 297-323, 496-497.

Ketcheson, G. and W. Megahan. 1996. Sediment production and downslope sediment transport from forest roads in granitic watersheds. Res. Pap. INT-RP-486. Ogden, UT: USDA Forest Service, Intermountain Research Station. 11p.

Petty, J. 2002-2005. Reports and Data from Level 2 Integrated Riparian Evaluations for the Fishlake National Forest. Shell Valley Consulting contract numbers 43-84N8-1-0236, 43-84N8-3-0040, 43-84N8-3-0219, and 43-84N8-4-0190.

Rodriguez, R. L. (compiler). 2006. Life History and Analysis of Endangered, Threatened, Candidate, Sensitive, and Management Indicator Species of the Fishlake National Forest, Ver. 4.1. USDA Forest Service, Fishlake National Forest, Richfield, UT. 153pp.

Seyedbagheri, K. 1996. Idaho Forestry Best Management Practices: Compilation of Research on Their Effectiveness. General Technical Report INT-GTR-339. Ogden, UT, USDA Forest Service Intermountain Research Station, 89p. http://www.fs.fed.us/rm/main/pubs/newpubs/np01_1jm.html

Smith, M. 2006. Soils Report for the Fishlake OHV Route Designation Project. Fishlake National Forest Supervisors Office, Richfield, UT. Report dated 9 November 2006. 39 p. plus maps

Solt, A. 2004. Hydrologist Report for the Richfield-Loa Districts Wildlife Habitat Improvement and Fuels Reduction Project. Fishlake National Forest Supervisors Office, Richfield, UT. Report dated 8 July 2004. 4 p.

USDA Forest Service. 1987. Water quality on the Fishlake National Forest Status Report – 1987. Fishlake National Forest Supervisors Office, Richfield, UT. Report dated 1987. 69 p.

USDA Forest Service. 2002. Beaver River Watershed Assessment. Fishlake National Forest Supervisors Office, Richfield UT. http://www.fs.fed.us/r4/fishlake/projects/nepa/beaver_river/beaver_eaws_startup.pdf.

USDA Forest Service. 2003. Roads Analysis Report – Forest-wide Roads Analysis. Dixie and Fishlake National Forest Supervisors Office, Cedar City and Richfield Utah. Report dated January 10, 2003.

USDA Forest Service. 2004. Fremont River Watershed Assessment. Fishlake National Forest Supervisors Office, Richfield UT. Internal Report.

USDA Forest Service. 2006. Roads Analysis Report – 2006 Supplement – Forest-wide Transportation Analysis for the Fishlake OHV Route Designation Project. Fishlake Roads Analysis Supplement. Fishlake National Forest Supervisors Office, Richfield Utah.

Vinson, M. various dates. Aquatic Macroinvertebrate Monitoring Report, Fishlake National Forest for 1998-2004. National Aquatic Monitoring Center, Utah State University, Logan, UT.

Whelan, J. 2001a. Fisheries Specialist Report for the BLM/FS Environmental Assessment – FS/BLM OHV Events. Fishlake National Forest Supervisors Office, Richfield, UT 84701. Specialist Report dated 1 May 2001. 14 p.

Whelan, J. 2001b. Biological Evaluation for Sensitive Aquatic Species for the BLM/FS Environmental Assessment – FS/BLM OHV Events. Fishlake National Forest Supervisors Office, Richfield, UT 84701. Specialist Report dated 1 May 2001. 15 p.

Whelan, J. 2002. Macroinvertebrate Monitoring Results of the 1995 and 1996 Rotenone Treatment of Manning Creek, Utah. Utah Department of Natural Resources – Division of Wildlife Resources. Publication Number 02-04, Salt Lake City, UT. 34 p.

Whelan, J. 2003. Summary of Aquatic Biota Management Indicator Species (MIS) and Aquatic Habitat Forest Plan Monitoring 1986-2002. Fishlake National Forest Supervisors Office, Richfield, UT 84701. Specialist Report dated 23 August 2003. 30p.

Winget, R. N. and F. A. Mangum. 1979. Biotic Condition Index: Integrated Biological, Physical, and Chemical Stream Parameters for Management. USDA Forest Service, Intermountain Region. 51pp.

Wisseman, R. 2006. Dixie National Forest Benthic Biomonitoring Results, 2005. Aquatic Biology Associates, Inc. Corvallis, OR.

Appendix A
Consistency Checklists and Regulatory Requirements

FOREST PLAN STANDARDS

The following tables show how the Fishlake OHV Route Designation Project applies existing Forest Plan Standards and Guidelines. It is important to remember that ongoing land uses and reasonably foreseeable activities are held to these same standards, which reduces the potential for adverse cumulative impacts from past, present, and reasonably foreseeable activities.

Fish Resource Management

General Direction: Manage waters capable of supporting self-sustaining trout populations to provide for those populations.	
Standards and Guidelines	**Application to Project**
a. Maintain 40% or more of overhanging grasses, forbs, sedges, and shrubs along banks of streams. b. Maintain 50% or more of total streambank length in stable condition where natural conditions allow c. No more than 25% of stream substrate should be covered by inorganic sediment less than 3.2 mm in size where natural conditions allow. d. Maintain a Biological Condition Index (BCI) of 75 or greater.	Each of the action alternatives improves the potential to support self-sustaining trout populations by reducing the miles of motorized routes and open use areas in riparian influence zones along channels, lake margins, and wetlands. The No Action alternative is least likely to be consistent with the Forest Plan over time given the existing and anticipated future levels of motorized use and the amount of unrestricted motorized use that would be allowed. Road and trail obliteration at stream crossings will induce short-term increases in turbidity that will affect relatively short segments of stream, but the net affect even in the short-term will be beneficial (see also the direct and indirect, and cumulative effects analyses in this report). All alternatives, except perhaps No Action meet the intent of this standard

General Direction: Manage and provide habitat for recovery of endangered and threatened species. Do not allow activities or practices that would negatively impact endangered, threatened, or sensitive plant or animal species.	
Standards and Guidelines	**Application to Project**
a. Follow direction in recovery plans.	This is discussed in the Biological Assessments and Biological Evaluations for this project, in the specialist reports for wildlife, vegetation, and fisheries, and in Rodriguez 2005. All alternatives meet the intent of this standard.

General Direction: Coordinate with U.S. Fish and Wildlife Service on all matters dealing with diversion or modification of waters of the United States	
Standards and Guidelines	**Application to Project**
a. Follow requirements of the Fish and Wildlife Coordination Act, and Clean Water Act.	The forest will follow Stream Channel Alteration permit requirements from the Utah Division of Water Rights and the Army Corp of Engineers when obliterating stream crossings and removing

	routes from wetlands. Coordination and consultation with the USFWS and the Utah Division of Wildlife Resources occurred during project planning and will be continued through implementation as needed. Therefore, the intent of this standard is being met.

Silvicultural Prescriptions

General Direction: Apply a variety of silvicultural systems and harvest methods, which best meet resource management objectives.	
Standards and Guidelines	**Application to Project**
1. To facilitate the control of soil erosion within acceptable tolerance: 2. Allow conventional logging equipment on slopes up to 40 percent where soil data are available to design erosion mitigation needs. 3. Utilize cable and aerial systems on slopes over 40 percent.	The Fishlake OHV Route Designation Project does not propose any silvicultural treatments. Only ongoing or reasonably foreseeable timber harvest treatments would be implemented under any of the alternatives. The reasonably foreseeable projects are responsible for meeting this standard. Therefore, this standard will be met under all alternatives.

Riparian Area Management

General Direction: Special protection and management will be given to floodplains, wetlands, and all land and vegetation for a minimum of 100 feet from the edges of all perennial streams, lakes and other bodies of water or to the outer margin of the riparian ecosystem if wider than 100 feet.	
Standards and Guidelines	**Application to Project**
a. Follow direction in FSM 2526 and 2527.	The Forest Service manual direction deals with riparian, floodplain, and wetland protection. As noted in this report, these values would be better protected in the action alternatives because of the removal of routes and open motorized use within riparian areas and wetlands. Ongoing and reasonably foreseeable projects are expected to follow this direction. Therefore, all alternatives meet the intent of this standard.
b. Maintain riparian dependent resource values including wildlife, fish, vegetation, watershed, and recreation in a stable or upward trend.	

General Direction: Design and implement activities in management areas to protect and manage the riparian ecosystem.	
Standards and Guidelines	**Application to Project**
a. none listed.	Each of the action alternatives improves the protection of riparian areas by reducing the miles of motorized routes and open use areas in riparian influence zones and along channels, lake margins, and wetlands. The No Action alternative is least likely to be consistent with the Forest Plan over time given the existing and anticipated future levels of motorized use and the amount of unrestricted motorized use that would be allowed (see also the direct and indirect, and cumulative effects analyses

	in this report). The "Required Design Criteria" would protect streams and riparian zones during the obliteration of routes. Thus, all alternatives meet the intent of this standard, except perhaps No Action.

General Direction: Prescribe livestock grazing systems to achieve riparian area objectives along streams capable of supporting self-sustaining fisheries.	
Standards and Guidelines	
a. Maintain a 4" minimum stubble height for hydric riparian species, and 6" minimum stubble heights in riparian emphasis management areas.	These standards are required for the existing grazing permits within the cumulative effects areas. Reducing the mileage of motorized routes and open use areas within and near riparian areas is consistent with the intent of this standard and will reduce the potential for cumulative riparian impacts with other land uses such as livestock grazing. Therefore, this standard would be met under all of the action alternatives. This standard is applied under No Action, but cumulative impacts of motorized use and grazing would not be reduced from existing levels.
b. Allow a maximum of 40% use of current years growth on young-aged browse species in riparian areas, and 50% for mature browse.	
c. Maintain ground cover of at least 70 percent within riparian areas.	

General Direction: Prescribe silvicultural systems to achieve riparian area objectives. a. prohibit the operation of motorized equipment within the riparian area except at constructed stream crossings. b. select stream crossing points to minimize bank and channel disturbance.	
Standards and Guidelines	
a. Maintain shade, bank stability and sediment standards as specified under wildlife and fish resource management standards and guidelines.	Only ongoing or reasonably foreseeable timber or fuels silvicultural treatments would occur in the riparian areas under any of the proposed alternatives. These activities would be required to meet this standard. Dispersed camping and other recreational use would occur within riparian influence zones, but would be less than current levels under the action alternatives. The action alternatives associated with the route designation project would improve the ability to meet this standard by reducing motorized route mileage and open use areas that are within and near riparian areas and wetlands. However, all alternatives meet the intent of this standard.

General Direction: Locate and construct arterial and collector roads to maintain the basic natural condition and character of riparian areas. a. locate roads outside of riparian area except for stream crossings or where other feasible alternatives do not exist. b. select stream crossing points to minimize bank and channel disturbance.	
	Application to Project

a. Maintain fish passage during all flow levels except peak flow events.	Only ongoing or reasonably foreseeable silvicultural or fuels treatment activities such as the South Fork Vegetation Treatment Project and the Quitchupah Creek, Gooseberry-Sevenmile or other road construction projects have the potential to create new roads within riparian areas or stream crossings. The action alternatives reduce the number of existing stream crossings and encroaching motorized routes. No Action maintains existing conditions. However, all alternatives meet the intent of this standard.

Water Uses Management

General Direction:

1. Determine and obtain rights to instream flow volumes to protect and maintain stream channel stability and capacity and to meet multiple use requirements.

2. Protest water right applications of others when such uses will lower streamflows below levels acceptable for National Forest uses and purposes.

3. Special Use Permits, easements, rights-of-way, and similar authorizations for use of NFS lands shall contain conditions and stipulations to maintain instream or bypass flows necessary to fulfill all National Forest uses and purposes.

4. Determine and obtain rights to other surface and ground waters to meet multiple use requirements.

5. Follow Utah Water Law procedures for water filings and for changes in Point of Diversion, Place, Purpose, or Period of Use.

	Application to Project
a. none listed.	None of the alternatives would directly, indirectly, or cumulatively affect instream flows. The Fishlake has a full time position dedicated to managing water rights. All of the alternatives meet the intent of this standard.

Water Resource Improvement and Maintenance

General Direction: Maintain instream flows and protect public property and resources.

Standards and Guidelines	**Application to Project**
a. none listed.	None of the proposed alternatives would directly, indirectly, or cumulatively affect instream flows. All of the alternatives meet the intent of this standard.

General Direction: Improve or maintain water quality to meet State water quality standards. However, where the natural background water pollutants cause degradation, it is not necessary to implement improvement actions. Short-term or temporary exceedence of some parameters of the State standard, such as increased sediment from road crossing construction or water resource development may be permitted in special cases.	
Standards and Guidelines	**Application to Project**
a. Follow requirements of the Fish and Wildlife Coordination Act, and Clean Water Act.	Water quality has been monitored for many years on the Fishlake. Deiter 2003 characterizes the exceedences in the 10-year Watershed Monitoring report. Short-term impacts from turbidity and sediment from route obliteration are permitted by this standard, but would be minimized by the "Required Design Criteria". Thus, all alternatives meet the intent of this standard. The action alternatives should result in short and long-term improvements to water quality in many watersheds. See also, the Biological Assessments and Biological Evaluations, the soils report by the forest soils scientist, and this report.

General Direction: Coordinate with the State at the local and State levels in assessing water quality problems.	
Standards and Guidelines	**Application to Project**
a. none listed.	This is a programmatic standard and it occurs through Forest Service involvement with the State of Utah in the Cooperative Water Quality Monitoring program and participation in the development of Total Maximum Daily Loads (TMDLs) for water quality limited stream segments. The Utah State Department of Environmental Quality, which includes the Division of Wildlife Resources, the Division of Water Quality, the Division of Drinking Water, and the Division of Water rights are included on the agency mailing list for project scoping and environmental documents and were consulted on this project.

General Direction: Rehabilitate disturbed areas that are contributing sediment directly to perennial streams as a result of management activities to maintain water quality and reestablish vegetative cover.	
Standards and Guidelines	**Application to Project**
a. Reduce to natural rate any erosion due to management activity through necessary mitigation measures such as water-barring and revegetation. Rehabilitation measures will be implemented within one year of the activity.	The No Action alternative would not create any new site disturbances, but also would not immediately fix the problem areas being addressed by the action alternatives. The action alternatives could contribute minimal amounts of sediment directly to perennial streams during road and trail obliteration (see the direct and indirect, and cumulative effects analyses in this report). Measures necessary to prevent and reduce erosion are specified in the "Required Design Criteria". All alternatives meet the intent of this standard.

General Direction: Limit use of herbicides, insecticides, rodenticides, or other chemical agents as part of terrestrial management activities to times and places where possible transport to or by surface water has a low probability of occurrence. Follow all label requirements concerning water quality protection.	
Standards and Guidelines	**Application to Project**
a. none listed.	This standard is applied through the requirements of the Fishlake National Forest Noxious Weed EA. The Cooperative Fisheries Enhancement projects will result in direct application of rotenone in 8 streams on the forest. Though not a terrestrial application, this will create short-term negative impacts to water quality and intentional short-term impacts to aquatic biota. However, these treatments are needed in order to maintain viable Bonneville and Colorado cutthroat fisheries on the forest over time. A report titled "Aquatic Macroinvertebrate Monitoring Results of the 1995 and 1996 Rotenone Treatment of Manning Creek, Utah indicates that adverse impacts to aquatic biota are temporary and mimic response to natural processes such as major floods or fires.. Closing the forest to motorized cross-country travel will reduce the potential for new infestations and spread of invasive plants and aquatic nuisance species, which helps reduce the long-term need for chemical treatments. Therefore, this standard is met by all alternatives.

Soil Resource Management

General Direction: Maintain soil productivity, minimize man-caused soil erosion, and maintain the integrity of associated ecosystems.

a. use site preparation methods which are designed to keep fertile, friable topsoil essentially intact.
b. give roads and trails special design considerations to prevent resource damage on capability areas containing soils with high shrink-swell capacity.
c. provide adequate road and trail cross drainage to reduce sediment transport energy.

d. revegetate all areas, capable of supporting vegetation, disturbed during road construction and/or reconstruction to stabilize the area and reduce soil erosion. Where practicable use less palatable plant species on cuts, fills, and other areas subject to trampling damage by domestic livestock and big game to discourage grazing. e. prevent livestock and wildlife grazing which reduces the percent of plant cover to less than the amount needed for watershed protection and plant health. f. place tractor-built firelines on the contour, where possible, and avoid use of tractors on highly erodible sites. g. provide permanent drainage and establish protective vegetative cover on all new temporary roads or equipment ways, and all existing roads which are being removed from the transportation system. h. minimize soil compaction by reducing vehicle passes, skidding on snow, frozen or dry soil conditions, or by off-ground logging systems. i. restore soil disturbance caused by human use to soil loss tolerance levels commensurate with the natural ecological processes for the treatment areas.	
Standards and Guidelines	**Application to Project**
Use the following standards and guidelines unless more site-specific requirements are developed during project design. 1. Limit intensive ground disturbing activities on unstable slopes and highly erodible sites. 2. Apply guide developed by Packer (19) in the design for cross drain spacing and buffers.	The No Action alternative would not create any new site disturbance, but also would not immediately fix the problem areas being addressed by the action alternatives. No Action would maintain over 937,000 acres as open to motorized cross-country travel, which has negative implications for long-term soil productivity. All alternatives meet the intent of this standard, but the action alternatives make the most improvements for protection of long-term soil productivity. See the direct, indirect, and cumulative impacts discussions in this report and the soils report written by the forest soil scientist for additional information.

General Direction: Identify at the project level, upland areas that are immediately adjacent to riparian (prescription 9A) Management Areas. Adjacent upland areas are those portions of a management area which, when subjected to management activities, have a potential for directly affecting the condition of the adjacent riparian management area. The magnitude of effects is dependent upon slope steepness, and the kind, amount, and location of surface and vegetation disturbance within the adjacent upland unit.

Standards and Guidelines	Application to Project
a. The following is a guide to identify the approximate extent of adjacent upland areas: SLOPE GRADIENT OF UPLAND AREAS ADJACENT TO RIPARIAN MANAGEMENT AREA. (% slope range) / DISTANCE UPSLOPE FROM BOUNDARY OF RIPARIAN MANAGEMENT AREA. (feet) 0-20: 100 20-30: 180 30-40: 280 40-50: 400 50-60: 520 60-70: 640 70-80: 760 80-90: 880 90-100: 1000 100-150: 1000-1300	The No Action alternative would not create any new site disturbance. The action alternatives would reduce the amount of disturbance and potential risks within the zones described by this standard. All alternatives meet the intent of this standard.

General Direction: Reduce project caused, on site, erosion rates through designed management practices and appropriate erosion mitigation, vegetation, or restoration measures.

Standards and Guidelines	Application to Project
a. Reduce erosion by 75% within the first year after disturbance. Reduce project caused on-site erosion by 95% within five years after initial disturbance. Calculate erosion with appropriate universal soil loss equation methodology.	The No Action alternative would not create any new site disturbance except for those associated with ongoing and reasonably foreseeable activities. The action alternatives have been designed to minimize induced erosion from chronic and catastrophic sources provided "Required Design Criteria" are correctly applied. Therefore, all alternatives meet the intent of this standard.

General Direction: Design continuing mitigation and restoration practices, and follow-up maintenance activities.

Standards and Guidelines	Application to Project
a. Insure that 80% original ground cover (vegetation) recovery occurs within five years after disturbance.	The No Action alternative would not result in any new disturbance. The "Required Design Criteria" for the action alternatives would promote vegetative recovery post treatment and provides for site rehabilitation if needed. Therefore, all alternatives meet the intent of this standard.

Vegetation Treated by Burning

General Direction: Limit use of prescribed fires on areas adjacent to riparian areas to protect riparian and aquatic values.	
Standards and Guidelines	**Application to Project**
a. none listed.	There are several ongoing and reasonably foreseeable prescribed burns. However, none are proposed in the Fishlake OHV Route Designation Project under any alternative. This standard will be applied to ongoing and reasonably foreseeable activities under all alternatives. Therefore, all alternatives meet the intent of this standard.

CLEAN WATER ACT

Army Corp Discharge, Dredge and Fill Permits

The Forest Service will coordinate with and obtain permits from the Army Corp of Engineers and Utah Division of Water Rights where applicable on the planned road obliterations that require stream channel alteration or wetland rehabilitation.

Water Quality Limited Stream Segments and Water Bodies

See Appendix B.

Appendix B

2004 (approved list) and 2006 (submitted list) 303(d) Water Quality Limited Streams, Lakes, Reservoirs* within or near the Fishlake National Forest

Category 5A – River, Stream, Lake, and Reservoir Assessment Units Requiring a TMDL			
Waterbody Name	**Beneficial Use Support**	**Cause of Impairment[1]**	**Spatial Extent**
Middle Muddy and tributaries	Non-supporting	*Salinity,* Total Dissolved Solids, *Chlorides*	From Quitchupah Creek confluence to U-10 crossing (see Map 2 for the spatial extent of the assessment area).
Lower Quitchupah Creek	Non-supporting	*Salinity,* Total Dissolved Solids, *Chlorides*	From confluence of Ivie Creek to U-10 crossing (see Map 2 for the spatial extent of the assessment area).
Lower Ivie Creek and tributaries	Non-supporting	*Salinity,* Total Dissolved Solids, *Chlorides*	From confluence with Muddy River to U-10 highway (see Map 2 for the spatial extent of the assessment area).
Lower Muddy Creek	Partially Supporting	*Salinity, Total Dissolved Solids, Chlorides* [2]Selenium	From confluence with Fremont River to Ivie Creek confluence (see Map 2 for the spatial extent of the assessment area).
Sevier River-3 and tributaries	*Partially Supporting*	*Total Phosphorus, Sediment*	*From Circleville Irrigation Diversion to Horse Valley Diversion (see Map 3 for the spatial extent of the assessment area).*
East Fork Sevier River-4 and tributaries	Partially Supporting	Total Phosphorus, Temperature	From confluence with Sevier River upstream to Antimony Creek confluence, excluding Otter Creek and tributaries (see Map 3 for the spatial extent of the assessment area).
Salina Creek-1 and tributaries	*Non-supporting*	*Salinity, Total Dissolved Solids, Chlorides*	*From confluence with Sevier River to USFS Boundary (see Map 3 for the spatial extent of the assessment area).*
[2]Sevier River-6	Partially Supporting	Temperature	Sevier River from Clear Creek confluence to HUC unit boundary (see Map 3 for the spatial extent of the assessment area).

Category 5A – River, Stream, Lake, and Reservoir Assessment Units Requiring a TMDL			
Waterbody Name[1]	**Beneficial Use Support**	**Cause of Impairment[1]**	**Spatial Extent**
Lost Creek-1 and tributaries	Non-supporting	*Salinity,* Total Dissolved Solids, *Chlorides*	From confluence with Sevier River upstream ~ 6 miles (see Map 3 for the spatial extent of the assessment area).
Sevier River-17	*Partial to Non-supporting*	*Total Phosphorus, Salinity, Total Dissolved Solids, Chlorides, Sediment*	*From Yuba Dam upstream to confluence with Salina Creek (see Map 3 for the spatial extent of the assessment area).*
Manning Meadow Reservoir	Partially Supporting	Total Phosphorus, Dissolved Oxygen	See Map 4 for location.
Koosharem Reservoir	Partially Supporting	Total Phosphorus	See Map 4 for location.
Lower Box Creek Reservoir	Partially Supporting	Total Phosphorus, Dissolved Oxygen	See Map 4 for location.
Otter Creek Reservoir	Partially Supporting	Total Phosphorus, *Temperature*	See Map 4 for location.
Piute Reservoir	Partially Supporting	Total Phosphorus, *Temperature*	See Map 4 for location.

[1]Waterbodies and Pollutants in italics have been removed from the 2006 303(d) list for Category 5A because TMDLs have been approved since 2004 or because the reassessment changed the impairment determination.

[2] Waterbody or pollutant added to the 303(d) list since 2004.

Category 5B – Requests for removal from the 303(d) list of impaired waters.			
Waterbody Name[1]	**Beneficial Use Support**	**Impairment[1]**	**Spatial Extent**
[2]Otter Creek Reservoir	Full Support	Temperature	See Map 4 for location.
[2]Piute Reservoir	Full Support	Temperature	See Map 4 for location.

[1]Waterbodies and Pollutants in italics have been removed from the 2006 303(d) list for Category 5A because TMDLs have been approved since 2004 or because the reassessment changed the impairment determination.

[2] Waterbody or pollutant added to the 303(d) list since 2004.

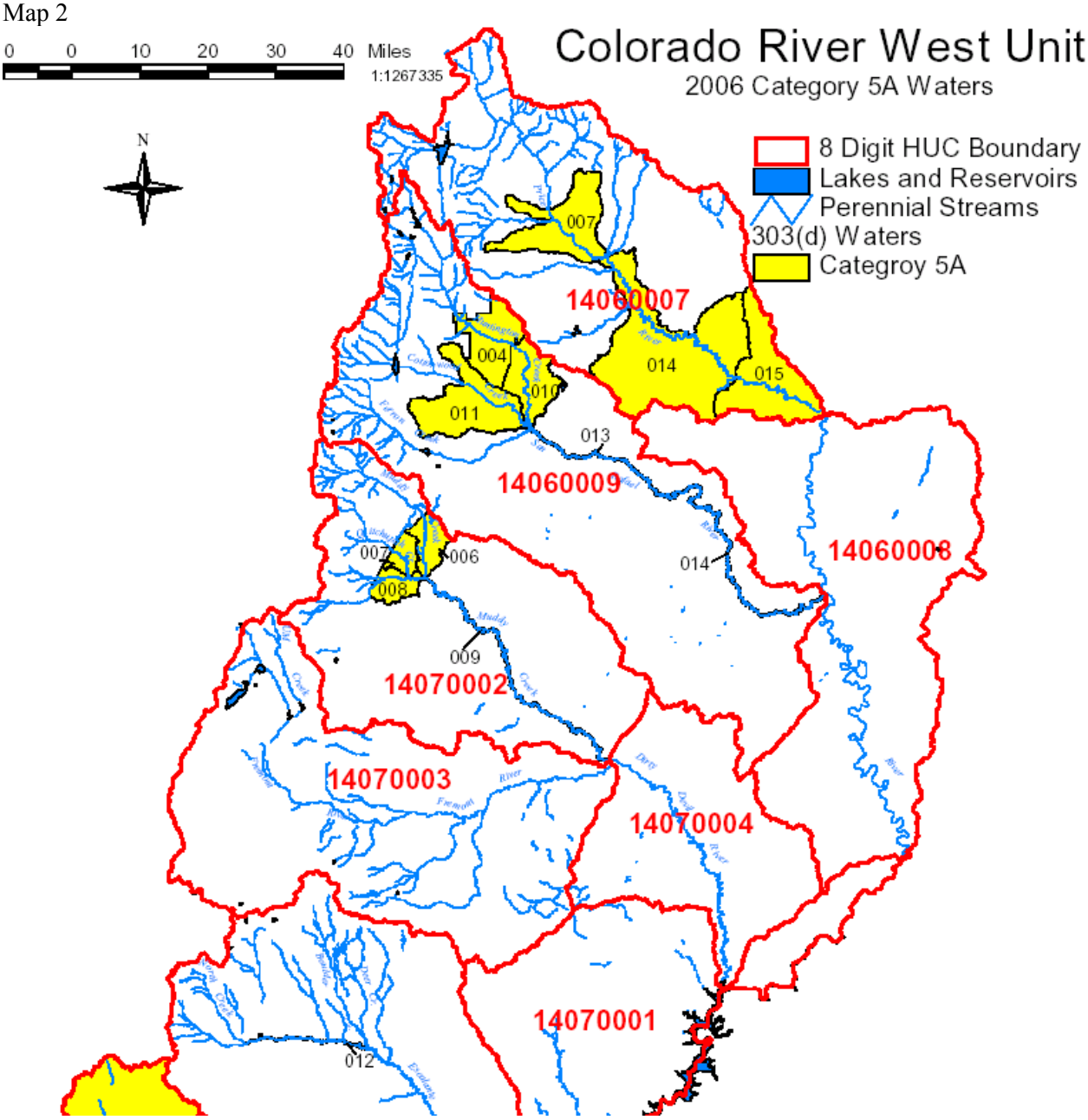
Category 5C – UPDES Permit Renewal TMDLs 2004-2006.			
Waterbody Name[1]	**Permit Number**	**Pollutants[1]**	**Facility Name**
Quitchupah Creek	UT0022616	Iron, Total Dissolved Solids, *Trichloroethene*	Consolidated Coal Co-Underground
[1]Waterbodies and Pollutants in italics have been removed from the 2006 303(d) list for Category 5A because TMDLs have been approved since 2004 or because the reassessment changed the impairment determination. [2] Waterbody or pollutant added to the 303(d) list since 2004.			

Category 5D – Lakes not Fully Supporting Beneficial Uses for 2004 that will not be listed until two consecutive assessment cycles demonstrate impairment.			
Waterbody Name[1]	**Beneficial Use Support**	**Cause of Impairment[1]**	**Spatial Extent**
[2]Three Creeks Reservoir	Partially Supporting	Dissolved Oxygen	See Map 4 for location.
Otter Creek Reservoir	*Partially Supporting*	*pH*	*See Map 4 for location.*
[1]Waterbodies and Pollutants in italics have been removed from the 2006 303(d) list for Category 5A because TMDLs have been approved since 2004 or because the reassessment changed the impairment determination. [2] Waterbody or pollutant added to the 303(d) list since 2004.			

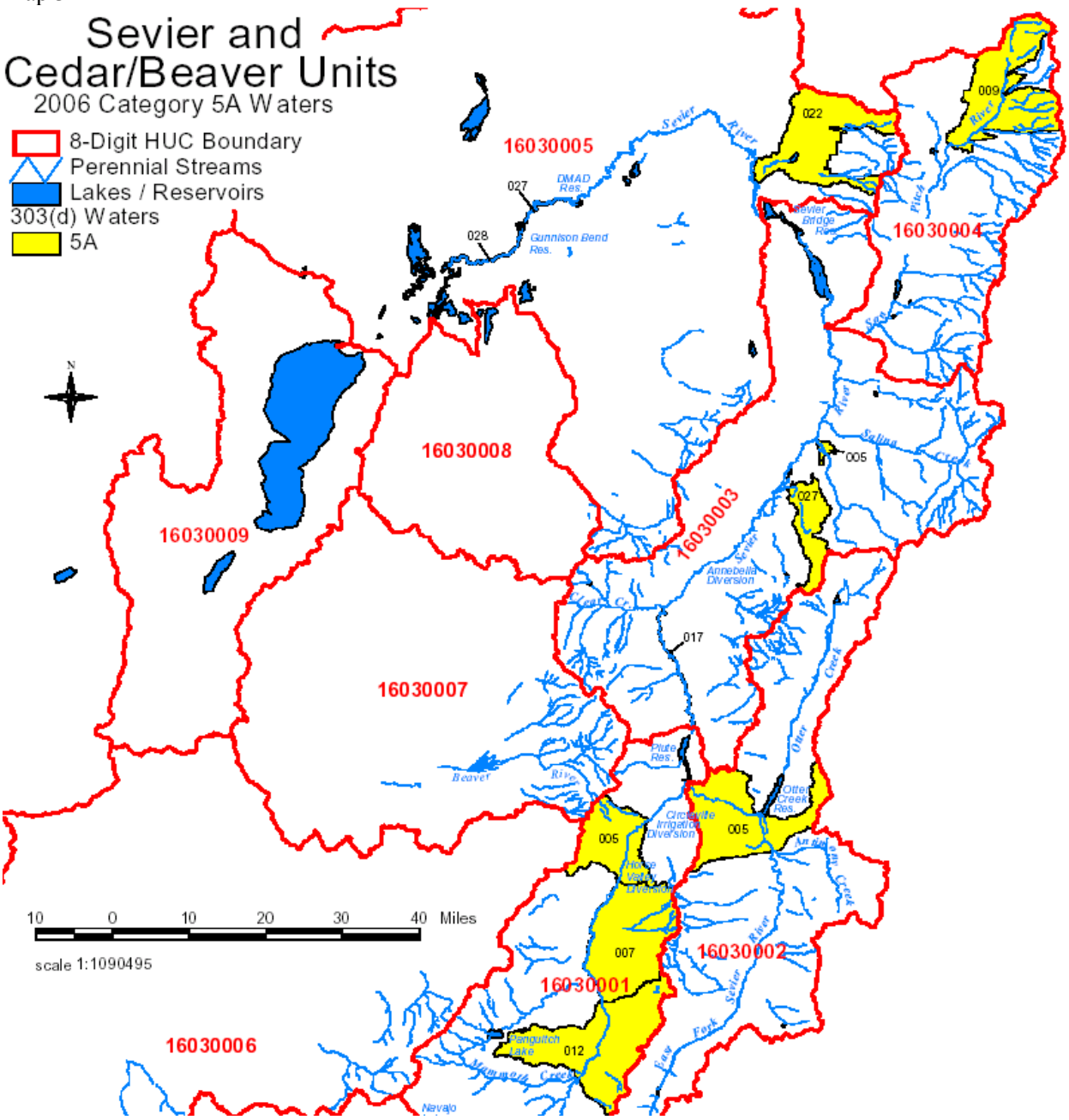
This list does not include impaired waters that have an approved TMDL in place. For completed TMDLs and additional specific listing information see the following web sites:

- http://waterquality.utah.gov/documents/2004305b-1-20-05rep.pdf
- http://www.waterquality.utah.gov/documents/Utah305b_2006Vol1_6-30-06.pdf
- http://waterquality.utah.gov/public%20notices/2004303dlist-01-15-04.pdf
- http://www.waterquality.utah.gov/documents/200_303d_submittal_3-31-06.pdf
- http://oaspub.epa.gov/waters/state_rept.control?p_state=UT.

Map 2

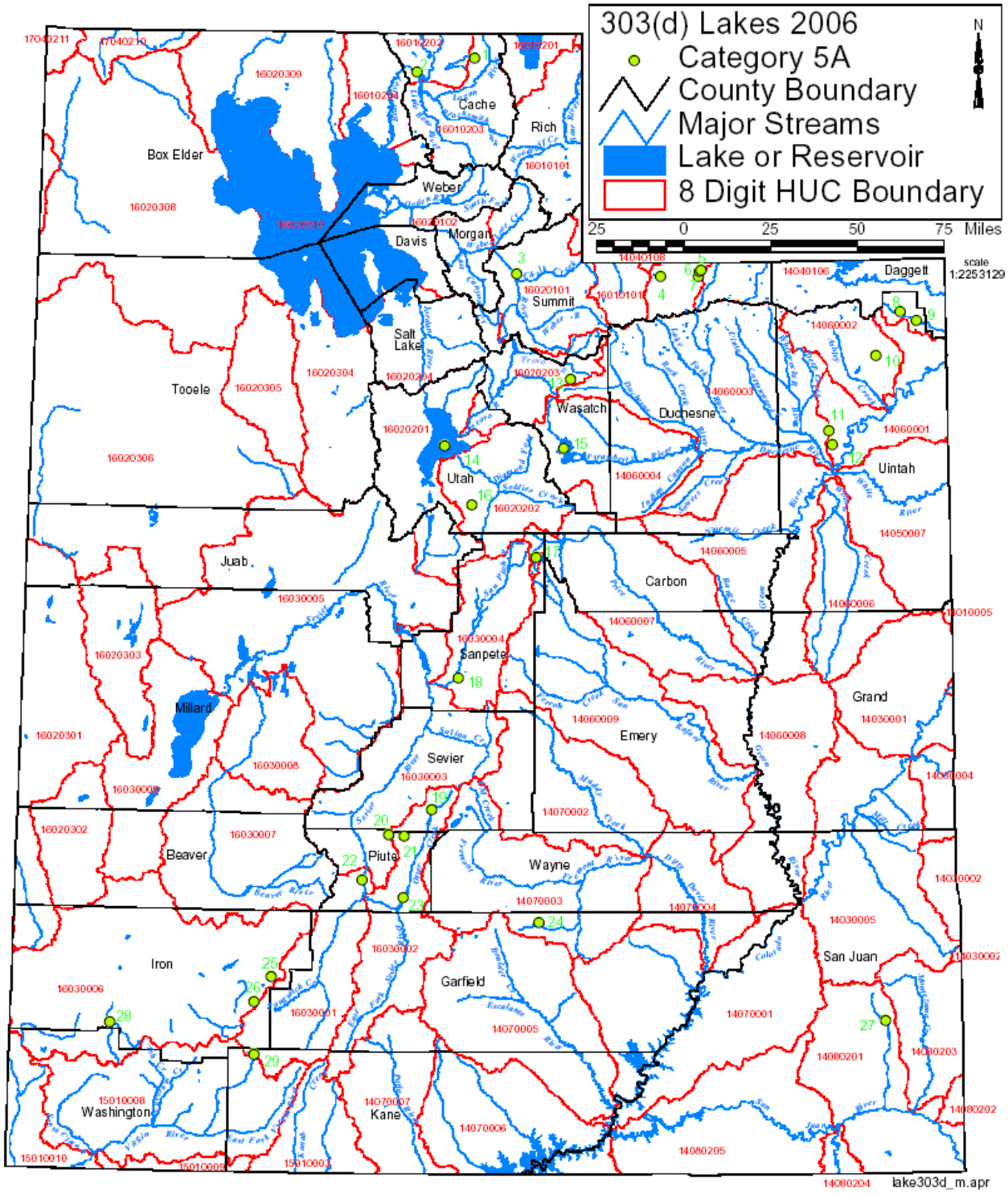

Colorado River West Unit
2006 Category 5A Waters
0 0 10 20 30 40 Miles
1:1267335
N
8 Digit HUC Boundary
Lakes and Reservoirs
Perennial Streams
303(d) Waters
Categroy 5A
14060007
14060009
14060008
14070002
14070003
14070004
14070001
007
004
010
011
014
015
013
007
006
008
014
009
012

Map 3



Map 4

Utah's Lake and Reservoir 303(d) Waters for 2006



Category 5A – River and Stream Assessment Units Requiring a TMDL		
Waterbody Name	**Cause of Impairment[1]**	**Sources of Impairment**
Middle Muddy and tributaries	*Salinity,* Total Dissolved Solids, *Chlorides*	The Water Quality Limited stream segment is located below the CEA and below National Forest System lands (see Map 2). The primary sources of the pollutants result from geologic parent material such as the Mancos shale formation that has inherently high levels of salts. The listed pollutants are added naturally in these soil types and through return flows from irrigated lands.
Lower Quitchupah Creek	*Salinity,* Total Dissolved Solids, *Chlorides*	The Water Quality Limited stream segment is located below the CEA and below National Forest System lands (see Map 2). The Quitchupah Creek Road project will induce increases in the pollutants of concern, but also reductions from offsetting mitigation. The FEIS for the Quitchupah Road Construction Project is incorporated by reference. The potential changes to the issue indicators are reflected in Tables 16 and 24 for the Ivie Creek – Upper Colorado River CEA. A Total Maximum Daily Load (TMDL) has been prepared and has been approved by the Environmental Protection Agency. The TMDL includes site-specific standards to reflect the inherent geologic conditions in this watershed have been in effect since June 1, 2005. This has changed the 303(d) status.
Lower Ivie Creek and tributaries	*Salinity,* Total Dissolved Solids, *Chlorides*	The Water Quality Limited stream segment is located below the CEA and below National Forest System lands (see Map 2). The primary sources of the pollutants result from geologic parent material such as the Mancos shale formation that has inherently high levels of salts. The listed pollutants are added naturally in these soil types and through return flows from irrigated lands.
Lower Muddy Creek	*Salinity, Total Dissolved Solids, Chlorides,* Selenium	This stream segment is hydrologically below the Middle Muddy, Lower Quitchupah Creek, and Lower Ivie Creek stream segments that are described above and are listed for the same parameters (see Map 2). As such, the same explanations as already described apply, especially given that the Fishlake OHV Route Designation project would not result in further impairment of any of those WQL segments.

Category 5A – River and Stream Assessment Units Requiring a TMDL		
Waterbody Name	**Cause of Impairment[1]**	**Sources of Impairment**
East Fork Sevier River-4 and tributaries	Total Phosphorus, Temperature	The Water Quality Limited stream segment is located below the CEA and below National Forest System lands (see Map 3). The mineralogy of the volcanic geology within the watershed predisposes it to having higher inherent phosphorus levels. The largest human related sources of phosphorus in Piute reservoir are from agricultural activities, including intense livestock grazing, below National Forest System lands. The temperature listing is related to local conditions caused by the storage and draining of water from the Otter Creek reservoir and shallower streamflow depths from channel widening. Tributaries from the National Forest benefit temperature by delivering cold water from high elevations.
Salina Creek-1 and tributaries	*Salinity, Total Dissolved Solids, Chlorides*	*The Water Quality Limited stream segment is located below the CEA and below National Forest System lands (see Map 3). The mineralogy of the sedimentary geology within the watershed predisposes it to having higher inherent levels of the pollutants of concern. The largest human related sources are from agricultural activities, including intense livestock grazing and degraded stream channel conditions below National Forest System lands.*
[2]Sevier River-6	Temperature	The Water Quality Limited stream segment is located below the CEA and below National Forest System lands (see Map 3). The primary causes of this impairment stem from loss of flow to irrigation diversions and widened channels that create shallower streamflow depths. The impairment also reflects the loss of streamside cover. Tributaries from the National Forest benefit temperature by delivering cold water from high elevations.
Lost Creek-1 and tributaries	*Salinity,* Total Dissolved Solids, *Chlorides*	The Water Quality Limited stream segment is located below the CEA and below National Forest System lands (see Map 3). The largest human related sources are from agricultural activities, including intense livestock grazing and degraded stream channel conditions below National Forest System lands.
Sevier River-17	*Total Phosphorus, Salinity, Total Dissolved Solids, Chlorides, Sediment*	*The Water Quality Limited stream segment is located below the CEA and below National Forest System lands (see Map 3). The mineralogy of the volcanic geology within the watershed predisposes it to having higher inherent levels of phosphorus. The largest human related sources for all of the pollutants of concern stem from agricultural activities, including intense livestock grazing and degraded stream channel conditions below National Forest System lands.*

Category 5A – River and Stream Assessment Units Requiring a TMDL		
Waterbody Name	**Cause of Impairment[1]**	**Sources of Impairment**
Manning Meadow Reservoir	Total Phosphorus, Dissolved Oxygen	Manning Meadow Reservoir is located within National Forest System lands (see #26 on Map 4). The mineralogy of the volcanic geology within the watershed predisposes it to having higher inherent levels of phosphorus. Livestock grazing, especially in the wetlands on the north end of the reservoir also is a likely contributor. The need for a fence to exclude livestock from the meadows was included in the Monroe Mountain Ecosystem Restoration Project. The forest still plans to implement this project when funds become available.
Koosharem Reservoir	Total Phosphorus	Koosharem Reservoir is located below the CEAs and below National Forest System lands (see #25 on Map 4). The mineralogy of the volcanic geology within the watershed predisposes it to having higher inherent phosphorus levels. Intensive livestock grazing, especially on the wetlands and riparian areas and gently sloped uplands upstream of the reservoir is a likely a primary contributor.
Lower Box Creek Reservoir	Total Phosphorus, Dissolved Oxygen	Lower Box Creek Reservoir is located within National Forest System lands (see #27 on Map 4). The mineralogy of the volcanic geology within the watershed predisposes it to having higher inherent phosphorus levels. Livestock grazing, especially in wetlands and riparian areas also is a likely contributor. The need for fences to exclude livestock from riparian areas in Upper Box Creek was included in the Monroe Mountain Ecosystem Restoration Project. The forest still plans to implement this project when funds become available.
Otter Creek Reservoir	Total Phosphorus, *Temperature, (ph - Cat. 5C)*	Otter Creek Reservoir is located below the CEAs and below National Forest System lands (see #29 on Map 4). The mineralogy of the volcanic geology within the watershed predisposes it to having higher inherent phosphorus levels. The largest human related sources of phosphorus in Otter Creek reservoir is from agricultural activities, including intense livestock grazing, below National Forest System lands in Grass Valley. The temperature listing is related to local conditions caused by the storage and draining of water from the reservoir and possibly poor conditions on the main channel above the reservoir. Tributaries from the National Forest benefit temperature by delivering cold water from high elevations.

Category 5A – River and Stream Assessment Units Requiring a TMDL		
Waterbody Name	**Cause of Impairment[1]**	**Sources of Impairment**
Piute Reservoir	Total Phosphorus, *Temperature*	Piute Reservoir is located below the CEAs and below National Forest System lands (see #28 on Map 4). The mineralogy of the volcanic geology within the watershed predisposes it to having higher inherent phosphorus levels. The largest human related sources of phosphorus in Piute reservoir are from agricultural activities, including intense livestock grazing, below National Forest System lands. The temperature listing is related to local conditions caused by the storage and draining of water from the reservoir. Tributaries from the National Forest benefit temperature by delivering cold water from high elevations.
[1]*Waterbodies and Pollutants in italics have been removed from the 2006 303(d) list for Category 5A because TMDLs have been approved since 2004 or because the reassessment changed the impairment determination.* [2] Waterbody or pollutant added to the 303(d) list since 2004.		

Cumulative Effects Summary

Reducing phosphorus loadings in streams and lakes is the single greatest improvement in water quality that is needed and that can potentially be achieved on the forest (Deiter 2003). Total Suspended Solid exceedences occur on some streams on the forest, but are not a pollutant of concern in any of the impaired waterbodies on the forest (Utah 2004 and 2006 303(d) lists). Though not reflected in the State water quality criteria, fine sediment is a concern in stream systems on the forest where livestock grazing has altered channel morphology and impacted stability, or where motorized routes and use cause sedimentation. Geology is a major factor that explains the variability in phosphorus concentrations in streams, lakes and reservoirs, as volcanic derived soils have higher natural levels of phosphorus and lower pH. In fact, the differences between mean sample values for aluminum, nitrogen as nitrate and nitrite, total phosphorus, total dissolved solids, and pH are statistically significantly by geologic type for stream data on the forest. However, human activities and inputs can and have lead to water quality exceedences on all geologic formations on the forest. Based on field observations, the dominant induced sources of phosphorus are related to the amount of grazing by livestock within riparian areas, the amounts and types of recreational use within riparian areas, and accelerated erosion within the watershed from roads and other land disturbing activities. Septic systems are also a probable source, especially in and near some of the high mountain lakes such as Fish Lake, Little Reservoir, and LeBaron (Deiter 2003, Fremont River and Beaver River TMDLs).

Bi-carbonates and carbonates, and salts intrinsic in sedimentary formations probably account for the higher total dissolved solids on sedimentary sites compared to volcanic sites on the forest. However, there are no exceedences on the forest for Total Dissolved Solids (Deiter 2003). The forest also has no water quality exceedences for salinity. Total Suspended Solid concentrations are related both to geologic factors and induced disturbances. Under No Action, the tributaries on National Forest would continue to meet State water quality standards for these parameters. However, to the degree that National Forest System lands contribute to downstream water quality – the action alternatives would reduce current and potential loadings by reducing motorized routes and open use in riparian areas and wetlands, and in the remainder of the cumulative effects watershed.

The existing beneficial uses and quality of support are listed in this report. The issue indicators for the CEAs above the WQL water bodies point to reducing current and potential impacts from motorized routes and open use in each of the action alternatives (see Tables 11 through 27 and Appendix D). The effects analysis discloses that none of the action alternatives for the Fishlake OHV Route Designation Project or foreseeable actions are likely to result in direct, indirect, or cumulative impacts that would degrade the quality or support of existing beneficial uses. Over time, the No Action alternative – Alternative 1 would create the greatest impacts to water quality, primarily due to impacts from motorized cross-country travel that would inevitably result from the increasing levels of motorized use allowed by the inadequate restrictions in the current motorized travel plan. The action alternatives reduce the potential for generating erosion or otherwise delivering phosphorus from National Forest System lands because motorized routes and open use areas within riparian areas, lake margins, and wetlands, and within the cumulative effects watersheds would be reduced. The same is true for sediment loadings and contributions to salinity and Total Dissolved Solids. Thus, all alternatives are consistent with 303(d) requirements and would not result in further impairment of the impacted beneficial uses.

Appendix C
Reasonably Foreseeable Activities

Project Name	Unit	Description of the Project and Potential Effects
Cooperative Fisheries Enhancement Projects	D1, D2, D3, D4, & Dixie NF	The Fishlake NF and Dixie NF, in cooperation with the UDWR, are re-establishing native trout populations in 10 streams, which will involve use of rotenone to remove nonnative trout. One marsh located on Utah Division of Wildlife Resources lands will also be treated. Fish migration barriers will be constructed where necessary to prevent reinvasion of streams by nonnative trout. The list of proposed streams on the Fishlake National Forest are North Creek, Pine Creek/Bullion Canyon, Fish Creek, Shingle Creek, Upper Clear Creek, Three Creek/Pole Creek, Willow Creek, and Tasha Creek. The Deer and Cottonwood Creek treatments on the Powell District of the Dixie National Forest are outside the project cumulative effects areas. The proposed activities will use existing access, and motorized cross-country travel is not needed. As such, the activities do not change the primary issue indicators assigned to track cumulative resource impacts for watershed and aquatics. The rotenone treatments will create short-term negative impacts to water quality and intentional short-term impacts to aquatic biota. However, these treatments are needed in order to maintain viable Bonneville and Colorado cutthroat fisheries on the forest over time. A report titled "Aquatic Macroinvertebrate Monitoring Results of the 1995 and 1996 Rotenone Treatment of Manning Creek, Utah indicates that adverse impacts to aquatic biota are relatively short lived and mimic responses to natural processes such as major floods. Closing the forest to motorized cross-country travel and the obliteration of motorized routes would reduce the potential for spread aquatic nuisance species and introductions of non-native fish species into restored streams. No adverse cumulative impacts to soil productivity, riparian and wetland condition, support of aquatic organisms and their habitat, or water quality are anticipated.
Fishlake Oil and Gas Leasing EIS	D1, D2, D3, D4	The O&G leasing EIS process is in the preliminary stages, with a target decision date for December of 2007. Following appeals and litigation, the BLM would be able to offer available National Forest System lands for lease contingent on the stipulations identified in the EIS. Some areas would have "no surface occupancy" stipulations; others would be subject to seasonal timing limitations for O&G activities; some subject to "standard lease terms" only, and so on. The forest has drafted the Reasonably Foreseeable Development Scenario (RFDS) for future O&G exploration and development and it is under review by the BLM. The draft RFDS predicts approximately 24 exploration well drill pads, 22 production well pads, about 60 miles of new roads (for exploration and production), and about 100 miles of light to heavy road reconstruction associated with oil and gas lease activities. Total gross surface disturbance (before reclamation) from all these facilities would be about 1,000 acres. These figures may be refined as the RFDS is developed further. These activities would require O&G leases to be issued. The forest has no existing federal O&G leases at this time. The earliest that exploration and development could take place is at least 2 years away. Future proposed lease exploration and development activities would require a site-specific NEPA analysis, generally either an EIS or EA, less frequently a CE, particularly in the early stages.

Project Name	Unit	Description of the Project and Potential Effects
		Future lease proposals do have the potential to impact watershed and aquatic issue indicators, although lease stipulations and Best Management Requirements would likely reduce the degree and extent of impacts. Considered cumulatively, the action alternatives still result in a substantial decrease in net motorized route densities and acres open to cross-country travel at the forest scale. The No Action alternative creates the opposite outcome and would result in greater negative impacts to the primary issues. No adverse cumulative impacts to soil productivity, riparian and wetland condition, support of aquatic organisms and their habitat, or water quality are anticipated, especially if an action alternative is implemented.
Grazing Permit Re-issuance NEPA	D1, D2, D3, D4	The forest will continue to conduct NEPA assessments to reauthorize existing grazing permits. Currently 1000 Lake, UM, Solomon, and Daniels Allotments are being evaluated to determine if they can be categorically excluded based on Sect. 339, P.L. 108-447, of the 2005 Consolidated Appropriations Act. In SEC. 339 the act states, "For fiscal years 2005 through 2007, a decision made by the Secretary of agriculture to authorize grazing on an allotment shall be categorically excluded from documentation in an environmental assessment or an environmental impact statement under the National Environmental Policy Act of 1969 (42 U.S.C. 4321 et seq.) if: (1) the decision continues current grazing management; (2) monitoring indicates that current grazing management is meeting, or satisfactorily moving toward, objectives in the land and resource management plan, as determined by the Secretary; and (3) the decision is consistent with agency policy concerning extraordinary circumstances. An environmental assessment or EIS will be conducted for allotments that cannot be categorically excluded. No new motorized routes or exemptions permitting cross-country travel would be needed to reissue permits. Therefore, the activities do not change the primary issue indicators assigned to track cumulative resource impacts for watershed and aquatic resources. No adverse cumulative impacts to soil productivity, riparian and wetland condition, support of aquatic organisms and their habitat, or water quality are anticipated.
OHV Events	D1, D2, D3, D4	The Fillmore ATV Jamboree and the Rocky Mountain ATV Jamboree occur annually. Up to 300 organized riders are allowed on the Fillmore Jamboree and up to 800 organized riders are permitted during the Rocky Mountain ATV event although those numbers have not ever been reached. These multi-day events are under special use permit and have been monitored for several years. Monitoring done to date indicates that the events, which are guided, are being well managed and are providing important opportunities for engaging with and educating the public. A positive example is the "Weed Warrier" program initiated in 2006 that gave riders free tokens to wash their ATVs to prevent the spread of noxious weeds. Some of the monitoring such as that done on forded stream crossing impacts on water quality reveals potential improvements that can be made to the route infrastructure to reduce impacts, but do not indicate that changes are necessary in the management of the events themselves. The needed improvements such as hardening forded crossings and relocating routes that encroach on stream channels were anticipated in the original analysis that authorized the issuance of the special use permit. There is a possibility that additional events could be requested and authorized in the future.

Project Name	Unit	Description of the Project and Potential Effects
		Monitoring has shown that the potential for impacts from jamboree events were adequately disclosed and analyzed in the OHV Event Environmental Assessment that was published in 2001. The jamboree events use existing routes that are designated and analyzed as open to motorized use in the action alternatives. The number of riders on any given ride of the event are limited and monitored. Travel off designated routes is not allowed in the special use permit. Future event permits would likely contain similar special use permit provisions as specified for the current events. Therefore, the jamborees do not change the primary issue indicators assigned to track cumulative resource impacts for the route designation project.
Utah Forest Highway 39 Sevenmile-Gooseberry Road [Note: this is not a Forest Service project.]	D2, D4	This project involves reconstructing Forest Highway 39 from the intersection with the I-70 frontage road south to the junction with Forest Highway 42 by Johnson Reservoir. The reconstruction activities includes road realignments (and obliteration of the original road alignments), increasing the size of existing stream crossings and the amount of cross-drainage, armoring drainage ditches, adding sub-grade materials, installing sub-surface slope drains, and paving. The project is being implemented in 3 phases. Phase 1 is complete. Phase 2 is scheduled to start in 2007 and phase 3 is scheduled to begin in 2010. Much of the existing road alignment in Phases 1 and 2 are located on North Horn sediments, which are prone to mass failure and surface erosion. The road realignments, obliteration, slope drains, etc. are intended to increase the stability of the road and slopes that it traverses. The project is having temporary impacts to water quality, but Best Management Practices are being applied to reduce the amounts of sediment delivery so that State water quality standards can still be met. There is give and take, but overall the completed road in combination with the obliteration of the relocated road segments should result in reduced potential for sedimentation relative to the original road. The road obliteration will reduce the mileage on sensitive soils and will remove a road segment that encroaches on Sevenmile Creek. The action alternatives for the route designation project should further reduce the potential for impacts to watershed and aquatic resources by reducing motorized route density and eliminating unregulated cross-country travel. The environmental assessment prepared for the reconstruction project concluded, "Cumulative and interconnected effects of this proposal and resulting increased recreational and part-time (or full-time) residential use of the area could affect wildlife use and habitat, cattle grazing, wetlands and riparian habitat, water quality, air quality, and fisheries in the project vicinity." But that "given planned and potential development in the area, and future area-wide impacts of this proposal, cumulative and secondary impacts would be expected to be minor and low." No adverse cumulative impacts to soil productivity, riparian and wetland condition, support of aquatic organisms and their habitat, or water quality are anticipated.
Wolverine Oil and Gas Seismic Exploration DM	D1, D2	This project was a reasonably foreseeable project at the time the DEIS was released. The project has since been completed. A Decision Memo was signed on July 6, 2005. The Forest Service found that no extraordinary circumstances or special conditions were

Project Name	Unit	Description of the Project and Potential Effects
		identified in the environmental analysis. The Forest Service evaluated the effects of the proposed operations. Wolverine used helicopter portable drills and rubber-tired drill buggies to drill shot holes at 220' intervals along 9.7 miles of line on NFS land on the Beaver Ranger District. There were short-term impacts associated with the activity, noise and some surface disturbance. After one year, it is difficult to detect residual surface disturbance, and is usually hard to find where the seismic lines were located. Based on follow-up inspections, Wolverine's contracted seismic companies did a good job of "leaving no trace." The activities did not permanently change the watershed or aquatic issue indicators assigned to track cumulative resource impacts for the route designation project. No adverse cumulative impacts occurred.
Grant Geophysical Oil and Gas Seismic Exploration DM	D1, D3	This project was a reasonably foreseeable project at the time the DEIS was released. The project has since been completed. The Grant geophysical project involved laying out geophones (receivers) on the forest by field personnel. Only foot-travel was used and no drilling was involved. No short- or long-term impacts occurred. The activities did not change the watershed or aquatic issue indicators assigned to track cumulative resource impacts for the route designation project. No adverse cumulative impacts occurred.
East Kanosh Fuels Reduction Project	D1	This project would treat hazardous fuels east of the town of Kanosh. Only existing motorized access would be needed. About 576 acres are proposed for mechanical treatment using a Dixie harrow. Authorized motorized route densities would not change from existing conditions. Acres of motorized cross-country travel would increase only during the days that the harrow and seeding treatment is applied. The project does not permanently change the watershed or aquatic issue indicators. Considered cumulatively, there would still be a significant net reduction in areas open to motorized cross-country travel. No adverse cumulative impacts to soil productivity, riparian and wetland condition, support of aquatic organisms and their habitat, or water quality are anticipated.
Elsinore Fuels Reduction Project	D1	This project would treat hazardous fuels west of the town of Elsinore. Only existing motorized access would be needed. About 730 acres are proposed for mechanical treatment using a Dixie harrow. Authorized motorized route densities would not change from existing conditions. Acres of motorized cross-country travel would increase only during the days that the harrow and seeding treatment is applied. The project does not permanently change the watershed or aquatic issue indicators. Considered cumulatively, there would still be a significant net reduction in areas open to motorized cross-country travel. No adverse cumulative impacts to soil productivity, riparian and wetland condition, support of aquatic organisms and their habitat, or water quality are anticipated.
Horse Hollow Fuels Reduction Project DM	D1	The project would apply prescribed fire to the following vegetation types: sagebrush, pinyon-juniper, mountain mahogany, non-commercial mixed conifer, and Gambel oak. Approximately 40-80 percent of the vegetation would be treated in the 1,234-acre project area. Burning would occur mainly during fall months, but could also occur during the spring or summer depending on weather and fuels conditions.

Project Name	Unit	Description of the Project and Potential Effects
		This project is ready for signature and qualifies as a categorical exclusion. The proposed activities would use existing access, and motorized cross-country travel would not needed. As such, the activities do not change the watershed or aquatic issue indicators assigned to track cumulative resource impacts for the route designation project. Therefore, no adverse cumulative impacts to soil productivity, riparian and wetland condition, support of aquatic organisms and their habitat, or water quality are anticipated.
Pioneer Hazardous Fuels Reduction DM	D1	The project will apply prescribed fire to the following vegetation types: sagebrush, pinyon-juniper, mountain mahogany, non-commercial mixed conifer, and Gambel oak. Approximately 40-80 percent of the vegetation will be treated in the 310-acre project area. Burning will occur mainly during fall months, but could also occur during the spring or summer depending on weather and fuels conditions. This project will use existing access, and motorized cross-country travel would not needed. As such, the activities do not change the watershed or aquatic issue indicators assigned to track cumulative resource impacts for the route designation project. Therefore, no adverse cumulative impacts to soil productivity, riparian and wetland condition, support of aquatic organisms and their habitat, or water quality are anticipated.
Wild Goose Hazardous Fuels Reduction DM	D1	The project will apply prescribed fire to the following vegetation types: sagebrush, pinyon-juniper, mountain mahogany, non-commercial mixed conifer, and Gambel oak. Approximately 40-80 percent of the vegetation will be removed in the 1,373-acre project area. Burning will occur mainly during fall months, but could also occur during the spring or summer depending on weather and fuels conditions. This project will use existing access, and motorized cross-country travel would not needed. As such, the activities do not change the watershed or aquatic issue indicators assigned to track cumulative resource impacts for the route designation project. Therefore, no adverse cumulative impacts to soil productivity, riparian and wetland condition, support of aquatic organisms and their habitat, or water quality are anticipated.
Adelaide Campground Reconstruction DM	D1	This project was reasonably foreseeable during the DEIS, but has since been completed. It involved replacing and refurbishing existing developed campsites including tables, grills, fire circles, and restrooms. Trees were planted in some areas. All of the activity was within the existing campground development and did not increase existing user capacity. Existing access was used to implement this project and motorized cross-country travel was not needed. Thus, the proposed activities did not change the watershed or aquatic issue indicators and is now part of the existing condition. No adverse cumulative impacts to soil productivity, riparian and wetland condition, support of aquatic organisms and their habitat, or water quality occurred.
Bowery Haven Resort RV Park Expansion DM	D2	The project would allow expansion of existing RV Park, within the permitted area, by adding an additional loop road with 9 parking spurs with water, power and sewer hookups. The project would also authorize the construction of a new laundry, shower and restroom building with an attached pavilion. The new loop road is proposed to be approximately 20 feet wide by 600 feet in length. The parking spurs are proposed to be approximately 30 feet wide and the pavilion approximately 20 feet by

Project Name	Unit	Description of the Project and Potential Effects
		25 feet. These new facilities would be tied into the existing sewer system, which presently services the Fish Lake basin. Water is provided by Bowery Spring. No part of the project is closer than 200 feet from Fish Lake and most is over 300 feet away. The new road construction adds to the miles of route within the riparian influence zone, but the net mileage under the action alternatives for the route designation project is still slightly less than current conditions. Therefore, no adverse cumulative impacts to soil productivity, riparian and wetland condition, support of aquatic organisms and their habitat, or water quality are anticipated.
Castle Valley Ranch Water System Project EA	D2	The project is currently in a state of flux and is currently on hold. One possibility would permit an applicant with existing water rights to maintain & operate 4 existing small reservoirs & approximately 20 miles of ditch and pipelines to provide irrigation livestock water to a ranch located on the east side of Thousand Lake Mountain. Another is that the Utah Division of Wildlife and/or the Forest Service may do varying degrees of maintenance or restoration, and the regulation dam would be built on the private ranch. Some action is necessary to bring the structures into compliance with State and federal regulations. Existing access would be used to maintain the dams, and motorized cross-country travel would not be needed outside of the reservoirs under either scenario. Thus, the activities do not change the watershed or aquatic issue indicators assigned to track cumulative resource impacts for the route designation project. Therefore, no adverse cumulative impacts to soil productivity, riparian and wetland condition, support of aquatic organisms and their habitat, or water quality are anticipated.
Fishlake Basin Cabin Reconstruction Project	D2	Four separate recreation residence special use permit holders have requested permission to replace their cabin with a new one. The existing structures are old and no longer meet their needs. The cabins are and will continue to be found on National Forest Land within areas set aside for recreation residences. The replacement structures would be required to meet current federal, state and county laws and regulations. Existing access would be used to reconstruct the residences and motorized route travel off-route would be limited to existing disturbed sites such as parking areas. As such, the activities do not change the watershed or aquatic issue indicators assigned to track cumulative resource impacts for the route designation project. No adverse cumulative impacts to soil productivity, riparian and wetland condition, support of aquatic organisms and their habitat, or water quality are anticipated.
Fish Lake Basin Water Systems Reconstruction Project	D2	This project will combine the Twin Creek, Bowery Creek, and Fish Lake Lodge water systems under the Twin Creek spring source and is scheduled for completion by November of 2006. The current spring developments at Bowery Creek and Fish Lake Lodge Spring will be abandoned and the domestic use water rights will be transferred to Twin Creek Spring. The project includes upgrading the Twin Creek water system to current State and Forest Service standards and will include the replacement of all lines at existing locations (from spring to service) within Twin Creek Administrative Site, Twin Creek Picnic Area and amphitheater, Mackinaw Campground and Bowery Creek Campground. The project will upgrade the system to provide drinking water to the

Project Name	Unit	Description of the Project and Potential Effects
		Fish Lake Lodge Resort, Twin Creek summer homes, and Bowery Haven Resort. The new system will follow existing line locations. The project will also combine the Doctor Creek and Lakeside Resort water systems under the Doctor Creek Spring Source. The Lakeside Resort spring will be abandoned and the domestic use water rights will be transferred to the Doctor Creek Spring Source. The project will upgrade the Doctor Creek water system to current State and Forest Service standards and will include the replacement of all lines at existing locations (from spring to service) to and within the Doctor Creek Campground, the Doctor Creek Group Sites, Mallard Bay Overflow Area, and the Trailer Dump Station. The project will upgrade the system to provide drinking water to Lakeside Resort and the Doctor Creek summer homes (18 total). The proposed activities only temporarily affect the cross-country travel indicator and add 1 stream crossing by a buried pipeline. Even so, the action alternatives for the Fishlake OHV Route Designation Project result in a net decrease in motorized route density and acres open to motorized cross-country travel and in the number of stream crossings within the CEA. The watershed report for the project concluded, "the aquatic and other resource values associated with Fish Lake, Twin Creek, and adjacent wetlands would not be affected by the proposed project." Accordingly, no adverse cumulative impacts to soil productivity, riparian and wetland condition, support of aquatic organisms and their habitat, or water quality are expected.
Fish Lake Cabins Fuels DM	D2	This project would remove fuels hazards directly adjacent to summer homes and administrative facilities in the Fish Lake basin and is considered site maintenance. Most of the treatments around the summer homes involve hand felling. Slash would be hand piled or chipped, and burned. Dixie harrow treatments are also being considered. The project would use existing access. No new road would be needed to conduct the proposed work. The Dixie harrow treatments would involve temporary motorized cross-country travel. Even so, the action alternatives for the Fishlake OHV Route Designation Project result in a net decrease in motorized route density and acres open to motorized cross-country travel. Dixie harrow projects typically influence soil productivity issues rather than a riparian or wetland impacts. The project would include Best Management Practices that limit treatment to suitable soil types during periods where the soils are dry enough to avoid compaction and rutting. The project does not change the watershed and aquatics issue indicators. Therefore, no adverse cumulative impacts to soil productivity, riparian and wetland condition, support of aquatic organisms and their habitat, or water quality are anticipated.
Fish Lake – Lake Shore Toilets Installation EA	D2	This project was reasonably foreseeable during the DEIS, but has since been completed. The project installed three single-unit, fully accessible, vault toilets in the Fishlake Basin primarily for ice fishermen, snowmobilers, and other recreationists visiting the Fish Lake basin during winter months. One toilet was located adjacent to the Lakeside Marina parking area, another was located just south of the entrance to Vale Drive, and the third was located at Mackinaw Point across from Bowery Creek Campground. Existing access was used to implement this project and motorized cross-

Project Name	Unit	Description of the Project and Potential Effects
		country travel was not needed. Thus, the activities did not change the watershed or aquatic issue indicators assigned to track cumulative resource impacts for the route designation project. No adverse cumulative impacts occurred.
Fish Lake Resorts Culinary Water Line Replacement DM	D2	The Project would permit Fish Lake Resorts to replace a culinary water line. Current plans are to supply water to resort facilities by connecting about 2500 feet of pipe to an existing Forest Service line. The project would include 2 crossings of Twin Creeks. This project qualified as a categorical exclusion. The proposed activities temporarily affect the cross-country travel issue indicator and add 1 stream crossing by a buried pipeline. Even so, the action alternatives result in a net decrease in acres open to motorized cross-country travel and in the number of stream crossings within the CEA. The aquatics report concluded "The project may result in minor (localized and short term) sedimentation impacts to trout spawning habitat in Twin Creek. The impacts are expected to be small (generally within the range of current variability and likely immeasurable) and temporary, with the limited amount of sediment flushed out the following runoff period. Therefore, there will be no long-term increase in cumulative effects when combined with past, present or reasonably foreseeable actions." Thus, no adverse cumulative impacts to soil productivity, riparian and wetland condition, support of aquatic organisms and their habitat, or water quality are anticipated.
Garkane Power Special Use Permit Reauthorizations DM	D2	The project would authorize the presence, repair and maintenance of electric power transmission lines, owned by Garkane Power Co, on National Forest System lands. Continued operation and maintenance of existing systems are being proposed with no change in current rules and regulations. Existing access would be used to implement the maintenance. Some temporary motorized cross-country travel within the existing corridor beneath the power line may be needed, but is restricted under the terms and conditions of the Special Use Permit. The action alternatives for the Fishlake OHV Route Designation Project result in a net decrease in acres open to motorized cross-country travel. No adverse cumulative impacts to soil productivity, riparian and wetland condition, support of aquatic organisms and their habitat, or water quality are anticipated.
Mytoge Mountain Vegetation Treatment DM	D2	This project was a reasonably foreseeable activity in the DEIS and has since been implemented. The sale has been offered two times with no bids received. This project may not ever sell, but the proposal is to treat insect and disease infested forest stands with attention to the dwarf mistletoe in the Douglas fir trees. Project would also improve the health of aspen stands, and reduce the heavy fuels in the project area. The project would include the harvest of beetle-infested, diseased, mature, and dead trees, including trees susceptible to disease and insects on 245 acres located roughly 0.5 miles southeast of Fish Lake. Basal area would be reduced from 200 to less than 140 square feet per acre and the percentage of conifer species in aspen stands would be reduced to less than 15 percent. All slash would be piled and burned or lopped and scattered. This would be done in a manner that reduces fuel loadings while protecting visual quality. No new road would be constructed to complete the harvest.

Project Name	Unit	Description of the Project and Potential Effects
		Motorized route density would not increase if this project were implemented. Acres of motorized cross-country travel would increase only as harvest and site-preparation activities are applied. This use is restricted by Best Management Practices and Forest Plan standards and guidelines that are incorporated into the timber sale contract. The action alternatives for the Fishlake OHV Route Designation Project still create a net decrease in motorized route densities and acres open to motorized cross-country travel. The watershed report done for the project states "I wouldn't expect there to be negative effects on water quality, floodplains, and wetlands". No adverse cumulative impacts to soil productivity, riparian and wetland condition, support of aquatic organisms and their habitat, or water quality are anticipated.
Neff's Irrigation System Special Use Permit Reauthorization DM	D2	The project would re-authorize a permit for the presence, repair and maintenance of an irrigation water reservoir and ditches on National Forest System lands. No changes in current use or permit requirements are proposed. The maintenance and repair occurs along existing ditches and from existing access. This use is restricted under the terms and conditions of the Special Use Permit. The action alternatives for the Fishlake OHV Route Designation Project result in a net decrease in motorized route densities and acres open to motorized cross-country travel. Therefore, no adverse cumulative impacts to soil productivity, riparian and wetland condition, support of aquatic organisms and their habitat, or water quality are anticipated.
Sevenmile Dixie Harrow Treatment DM	D2	This project was reasonably foreseeable when the DEIS was prepared. It has since been dropped from consideration.
Sheep Valley Dixie Harrow Treatment DM	D2	This project would treat approximately 600 acres of Big and Silver sage, with the Dixie Harrow, on NFS lands. Authorized motorized route densities would not change from existing conditions. Acres of motorized cross-country travel would increase only during the days that the harrow and seeding treatment is applied. The project does not permanently change the watershed or aquatic issue indicators. Considered cumulatively, there would still be a significant net reduction in areas open to motorized cross-country travel. Dixie harrow projects typically influence soil productivity issues rather than riparian or wetland impacts. The project includes Best Management Practices that limit treatment to suitable soil types during periods where the soils are dry enough to avoid compaction and rutting (Solt 2004) and only involves temporary motorized off-route travel. In fact, Dixie harrow treatments have been used on the forest to effectively obliterate user created routes in grass and sage vegetation types. The project does not change the watershed and aquatics issue indicators. Therefore, adverse cumulative impacts to soil productivity, riparian and wetland condition, support of aquatic organisms and their habitat, or water quality are not anticipated.
Thousand Lakes Mountain East Dixie Harrow Treatment DM	D2	This project is currently on hold. If pursued, this project would treat approximately 245 acres of Big sage, Silver sage, with the Dixie harrow, on NFS lands. Authorized motorized route densities would not change from existing conditions. Acres of motorized cross-country travel would increase only during the days that the harrow and seeding treatment is applied. The

Project Name	Unit	Description of the Project and Potential Effects
		project does not permanently change the watershed or aquatics issue indicators. Considered cumulatively, there would still be a significant net reduction in areas open to motorized cross-country travel. Dixie harrow projects typically influence soil productivity issues rather than riparian or wetland impacts. The project includes Best Management Practices that limit treatment to suitable soil types during periods where the soils are dry enough to avoid compaction and rutting (Solt 2004) and only involves temporary motorized off-route travel. In fact, Dixie harrow treatments have been used on the forest to effectively obliterate user created routes in grass and sage vegetation types. Therefore, adverse cumulative impacts to soil productivity, riparian and wetland condition, support of aquatic organisms and their habitat, or water quality are not anticipated.
Torrey Culinary Water Augmentation Project EA	D2	This project was reasonably foreseeable during the DEIS, but has since been completed. The project developed Sulphur Spring for culinary water purposes. The spring development required removing deep-rooted vegetation, burying perforated pipe and installing a clay cutoff wall to capture available water, installing an overflow/drain pipe with a 3'by 3' concrete headwall, covering the development with a plastic liner, burying it with 2 feet of clean backfill material and installing an area protection fence. About 7400 feet of pipeline was installed to take the captured water to an existing water transmission pipeline. The pipeline was buried under two small creeks, Sand Creek and East Sand Creek. A borrow site less than ¾ of an acre in size was used for the fill dirt needed for the development of Sulphur Spring and to cross a boulder field near the existing water transmission pipeline. About 9.5 acres of land was involved with this part of the project in the short-term and 6.0 acres in the long-term. Ten gallons of water per minute is released below Sulphur Spring and the Sand Creek Irrigation ditch diversion, in order to ensure the long-term maintenance of the existing wetland below Sulphur Spring. This amount will be monitored and adjusted as needed to maintain the wetland. Water from undeveloped springs along the rest of the ditch continues to flow into and through the ditch. The project also installed roughly 3500 feet of new 12-inch diameter pipeline. This pipeline begins at some existing water storage tanks and is placed between an existing waterline and road to the National Forest Boundary near Torrey. About 4.0 acres of land was involved with this part of the project in the short-term and 2.4 acres in the long-term. All areas disturbed during implementation were reclaimed and reseeded with native vegetation. The project allowed temporary motorized cross-country travel and added crossings by buried pipe, but did not permanently change the watershed or aquatic issue indicators. Reclamation work has been completed and the disturbed sites are recovering. Cumulatively, net motorized route density and acres open to motorized cross-country travel is reduced under the action alternatives. The watershed report for the project concluded, "The construction of this culinary pipeline, in combination with the activities listed above, has the potential to effect water quality and sediment delivery in the short term. After the short term effects of construction have subsided, no significant long term cumulative effects are expected." Therefore, adverse cumulative impacts to soil productivity, riparian and wetland condition, support of aquatic organisms and their habitat, or water quality are not anticipated.

Project Name	Unit	Description of the Project and Potential Effects
UM Creek Riparian Area Management DM	D2	This project was reasonably foreseeable during the DEIS and is now half completed. The project is constructing 2 watering systems to provide alternate watering sources for livestock that currently water on UM Creek. The project is constructing two watering systems including pipelines and a series of watering troughs away from UM Creek in the Right Fork and Mables areas on the UM Creek allotment. This will provide alternate watering sources for livestock that currently water directly on UM Creek. This will also redistribute livestock use away from the riparian area to enhance the fishery by improving riparian vegetation and stream channel conditions. Existing access is being utilized although temporary motorized cross-country travel has been needed. The project does not permanently change any of the watershed or aquatic issue indicators. In actuality, there is still a net reduction in motorized route densities and areas open to motorized cross-country use. The watershed report for this project indicated this project would improve riparian and wetland conditions in UM Creek and that significant negative cumulative effects would not occur. Therefore, adverse cumulative impacts to soil productivity, riparian and wetland condition, support of aquatic organisms and their habitat, or water quality are not anticipated.
UM Pass Vegetation Management	D2	This project was reasonably foreseeable in the DEIS and has recently been approved in a Decision Memo. The project will treat stands being impacted by spruce bark beetle and is intended to reduce fuel loadings. The project consists of the commercial removal of dead and currently infested trees on 210 acres. In addition, commercial intermediate thinning will be implemented to move the stands towards properly functioning condition in terms of composition and density as well as to improve structural diversity. As part of the project, up to ½ mile of temporary road will be constructed. Following implementation, the temporary road will be completely obliterated, restored to a natural slope, covered with slash and debris, and revegetated. This project results in a temporary increase in motorized route density and cross-country travel. However, motorized route density and acres open to cross-country travel decrease when considered cumulatively with the route designation project. No adverse cumulative impacts to soil productivity, riparian and wetland condition, support of aquatic organisms and their habitat, or water quality are anticipated.

Project Name	Unit	Description of the Project and Potential Effects
Big Flat Water System Reconstruction	D3	This project would reconstruct the current culinary spring that serves the Big Flat Guard Station and replace a faucet that provides drinking water to the public adjacent to State Road 153. This is the only "tested" drinking water on the top of the mountain for several miles. Currently, the system does not meet State and Federal water quality standards due to the lack of pressure in the system. Since all of the water is not being collected in the spring source, there is currently no way for a chlorination procedure. The proposed project consists of installing a new spring collection box at the Big Flat Spring, solar pump, chlorination box, 2000-gallon fiberglass tank, 2200 feet of HDPE pipe, 2 new hydrants, and all associated valves. The new collection box would be a 4-foot diameter pre-cast concrete pipe with a steel man-way on top. A hypo-chlorinator will be added to the system for potential chlorination in case of poor bacteriological tests, if needed. Much of the work for the project will take place within the SR-153 corridor or within areas that have already been previously disturbed. This project does not increase existing motorized route density and only temporarily impacts acres used for cross-country travel. Considered cumulatively, net motorized route density would decrease and acres of cross-country travel would decrease slightly. No adverse cumulative impacts to soil productivity, riparian and wetland condition, support of aquatic organisms and their habitat, or water quality are anticipated.
Cove Fort-Sulphurdale Geothermal Leasing EA	D3	This project was reasonably foreseeable at the time the DEIS was released. The Utah State Office of the Bureau of Land Management is proposing to lease three parcels of National Forest System land in the Cove Fort-Sulphurdale area for geothermal resources. The analysis for this project, including consideration of cumulative impacts, concluded that there would be no significant impacts. The proposed lease parcels, total 6,097 acres, lying north and south of the existing geothermal lease area and power plant facilities at Sulphurdale. A Reasonably Foreseeable Development Scenario was prepared for this project. Existing roads would be used wherever possible, but it is expected to that some of the exising roads would be upgraded and that new, temporary, and permanent access roads would be constructed in all parcels. Roughly 8 production wells and 4 injection wells with a 2 to 3 acre footprint would likely be needed. One to two miles of geothermal pipeline may also be installed. The power plant would be expected to cover 5 to 10 acres and 1 to 2 miles of transmission lines with 40-foot wide rights-of-way would be needed for each parcel. The Forest Supervisor specified leasing stipulations as mitigation measures in the environmental analysis process. If the parcels are offered and sold, the new leaseholder(s) would have the exclusive right to drill for, extract, produce, utilize, and dispose of all geothermal resources in the leased lands. The leaseholder(s) would also have the right to build and maintain necessary improvements on the leased lands for a primary term of 10 years, subject to renewal or extension in accordance with the appropriate leasing authority. This action will likely add mileage the motorized route network and result in temporary increases in cross-country travel. The lease itself does not affect the watershed and aquatics issue indicators although it is possible that the foreseeable access roads could add mileage within 300 feet of the channel network. The watershed report for the project stated "the direct and interacting cumulative effects from the proposed action

Project Name	Unit	Description of the Project and Potential Effects
		in combination with other past, present and reasonably foreseeable activities are expected to be minimal or virtually undetectable." The actions from the Fishlake OHV Route Designation Project reduce the potential for cumulative impacts by eliminating motorized cross-country travel and by removing ATV use off of routes that are intended to have non-motorized use only. Therefore, adverse cumulative impacts to soil productivity, riparian and wetland condition, support of aquatic organisms and their habitat, or water quality are not anticipated as long as an action alternative from the route designation project is implemented.
Elk Meadows Fuel Reduction and Aspen Restoration Project EA	D3	This project was reasonably foreseeable when the DEIS was released, but is no longer a reasonably foreseeable action due to unresolved resource and private property issues. There is no estimate for when or if these issues can be resolved.
Interstate-70 Wireless Communications Site Project EA	D3	This project was reasonably foreseeable when the DEIS was released, but has since been approved for implemention. The analysis for this project, including consideration of cumulative impacts, concluded that there would be no significant impacts. This project designated two wireless telecommunications sites, along I-70 between Cove Fort and Fremont Indian State Park, with primary purpose of serving cellular, personal communications services and enhanced specialized mobile radio. The proposed communications sites will consist of land allocations of about 100 by 100 feet on which equipment building(s) and communication tower(s) will be located. The tower height at each proposed site will not exceed 199 feet. The proposed wireless system will be designed to meet the technical requirements of all licensed wireless carriers through co-location. Less than ½ of a mile of new road will permanently be needed to access the sites. The project would result in a slight increase in motorized route density that would be more than offset by route obliteration associated with the action alternatives for the route designation project. Cross-country travel may be needed during site construction, and occasionally for powerline maintenance, but this impact will be temporary and will be controlled under the terms of the Special Use Permit. The proposed new road is more than 300 feet from riparian areas and wetlands. The project does not change the watershed or aquatics issue indicators. Therefore, adverse cumulative impacts to soil productivity, riparian and wetland condition, support of aquatic organisms and their habitat, or water quality are not anticipated.
Kents Lake Road Reconstruction Project	D3	This project consists of approximately 5.2 miles of road re-construction on Forest Road 137. Work elements include roadway excavation, placing embankments, disposing of excess and unsuitable excavated materials, removal and installations of metal culverts, constructing rock buttresses, installation of underdrains, placing aggregate base and hot asphalt concrete pavement, installing guardrail systems, resetting signs, pavement markings, installation of gates, and related work. The project will be completed this year. The activities do not change the watershed or aquatic issue indicators assigned to track cumulative resource impacts for the route designation project. The completed project will reduce potential for cumulative watershed impacts. Currently the road prism and ditchline drain directly to stream channels. The reconstruction project will disconnect the road ditches from the

Project Name	Unit	Description of the Project and Potential Effects
		channel network, which will reduce the potential for elevated water yields and sediment delivery (see the watershed report for the Beaver River Watershed Assessment for further details). The project will also redesign and increase the capacity of some stream crossings, which will reduce the potential for catastrophic failure. The project does not change the watershed and aquatics issue indicators. Therefore, adverse cumulative impacts to soil productivity, riparian and wetland condition, support of aquatic organisms and their habitat, or water quality are not anticipated.
Little Reservoir Vegetation Management Project DM	D3	The project will mechanically treat fuels within a 400 feet wide buffer on portions of the west, north, and east boundary of the private land subdivisions adjacent to Little Reservoir. The total amount of area treated will be about 144 acres. The treatment will be limited to hand felling and chipping of trees, brush, logs, and downed woody material within the 400-foot wide area surrounding the private land. The chipper will be used adjacent to properties where the landowner allows access across the private property and it is reasonable to drive a rubber-tired vehicle without construction of roads. In terrain inaccessible to the chipper, thinned vegetation will be hand piled and burned. Leftover slash will also be hand piled and burned in areas where the chipper is utilized. Trees larger than 12 inches diameter at breast height will not be removed. No new roads or motorized trails would be constructed. Temporary motorized cross-country travel would be permitted for the chipper vehicle. Even so, the action alternatives for the Fishlake OHV Route Designation Project result in a net decrease in motorized route densities and acres open to motorized cross-country travel. No adverse cumulative impacts to soil productivity, riparian and wetland condition, support of aquatic organisms and their habitat, or water quality are anticipated.
South Fork Vegetation Treatment Project EA	D3	This project would use commercial salvage and thinning to reduce fuels, stand density, and susceptibility to spruce beetle. Roughly 1,824 to 2,040 acres of Engelmann spruce and sub-alpine fir forest currently infested with, or at high-risk of spruce beetle infestation would be treated. About 1.7 to 2.3 miles of temporary road would need to be constructed and 9.0 to 10.1 miles of existing temporary road would need to be reopened. Treatments would occur in five to six units ranging from 207 to 570 acres in size. The temporary roads result in a short-term increase in the stream crossing frequency and riparian route mileage, although the net effect would be only slightly greater if an action alternative is chosen for the route designation project. The project would conduct harvesting activities adjacent to but not within riparian areas and would add temporary stream crossings. The temporary roads being constructed and reopened would increase encroaching road mileages by about 0.15 miles. About 3.3 of these miles are within the riparian influence zone and 3.0 miles are located on sensitive soils. The temporary roads result in a short-term increase in the stream crossing frequency and riparian route mileage, although the net effect would be only slightly greater if an action alternative is chosen for the route designation project. Encroaching route miles and miles on sensitive soils still decrease if an action alternative is chosen for the route designation project. The combined effect on the watershed and aquatic issue indicators would be

Project Name	Unit	Description of the Project and Potential Effects
		a net decrease in areas open to motorized cross-country travel, even if the cross-country travel by harvesting equipment is included. The South Fork project may result in short-term adverse impacts to riparian condition and function and water quality. Regardless of the impacts created by the South Fork project, the effects created by the action alternatives for the Fishlake OHV Route Designation Project would benefit hydrologic and aquatic resource values. The Kents Lake Road Reconstruction project will also reduce the potential for cumulative impacts by disconnecting road ditchlines from the channel network and by increasing capacity at some stream crossings. Therefore, adverse cumulative impacts to soil productivity, riparian and wetland condition, support of aquatic organisms and their habitat, or water quality are not anticipated.
Utah Forest Highway 29 / Beaver to Junction Road Reconstruction EA [Note: this is not a Forest Service project.]	D3	This project would provide improvements to Segment 3 (mileposts 12.3 to 14.2), Segment 5 (mileposts 21.4 to 31.3), and Segment 6 (mileposts 31.3 to 35.0) of Federal Highway 29. Currently this project is not scheduled to begin until 2010. An existing waste disposal area located adjacent to Segment 2 will be used for disposal of excess fill material from roadway improvements. The proposed action includes reconstructing the road and shoulders in Segment 3, Segment 5, and Segment 6 to a width of 26 feet paved surface, 24 feet of graveled surface, and 24 feet of paved surface, respectively. Segment 3 would consist of two travel lanes, each with a paved width of 11 feet and two paved 2 feet wide shoulders. Segment 5 would consist of a 24 feet wide gravel-base roadway that would accommodate vehicles passing in opposite directions, with each of two lanes having a width of 10 feet and two 2 feet wide shoulders. Segment 6 would consist of two travel lanes, each with a paved width of 10 feet and two paved 2 feet wide shoulders. An estimated total of 0.235 acres of Waters of the U.S. and jurisdictional wetlands would be impacted thereby requiring compensatory mitigation. The route obliteration and closure to unrestricted cross-country travel associated with the route designation project would reduce the potential for adverse cumulative effects relative to No Action. This project contains numerous site-specific Best Management Practices that are designed to reduce potential impacts to watershed and aquatic resources. The Environmental Assessment and Biological Evaluation done for the project indicate that the cumulative impacts to riparian and wetland condition, support of aquatic organisms and their habitat, or water quality is not significant. By definition, soil productivity will be permanently impacted in locations where the road is widened. Nonetheless, the net affects of the types of activities proposed for the Fishlake OHV Route Designation Project would reduce the potential for cumulative effects relative to No Action. Adverse cumulative impacts to riparian and wetland condition, support of aquatic organisms and their habitat, or water quality are not anticipated.
Tushar Grazing Environmental Impact Statement	D3	The project is evaluating the environmental effects of reissuing 10-year term grazing permits to continue to authorize grazing on eight grazing allotments on the Beaver Ranger District in central Utah. The project does not affect the issue indicators, except on locations where the Forest Service allows permittees administrative motorized access that involves cross-country travel. Even when exemptions are permitted, there would still be a net reduction in potential for motorized

Project Name	Unit	Description of the Project and Potential Effects
		cross-country travel under the action alternatives for the route designation project. Annual Operating Plans and Allotment Management Plans are monitored and can be modified to reduce or avoid adverse resource impacts to hydrologic and aquatic resources. Therefore, adverse cumulative impacts to soil productivity, riparian and wetland condition, support of aquatic organisms and their habitat, or water quality are not anticipated.
Box Creek Hazardous Fuels Reduction Project DM	D4	The project would implement fuels reduction treatments using up to 1,000 acres mechanical treatments and up to 4,500 acres of prescribed fire. Treatment areas are located in the Dairies and Brindley Flats units on Monroe Mountain. The proposal would reduce the fuel loading and the risk of high-intensity, high severity wildland fire in the project area, reduce the susceptibility of spruce fir stands to insects and diseases, and improve aspen stand health. Roughly 2.1 miles of temporary road is proposed for the Dairies unit and 2.2 miles of temporary road are proposed in the Brindley Flat unit. The action alternatives for the Fishlake OHV Route Designation Project result in a net decrease in acres open to motorized cross-country travel. The proposed temporary roads do not permanently change the issue indicators. The proposed temporary roads and all but one of the treatment areas in the Dairies unit are located further than 300 feet from riparian areas and wetlands. Therefore, these projects do not change the watershed and aquatics issue indicators. Some motorized cross-country travel would be permitted for logging skid trails, but this use is restricted by Best Management Practices and Forest Plan standards and guidelines that are incorporated into the timber sale contract. The action alternatives for the Fishlake OHV Route Designation Project result in a net decrease in acres open to motorized cross-country travel. The watershed and aquatics reports (includes the original Monroe Mountain Ecosystem Restoration Project EIS and subsequent supplements) done for the project does not anticipate adverse impacts to soil productivity, riparian and wetland condition, support of aquatic organisms and their habitat, or water quality. Therefore, adverse cumulative impacts to soil productivity, riparian and wetland condition, support of aquatic organisms and their habitat, or water quality are not anticipated.
Flat Top Dixie Harrow Treatment DM	D4	This project would reduce hazardous fuels and improve wildlife habitat on approximately 1,131 acres in four separate project areas: Horse Pasture (527 acres), Browns Hole North (128 acres), Browns Hole South (294 acres), and Flat Top (182 acres). Authorized motorized route densities would not change from existing conditions. Acres of motorized cross-country travel would increase only during the days that the harrow and seeding treatment is applied. The project does not permanently change the issue indicators. Considered cumulatively, there would still be a significant net reduction in areas open to motorized cross-country travel. Dixie harrow projects typically influence soil productivity issues rather than riparian or wetland impacts. The project includes Best Management Practices that limit treatment to suitable soil types during periods where the soils are dry enough to avoid compaction and rutting (Solt 2004) and only involves temporary motorized off-route travel. In fact, Dixie harrow treatments have been used on the forest to effectively obliterate user created routes in grass and sage vegetation types. The project does not change the watershed and aquatics issue indicators. Therefore, adverse cumulative

Project Name	Unit	Description of the Project and Potential Effects
		impacts to soil productivity, riparian and wetland condition, support of aquatic organisms and their habitat, or water quality are not anticipated.
Henries Hollow Geophysical	D4	The Fishlake National Forest has received a Notice of Intent to conduct oil and gas geophysical exploration operations from Wolverine Gas and Oil Company. The project, Henries Hollow 2D, would involve operations on National Forest System (NFS), Bureau of Land Management, private, and state lands. The survey lines would total about 56 miles on NFS land on the Richfield Ranger District. If approved, the District Ranger would authorize only that portion of the project on NFS land. The survey would be completed using rubber-tired buggy mounted and helicopter-portable drilling equipment to excavate 3½ inch by 40 foot-deep shot holes to carry small explosive charges. The shot holes would be drilled on approximately 330-foot intervals along the lengths of each seismic line. Receivers (geophones) would be temporarily placed on the ground and used to record seismic waves as the charges were detonated. No road construction or road improvements would be required. About 40-60 days would be required to complete the drilling and recording on portions of the lines on NFS land. This project would result in temporary increases in motorized cross-country travel. However, the project would specify standard and site-specific management practices that help assure that negative resource impacts are avoided. The project would not permanently change the primary issue indicators assigned to track cumulative resource impacts for the route designation project.
Mt. Terrill Dixie Harrow Treatment DM	D4	This project would treat approximately 850 acres of big sage and silver sage, with the Dixie Harrow, on NFS lands west of Mt. Terrill. Authorized motorized route densities would not change from existing conditions. Acres of motorized cross-country travel would increase only during the days that the harrow and seeding treatment is applied. The project does not permanently change the issue indicators. Considered cumulatively, there would still be a significant net reduction in areas open to motorized cross-country travel. Dixie harrow projects typically influence soil productivity issues rather than riparian or wetland impacts. The project includes Best Management Practices that limit treatment to suitable soil types during periods where the soils are dry enough to avoid compaction and rutting (Solt 2004) and only involves temporary motorized off-route travel. In fact, Dixie harrow treatments have been used on the forest to effectively obliterate user created routes in grass and sage vegetation types. The project does not change the watershed and aquatics issue indicators. Therefore, adverse cumulative impacts to soil productivity, riparian and wetland condition, support of aquatic organisms and their habitat, or water quality are not anticipated.
North Clover Vegetation Treatment DM	D4	The project will treat stands infested with spruce beetles and those susceptible of to further attack in the project area as well as improving the aspen stand health, while reducing the heavy fuels. Harvest will occur on roughly 248 acres. Roughly 0.4 miles of temporary road would be needed to facilitate the mechanical treatments. Some motorized cross-country travel would be permitted for logging skid trails, but this use is restricted by Best Management Practices and Forest Plan standards and guidelines that are incorporated into the timber sale contract. Even so, the action alternatives for the Fishlake

Project Name	Unit	Description of the Project and Potential Effects
		OHV Route Designation Project still result in a net decrease in acres open to motorized cross-country travel. Net motorized route density would also decrease under the action alternatives for the route designation project. Therefore, no adverse cumulative impacts would be anticipated. The proposed temporary road is further than 300 feet from riparian areas and wetlands. The watershed report done for the project states "Cumulative effects because of the harvest activities will likely revert back to those that currently exist in the CEA in a few years following treatment. Cumulative effects associated with livestock grazing will be similar to those described for the no action alternative which means that some sedimentation is likely occurring because of grazing practices with in the CEA, but would not likely lead to impairment of any beneficial use because it has not yet." No adverse cumulative impacts to soil productivity, riparian and wetland condition, support of aquatic organisms and their habitat, or water quality are anticipated.
Quitchupah Creek Road EIS	D4	This project will upgrade and add on to existing roads to provide a shorter and alternate access route from SUFCO Mine to Highway 10. The project will construct 11.25 miles of 28 foot wide paved road and would install numerous pipe and box culverts and possibly one bridge. The proposed road crosses public and private lands. Roughly 2.52 miles of paved road will be constructed on National Forest System lands, with 7.94 miles built on BLM, 0.26 miles on SITLA, and 0.53 miles built on private lands. The project includes a mitigation package to offset impacts to riparian areas and wetlands, wildlife, and range management. The Water Hollow road will utilize the Quitchupah Creek road Alignment for 2.0 miles of the westernmost portion of its alignment. At that point, it crosses Quitchupah Creek and follows to the south of this drainage for approximately 0.5 mile to the forest boundary. The route continues in an easterly direction along an existing jeep trail to Water Hollow Benches where it then turns south to Saleratus Benches. From Saleratus Benches, the road will then turn north and east to connect with SR-10. The acreage of impact is estimated at 146.3 acres. The crossing of Water Hollow will require large cuts up to 65 feet deep on both approaches and a large fill 90 feet high and 350 feet wide. This alignment also crosses several other large perennial and ephemeral tributary drainages, for 20 primary crossings. The Draft and Final Environmental Impact Statement (EIS) for the Quitchupah project are incorporated by reference. Only the draft EIS was available to the public at the time the route designation EIS was released. The final EIS and Record of Decision have subsequently been released to the public. The Quitchupah project will add to encroaching and riparian motorized routes and numerous stream crossings, but includes a mitigation package and required design criteria intended to some degree mitigate the potential for adverse cumulative impacts to hydrologic and aquatic resources. Net area open to motorized cross-country travel would decrease under the action alternatives from the route designation project. Proposed route obliteration would offset some of the impacts from the Quitchupah road on forest, but not totally due to the differences in magnitude, size, and use of the paved route. Applicant committed environmental protection measures are specified to mitigate negative resource impacts from the Quitchupah road. The action alternatives for the route designation project should reduce the potential for cumulative impacts relative to No Action.

Project Name	Unit	Description of the Project and Potential Effects
		The Quitchupah analysis does not anticipate measurable cumulative effects. The Fishlake OHV Route Designation Project should reduce the potential for cumulative impacts relative to maintaining the current motorized travel plan. Therefore, adverse cumulative impacts to soil productivity, riparian and wetland condition, support of aquatic organisms and their habitat, or water quality are not anticipated.
Rueben Hazardous Fuels Reduction & Wildlife Improvement Project DM	D4	This was a reasonably foreseeable project when the DEIS was released. This project has now been completed. Post-implemenation monitoring indicated that desired resource outcomes and benefits were achieved without adverse negative consequences. The project did not change the watershed or aquatics issue indicators assigned to track cumulative resource impacts for the route designation project. The watershed report done for the project concluded, "It is not likely that there will be negative effects to stream channels, or floodplains from the increased peakflows generated from the prescribed burned areas." As such, no adverse cumulative impacts to soil productivity, riparian and wetland condition, support of aquatic organisms and their habitat, or water quality have so far occurred or are anticipated.
Salina Creek Dispersed Recreation	D4	This project will construct less than ½ mile of road to create a dispersed recreation loop to replace the existing dispersed camp sites located at the second crossing of Salina Creek, which are causing damage to riparian vegetation and Salina Creek, and is impacting water quality. The existing dispersed sites will be rehabilitated. A vault restroom facility will be added for the roughly 30 replacement sites. A trailhead will also be constructed at Beaver Creek and at Second Crossing to serve trail use parking. The purpose of and design for this project is to reduce riparian and water quality impacts. The relocated road is further away from the stream than the existing access and has specified Best Management Practices to reduce erosion potential. The project causes a slight increase in route density that is more than offset by proposed route obliterations from the route designation project. Unrestricted motorized cross-country travel would also be substantially reduced. Therefore, a net benefit to soil productivity, riparian and wetland condition, support of aquatic organisms and their habitat, or water quality is anticipated.
Seven Mile Spruce Beetle Infestation Project DM	D4	The project will use commercial thinning to reduce stand density of Engelmann spruce within 123 acres of beetle-infested, diseased, mature and dead timber stands. About ½ mile of temporary road would be needed to facilitate logging. Some motorized cross-country travel is permitted for logging skid trails, but this use is restricted by Best Management Practices and Forest Plan standards and guidelines that are incorporated into the timber sale contract. The action alternatives for the Fishlake OHV Route Designation Project still result in a net decrease in motorized route density and acres open to motorized cross-country travel. The proposed temporary road is further than 300 feet from any channel. The watershed report for the project concluded, "minimal or no direct and indirect effects from the proposed, existing, and foreseeable activities are expected. The types and locations of disturbances are not situated

Project Name	Unit	Description of the Project and Potential Effects
		such that the minimal effects would be amplified under any alternative. As a result, the potential for direct and indirect effects to interact cumulatively is considered minimal. Therefore, no physical response from the Sevenmile Spruce Beetle project would extend to or be measurable in Gooseberry Creek, Salina Creek, or the Sevier River." No adverse cumulative impacts to soil productivity, riparian and wetland condition, support of aquatic organisms and their habitat, or water quality are anticipated.
Wolverine Geophysical Survey II DM	D4	The survey would be completed using tractor-mounted and helicopter-portable drilling equipment to excavate shot holes for explosives. Geophone receivers would be spaced at 220-foot intervals for approximately 18 miles across National Forest System lands. No new road construction would be necessary. This project would result in temporary increases in motorized cross-country travel. However, the project would specify standard and site-specific management practices that help assure that negative resource impacts are avoided. The project would not permanently change the primary issue indicators assigned to track cumulative resource impacts for the route designation project. Based on the above factors and the results from the previous Wolverine project, no adverse cumulative impacts to soil productivity, riparian and wetland condition, support of aquatic organisms and their habitat, or water quality are anticipated.
Transportation projects that do not yet have specific proposed actions and/or that are not being analyzed currently, but that <u>may</u> be developed some time during the implementation period for the Fishlake OHV Route Designation Project – See the 2006 Fishlake Roads Analysis Supplement located in the project file for further details.		Forestwide – Motorized Over-snow Use Travel Plan Forestwide – Dispersed Recreation Strategy D1 – Chalk Creek Trail 326 Realignment / Relocation D2 - Great Western Trail (GWT) Reroutes D2 - Black Flat Crossing (may or may not be part of the GWT reroutes) D2 - Danish Meadows Private Land Access D2 - Sevenmile Creek Trail Reroute D2 – Daniels Canyon Trail 129 Reroute D3 - Forest Access to Junction, Utah D3 - Kents Lake Road cutoff / loop D4 - Accord Lakes Private Lands Through-route D4 - Barney Lake Dispersed Camping and Road Relocation The revision of the winter motorized travel plan will complement the travel planning done for summer motorized use and would be designed to reduce the potential for adverse resource impacts. Similarly, the restoration and management recommendations that result from the dispersed recreation assessment will be designed to reduce existing and future resource impacts to watershed and aquatic resources. The primary purpose of the Chalk Creek trail realignment would be to reduce the number of stream crossings and the miles of motorized trail directly within the stream and riparian corridor. The two Great Western Trail reroutes offer the potential to reduce riparian and wetland impacts and to protect a Threatened and Endangered plant. Addressing the Black Flat crossing would mitigate the potential for introducing whirling disease into a currently uninfected stream segment and would improve water quality. The Barney Lake project would reduce the potential for motorized use and dispersed recreation to impact Boreal toads. The Daniels Canyon project is needed to eliminate stream and wetland impacts from the current trail location. Given the purpose and need for the above projects, the potential for cumulative impacts with the route designation project would be less than what exists currently under No

Project Name	Unit	Description of the Project and Potential Effects
		Action. The remaining projects are needed to reduce user conflicts by improving and/or restoring route connections. The projects would be designed to avoid or reduce existing negative impacts to biological and physical resources. The Fishlake OHV Route Designation Project will either be an existing condition or ongoing/foreseeable action for all of these projects. As such, the design for these projects would be modified if necessary to avoid adverse cumulative impacts. This need is not expected given that the route designation project will reduce the potential for cumulative impacts across the forest. Each of the above projects would have some level of NEPA analysis and project file that would document the project design and analyses findings. Therefore, no adverse cumulative impacts to soil productivity, riparian and wetland condition, support of aquatic organisms and their habitat, or water quality are anticipated.
Miscellaneous projects that do not yet have specific proposed actions and/or that are not being analyzed currently, but that <u>may</u> be developed some time during the implementation period for the Fishlake OHV Route Designation Project		D1 – Oak Creek Plantation Thinning & Dispersed Recreation EA D1 – Watts Mountain Fuels and Dixie Harrow Project EA D2 – Fishlake Plateau Grazing Environmental Impact Statement (13 allotments D2 – Hondoo Trails Special Use Permit D2 – Last Chance Dixie Harrow Treatment DM (~ 605 acres) D2 – Lost Creek Timber Sale D2 – North Creek, Cedarless Flat, West Tidwell Livestock Waterlines D2 – Paradise Valley Dixie Harrow Treatment DM (~ 312 acres) D2 – Wide Hollow Fuels Project D3 – Big Flat / Timid Springs Water System D3 – Big Flat Roads and Trails D3 – Circleville Dixie Harrow Treatment DM (~ 300 acres) D4 – Cove Mountain Fuels Project D4 – Gooseberry Fuels Project D4 – Old Woman Dixie Harrow Treatment DM (~ 258 acres) D4 – Old Woman Fuels Project DM Potential impacts from these projects would be similar to those described above for like project types and in the accompanying specialist reports. The Fishlake OHV Route Designation Project will either be an existing condition or ongoing/foreseeable action for these projects. As such, the design for these projects would be modified if necessary to avoid adverse cumulative impacts. This need is not expected given that the route designation project will reduce the potential for cumulative impacts across the forest. Each of the above projects would have some level of NEPA analysis and project file that would document the project design and analyses findings. Therefore, no adverse cumulative impacts to soil productivity, riparian and wetland condition, support of aquatic organisms and their habitat, or water quality are anticipated.

Cumulative Effects Summary

Relevant impacts from past management projects are incorporated and described in the Affected Environment descriptions for the primary issues. Current and historic livestock grazing, invasive plant treatments, water development, collection of forest products, timber sales, mechanical and prescribed fire and fuels treatments, road and trail construction, reconstruction and maintenance, underground mining for coal, oil and gas exploration and development, geothermal development, and recreational use on federal

and private lands considered as part of the existing condition. Many are ongoing and will continue. Wildfires will occur somewhere on the forest every year under all alternatives.

Some projects in Appendix C are currently in the process of being implemented and are accounted for in the EIS for the route designation project design and analysis. However, projects to which the Fishlake OHV Route Designation project will either be an existing condition or foreseeable action can modify proposed treatments if necessary to assure that the future proposals avoid undesirable cumulative impacts. Foreseeable projects must comply with Forest Plan standards and guidelines and the forest will continue annual project and Forest Plan level monitoring. Each of these features increases the likelihood that future adverse cumulative impacts can be avoided or mitigated if they occur. **It is important to note that most of the foreseeable activities take place off of routes. Therefore, reducing off-route motorized cross-country travel directly reduces the potential for direct and indirect interactions and cumulative impacts with other land uses relative to No Action.** In fact, even if a given foreseeable action or unforeseen event for some reason has significant adverse impacts to hydrologic or aquatic resources, the nature and magnitude of the cumulative impacts will in almost every case be some degree less provided an action alternative from the route designation project is implemented.

Livestock management will continue to be monitored and adjusted when additional resource protection is needed through implementation of the Annual Operating Plans and the Allotment Management Plans. Herbicides are the primary pesticide used on the forest and use will continue under all alternatives. Rotenone piscicide will be used in reasonably foreseeable fisheries reintroduction projects. Pesticides will not cause direct, indirect, or cumulative effects that could be detrimental to water quality or the values-at-risk provided the implementation requirements from the Fishlake Noxious Weed EA and the Cooperative Fisheries Enhancement Project assessment are followed. The noxious weed EA concluded that there would be no significant direct, indirect, or indirect impacts to soil, watershed, or aquatic resources. An assessment for the rotenone treatments is nearly complete and indicates the treatments can be done without permanent adverse impacts to watershed and aquatic resources. Water developments will continue to be monitored and modified as necessary to protect aquatic values. The collection of forest products will continue to require a permit with District Ranger approval. Effects from foreseeable timber sales, mechanical and prescribed fire and fuels treatments, road and trail construction, reconstruction and maintenance, underground mining for coal, oil and gas exploration and development, geothermal development are described in the tables above. The primary issues cover the effects from recreational impacts. With wildfire, there is no planning for the time or place of ignition so potential impacts can vary greatly. Wildland Fire Use may also be used when deemed appropriate through the process outlined in the Utah Fire Amendment. Burned Area Emergency Response (BAER) assessments and rehabilitation are done if post fire conditions threaten life or property or important natural resources. BAER assessments are required if the wildfire is 300 acres or larger. In burned watersheds, the potential for impacts to watersheds and aquatics will be greater than what is displayed for the proposed actions.

As outlined above, reasonably foreseeable activities are generally not creating the types and/or magnitudes of direct or indirect impacts that will be significant, even when considered cumulatively with the Fishlake OHV Route Designation Project. The transportation projects are the exceptions to this rule, but these projects are designed to maintain the protection of biophysical resources through avoidance or mitigation, or improve conditions through route redesign, relocation and/or obliteration. Therefore, significant adverse cumulative impacts are not anticipated. In fact, fewer cumulative impacts should result.

Appendix D

Issue Indicators by Alternative for 6th Field HUC and Other Fine Scale Cumulative Effect Watersheds

Table D-1						
HUC Number	Cumulative Effects Watershed	Miles of Motorized Route Encroaching on Channels, Lakes, and Wetlands				
		Alt 1	Alt 2	Alt 3	Alt 4	Alt 5
140700020101	Ivie Creek / Hilgard Mountain below National Forest	4.9	4.3	4.4	3.8	4.5
140700020103	Quitchupah Creek above confluence with North Fork Quitchupah Creek	3.0	2.9	2.8	2.3	2.8
140700020104	Saleratus Creek below National Forest	0.4	0.4	0.4	0.4	0.4
140700020104	Trough / Mill Hollow below National Forest	1.4	1.4	1.4	1.4	1.4
140700020105	Post Hollow below National Forest	0.4	0.4	0.4	0.4	0.4
1407000301	**Fremont River at Mill Meadow Reservoir Dam**	18.1	10.7	11.0	9.7	14.3
140700030101	UM Creek at Forsyth Reservoir	3.0	1.6	1.9	0.9	2.0
140700030102	Lake Creek / Fishlake Basin at Johnson Valley Reservoir	1.4	1.3	1.3	1.3	1.3
140700030103	Sevenmile Creek at Johnson Valley Reservoir	0.4	0.3	0.3	0.3	0.3
140700030304	Sand Creek at National Forest Boundary	2.0	1.1	1.3	1.1	1.7
160300010603	Birch Creek / Circleville Mountain at National Forest Boundary	0.5	0.3	0.4	0.3	0.4
160300020102	Otter Creek below National Forest	0.4	0.3	1.1	0.3	1.1
160300020106	Greenwich Creek at National Forest Boundary	1.4	1.3	1.3	1.2	1.3
160300020107	Box Creek below National Forest	5.8	5.2	4.9	1.3	4.9
160300030101	Fish Creek above confluence with Clear Creek	2.2	1.1	1.0	1.0	1.1
160300030102	Shingle Creek / Upper Clear Creek above confluence with Fish Creek	3.4	2.6	2.8	2.3	2.1
160300030103	Three Creeks / Pole Creek above confluence with Clear Creek	2.6	2.3	2.0	1.8	1.8
160300030104	Mill Creek above confluence with Clear Creek	4.9	4.0	4.0	3.9	4.3
160300030105	Sam Stowe Canyon above confluence with Clear Creek	1.5	1.3	1.3	1.2	1.3
160300030203	Manning Creek below National Forest	1.3	1.0	1.0	0.7	1.0
160300030204	Tenmile Creek below National Forest Boundary	1.1	0.4	0.4	0.4	0.4
160300030205	Pine Creek / Bullion Canyon below National Forest	0.6	0.4	0.4	0.4	0.4
160300030303	Monroe Creek at National Forest Boundary	2.7	1.4	1.4	1.3	1.4

Table D-1						
HUC Number	Cumulative Effects Watershed	Miles of Motorized Route Encroaching on Channels, Lakes, and Wetlands				
		Alt 1	Alt 2	Alt 3	Alt 4	Alt 5
160300030308	Squeedunk Canyon below National Forest	3.2	2.1	2.1	0.7	2.4
160300030308	Water Creek below National Forest	7.0	4.7	4.7	1.1	4.7
1603000304	**Salina Creek at Salina Canyon Dam**	20.2	17.0	17.3	11.6	18.0
1603000305	**Lost Creek below National Forest**	10.7	7.4	7.6	5.4	8.8
160300030504	Little Lost Creek above confluence with Lost Creek	4.4	3.9	3.9	2.7	4.0
160300030505	Lost Creek above confluence with Little Lost Creek	4.2	2.3	2.4	2.0	3.5
160300030602	Willow Creek / Musina below National Forest	1.1	0.7	0.8	0.5	0.9
1603000513	**Corn Creek above Private Dam and Diversion**	7.0	7.5	7.5	3.5	7.6
160300051301	Second Creek above confluence with Corn Creek	2.1	2.7	2.7	1.8	2.7
160300051302	Corn Creek above confluence with Second Creek	2.3	2.2	2.2	0.9	2.2
1603000514	**Chalk Creek at National Forest Boundary / Diversion**	3.5	3.4	3.5	2.4	3.4
160300051401	North Fork of Chalk Creek above confluence with South Fork of Chalk Creek	0.1	0.1	0.1	0.0	0.1
160300051402	South Fork of Chalk Creek above confluence with North Fork of Chalk Creek	3.4	3.2	3.3	2.4	3.4
160300070101	Indian Creek / Mt. Baldy at Private Diversion	3.7	3.3	3.3	3.3	3.4
1603000702	**Beaver River above Private Diversion**	7.5	6.1	6.2	6.0	6.6
160300070201	Merchant Creek above confluence with Three Creeks	0.9	0.8	0.8	0.8	0.9
160300070202	Three Creeks above confluence with Merchant Creek	1.0	0.7	0.7	0.7	0.9
160300070203	South Fork of North Creek above confluence with North Fork of North Creek	0.0	0.0	0.0	0.0	0.0
160300070205	South Creek / Circleville Mountain below National Forest	2.0	1.9	1.9	0.6	2.0
160300070206	Birch Creek / Birch Creek Mountain at National Forest Boundary	0.2	0.2	0.2	0.0	0.2
160300070208	North Fork of North Creek above confluence with South Fork of North Creek	3.4	2.8	2.4	2.4	2.5
160300070501	Pine Creek / Tushar Mountains at National Forest Boundary	1.2	0.6	0.6	0.6	1.2

Table D-2						
HUC Number	Cumulative Effects Watershed	Miles of Motorized Route in the Riparian Influence Zone				
		Alt 1	Alt 2	Alt 3	Alt 4	Alt 5
140700020101	Ivie Creek / Hilgard Mountain below National Forest	34.6	29.4	29.5	26.0	30.7
140700020103	Quitchupah Creek above confluence with North Fork Quitchupah Creek	17.2	14.6	14.5	12.8	14.8
140700020104	Saleratus Creek below National Forest	1.7	1.5	1.5	1.5	1.6
140700020104	Trough / Mill Hollow below National Forest	5.0	4.8	4.8	4.8	4.3
140700020105	Post Hollow below National Forest	1.4	0.8	0.8	0.8	0.9
1407000301	**Fremont River at Mill Meadow Reservoir Dam**	90.0	62.0	64.7	56.6	73.5
140700030101	UM Creek at Forsyth Reservoir	17.9	10.8	11.6	6.8	12.1
140700030102	Lake Creek / Fishlake Basin at Johnson Valley Reservoir	12.1	11.3	11.3	11.3	11.6
140700030103	Sevenmile Creek at Johnson Valley Reservoir	3.4	2.8	2.8	2.8	2.9
140700030304	Sand Creek at National Forest Boundary	11.6	7.5	9.3	8.0	10.0
160300010603	Birch Creek / Circleville Mountain at National Forest Boundary	4.7	3.3	3.6	3.3	3.9
160300020102	Otter Creek below National Forest	2.7	2.3	5.1	2.1	5.1
160300020106	Greenwich Creek at National Forest Boundary	9.8	9.7	9.2	8.7	9.2
160300020107	Box Creek below National Forest	26.5	23.7	22.6	12.7	22.7
160300030101	Fish Creek above confluence with Clear Creek	12.0	8.6	7.3	7.1	7.5
160300030102	Shingle Creek / Upper Clear Creek above confluence with Fish Creek	19.2	15.7	16.6	14.6	14.5
160300030103	Three Creeks / Pole Creek above confluence with Clear Creek	11.8	11.1	10.3	9.5	9.9
160300030104	Mill Creek above confluence with Clear Creek	22.0	18.1	18.1	17.9	19.9
160300030105	Sam Stowe Canyon above confluence with Clear Creek	6.3	5.9	6.0	5.0	5.5
160300030203	Manning Creek below National Forest	10.2	8.2	8.2	6.2	8.3
160300030204	Tenmile Creek below National Forest Boundary	2.0	0.6	0.7	0.6	0.7
160300030205	Pine Creek / Bullion Canyon below National Forest	7.0	5.4	5.8	5.4	5.8
160300030303	Monroe Creek at National Forest Boundary	12.2	9.1	9.1	8.4	9.3
160300030308	Squeedunk Canyon below National Forest	9.3	7.2	7.2	4.1	7.7
160300030308	Water Creek below National Forest	20.7	15.3	15.3	8.7	15.7
1603000304	**Salina Creek at Salina Canyon Dam**	155.8	134.1	135.4	113.7	139.0
1603000305	**Lost Creek below National Forest**	53.9	40.1	41.0	31.5	43.9

Table D-2						
HUC Number		Miles of Motorized Route in the Riparian Influence Zone				
		Alt 1	Alt 2	Alt 3		Alt 5
160300030504	Little Lost Creek above confluence with Lost Creek	22.2	19.8	19.8	15.6	19.8
160300030505	Lost Creek above confluence with Little Lost Creek	19.7	13.1	13.6	11.9	16.2
160300030602	Willow Creek / Musina below National Forest	9.6	7.9	8.3	6.0	8.8
1603000513	**Corn Creek above Private Dam and Diversion**	37.2	39.2	39.1	25.4	39.8
160300051301	Second Creek above confluence with Corn Creek	15.0	17.7	17.7	13.1	17.9
160300051302	Corn Creek above confluence with Second Creek	11.7	11.3	11.2	7.2	11.5
1603000514	**Chalk Creek at National Forest Boundary / Diversion**	15.0	13.4	14.4	10.5	14.1
160300051401	North Fork of Chalk Creek above confluence with South Fork of Chalk Creek	2.2	2.2	2.2	1.0	1.7
160300051402	South Fork of Chalk Creek above confluence with North Fork of Chalk Creek	12.4	10.8	11.8	9.2	12.0
160300070101	Indian Creek / Mt. Baldy at Private Diversion	12.9	10.8	10.9	10.8	11.1
1603000702	**Beaver River above Private Diversion**	56.7	51.8	52.8	50.1	54.1
160300070201	Merchant Creek above confluence with Three Creeks	11.0	10.2	10.1	9.6	10.3
160300070202	Three Creeks above confluence with Merchant Creek	10.6	9.8	9.8	9.5	10.2
160300070203	South Fork of North Creek above confluence with North Fork of North Creek	0.2	0.2	0.2	0.1	0.2
160300070205	South Creek / Circleville Mountain below National Forest	11.7	10.9	10.9	5.5	11.4
160300070206	Birch Creek / Birch Creek Mountain at National Forest Boundary	1.4	1.4	1.4	0.6	1.4
160300070208	North Fork of North Creek above confluence with South Fork of North Creek	11.9	10.0	8.8	8.8	9.0
160300070501	Pine Creek / Tushar Mountains at National Forest Boundary	3.3	1.7	1.7	1.7	3.3

Table D-3						
HUC Number	Cumulative Effects Watershed	Stream Crossing Frequency (number per mile of channel)				
		Alt 1	Alt 2	Alt 3	Alt 4	Alt 5
140700020101	Ivie Creek / Hilgard Mountain below National Forest	0.8	0.7	0.7	0.5	0.7
140700020103	Quitchupah Creek above confluence with North Fork Quitchupah Creek	0.7	0.6	0.6	0.5	0.6
140700020104	Saleratus Creek below National Forest	0.2	0.1	0.1	0.1	0.2
140700020104	Trough / Mill Hollow below National Forest	1.1	1.0	1.0	1.0	0.9
140700020105	Post Hollow below National Forest	0.6	0.6	0.6	0.6	0.6
1407000301	**Fremont River at Mill Meadow Reservoir Dam**	1.3	0.9	0.9	0.8	1.1
140700030101	UM Creek at Forsyth Reservoir	0.7	0.4	0.4	0.3	0.5
140700030102	Lake Creek / Fishlake Basin at Johnson Valley Reservoir	1.6	1.6	1.6	1.6	1.6
140700030103	Sevenmile Creek at Johnson Valley Reservoir	0.4	0.3	0.3	0.3	0.3
140700030304	Sand Creek at National Forest Boundary	2.9	1.3	1.5	1.2	2.3
160300010603	Birch Creek / Circleville Mountain at National Forest Boundary	0.7	0.4	0.4	0.3	0.5
160300020102	Otter Creek below National Forest	0.3	0.2	0.7	0.2	0.7
160300020106	Greenwich Creek at National Forest Boundary	0.8	0.8	0.7	0.6	0.7
160300020107	Box Creek below National Forest	1.5	1.4	1.3	0.6	1.3
160300030101	Fish Creek above confluence with Clear Creek	0.5	0.4	0.3	0.3	0.3
160300030102	Shingle Creek / Upper Clear Creek above confluence with Fish Creek	1.1	0.8	0.9	0.7	0.8
160300030103	Three Creeks / Pole Creek above confluence with Clear Creek	0.5	0.5	0.5	0.4	0.4
160300030104	Mill Creek above confluence with Clear Creek	1.3	1.0	1.0	1.0	1.1
160300030105	Sam Stowe Canyon above confluence with Clear Creek	1.0	0.9	0.9	0.8	1.0
160300030203	Manning Creek below National Forest	0.8	0.7	0.6	0.5	0.6
160300030204	Tenmile Creek below National Forest Boundary	0.4	0.1	0.1	0.1	0.1
160300030205	Pine Creek / Bullion Canyon below National Forest	0.3	0.2	0.2	0.2	0.2
160300030303	Monroe Creek at National Forest Boundary	0.5	0.3	0.3	0.3	0.4
160300030308	Squeedunk Canyon below National Forest	1.3	0.8	0.8	0.3	0.8
160300030308	Water Creek below National Forest	1.4	1.1	1.1	0.4	1.1
1603000304	**Salina Creek at Salina Canyon Dam**	0.7	0.6	0.6	0.4	0.6
1603000305	**Lost Creek below National Forest**	0.7	0.5	0.5	0.3	0.6

Table D-3						
HUC Number	**Cumulative Effects Watershed**	**Stream Crossing Frequency (number per mile of channel)**				
		Alt 1	**Alt 2**	**Alt 3**	**Alt 4**	**Alt 5**
160300030504	Little Lost Creek above confluence with Lost Creek	1.0	0.8	0.8	0.6	0.8
160300030505	Lost Creek above confluence with Little Lost Creek	0.8	0.5	0.5	0.4	0.7
160300030602	Willow Creek / Musina below National Forest	0.4	0.3	0.4	0.2	0.4
1603000513	**Corn Creek above Private Dam and Diversion**	0.4	0.4	0.4	0.2	0.4
160300051301	Second Creek above confluence with Corn Creek	0.4	0.5	0.5	0.4	0.5
160300051302	Corn Creek above confluence with Second Creek	0.4	0.4	0.4	0.1	0.4
1603000514	**Chalk Creek at National Forest Boundary / Diversion**	0.6	0.5	0.6	0.4	0.5
160300051401	North Fork of Chalk Creek above confluence with South Fork of Chalk Creek	0.1	0.1	0.1	0.0	0.1
160300051402	South Fork of Chalk Creek above confluence with North Fork of Chalk Creek	1.0	0.9	0.9	0.7	1.0
160300070101	Indian Creek / Mt. Baldy at Private Diversion	1.0	0.8	0.8	0.8	0.8
1603000702	**Beaver River above Private Diversion**	0.9	0.8	0.8	0.8	0.8
160300070201	Merchant Creek above confluence with Three Creeks	0.6	0.6	0.6	0.6	0.6
160300070202	Three Creeks above confluence with Merchant Creek	0.7	0.6	0.6	0.6	0.6
160300070203	South Fork of North Creek above confluence with North Fork of North Creek	0.0	0.0	0.0	0.0	0.0
160300070205	South Creek / Circleville Mountain below National Forest	0.5	0.5	0.5	0.3	0.5
160300070206	Birch Creek / Birch Creek Mountain at National Forest Boundary	0.4	0.4	0.4	0.0	0.4
160300070208	North Fork of North Creek above confluence with South Fork of North Creek	1.2	1.0	0.8	0.8	0.9
160300070501	Pine Creek / Tushar Mountains at National Forest Boundary	1.3	0.5	0.5	0.5	1.3

Table D-4						
HUC Number	Cumulative Effects Watershed	Open Use Area and Dispersed Camping Distance Designations in the Riparian Influence Zone (acres)				
		Alt 1	Alt 2	Alt 3	Alt 4	Alt 5
140700020101	Ivie Creek / Hilgard Mountain below National Forest	5184	1304	719	602	723
140700020103	Quitchupah Creek above confluence with North Fork Quitchupah Creek	2974	853	448	390	456
140700020104	Saleratus Creek below National Forest	611	87	51	51	53
140700020104	Trough / Mill Hollow below National Forest	772	307	169	169	153
140700020105	Post Hollow below National Forest	604	46	27	27	27
1407000301	**Fremont River at Mill Meadow Reservoir Dam**	13126	2645	1505	1255	1772
140700030101	UM Creek at Forsyth Reservoir	2339	651	381	233	392
140700030102	Lake Creek / Fishlake Basin at Johnson Valley Reservoir	3498	98	52	52	56
140700030103	Sevenmile Creek at Johnson Valley Reservoir	193	51	21	21	26
140700030304	Sand Creek at National Forest Boundary	831	488	318	277	318
160300010603	Birch Creek / Circleville Mountain at National Forest Boundary	379	203	117	111	118
160300020102	Otter Creek below National Forest	1429	170	183	78	184
160300020106	Greenwich Creek at National Forest Boundary	2041	609	315	298	315
160300020107	Box Creek below National Forest	3870	1377	742	432	743
160300030101	Fish Creek above confluence with Clear Creek	1820	356	141	133	141
160300030102	Shingle Creek / Upper Clear Creek above confluence with Fish Creek	2435	691	423	356	355
160300030103	Three Creeks / Pole Creek above confluence with Clear Creek	2717	657	358	333	343
160300030104	Mill Creek above confluence with Clear Creek	3122	841	475	471	475
160300030105	Sam Stowe Canyon above confluence with Clear Creek	1203	370	206	170	186
160300030203	Manning Creek below National Forest	2786	434	239	173	240
160300030204	Tenmile Creek below National Forest Boundary	740	47	24	23	24
160300030205	Pine Creek / Bullion Canyon below National Forest	1269	303	179	168	170
160300030303	Monroe Creek at National Forest Boundary	1862	432	244	223	246
160300030308	Squeedunk Canyon below National Forest	1229	398	225	127	242
160300030308	Water Creek below National Forest	1174	789	472	296	447
1603000304	**Salina Creek at Salina Canyon Dam**	10466	5078	2838	2129	2884
1603000305	**Lost Creek below National Forest**	7400	2532	1432	1112	1517

Table D-4						
HUC Number	Cumulative Effects Watershed	Open Use Area and Dispersed Camping Distance Designations in the Riparian Influence Zone (acres)				
		Alt 1	Alt 2	Alt 3	Alt 4	Alt 5
160300030504	Little Lost Creek above confluence with Lost Creek	2815	1221	694	552	695
160300030505	Lost Creek above confluence with Little Lost Creek	2195	818	466	411	544
160300030602	Willow Creek / Musina below National Forest	370	482	278	211	292
1603000513	**Corn Creek above Private Dam and Diversion**	4047	2335	1329	865	1342
160300051301	Second Creek above confluence with Corn Creek	1010	1087	623	464	624
160300051302	Corn Creek above confluence with Second Creek	689	672	373	242	382
1603000514	**Chalk Creek at National Forest Boundary / Diversion**	5596	794	468	330	448
160300051401	North Fork of Chalk Creek above confluence with South Fork of Chalk Creek	2578	150	69	21	49
160300051402	South Fork of Chalk Creek above confluence with North Fork of Chalk Creek	2990	626	387	297	387
160300070101	Indian Creek / Mt. Baldy at Private Diversion	1718	606	340	339	346
1603000702	**Beaver River above Private Diversion**	8362	2405	1372	1290	1297
160300070201	Merchant Creek above confluence with Three Creeks	782	505	287	268	292
160300070202	Three Creeks above confluence with Merchant Creek	1606	554	311	302	320
160300070203	South Fork of North Creek above confluence with North Fork of North Creek	105	16	8	6	8
160300070205	South Creek / Circleville Mountain below National Forest	2918	670	379	191	387
160300070206	Birch Creek / Birch Creek Mountain at National Forest Boundary	29	94	50	20	50
160300070208	North Fork of North Creek above confluence with South Fork of North Creek	1847	605	307	307	308
160300070501	Pine Creek / Tushar Mountains at National Forest Boundary	882	109	59	59	115

Table D-5				
HUC Number	Cumulative Effects Watershed	Existing Number of Individual Inventoried Dispersed Campsites		
		Encroaching on Channels and Lakes	Within Riparian Influence Zone	
140700020101	Ivie Creek / Hilgard Mountain below National Forest	5	29	69
140700020103	Quitchupah Creek above confluence with North Fork Quitchupah Creek	0	9	57
140700020104	Saleratus Creek below National Forest	1	3	7
140700020104	Trough / Mill Hollow below National Forest	1	1	15
140700020105	Post Hollow below National Forest	0	0	0
1407000301	**Fremont River at Mill Meadow Reservoir Dam**	45	140	473
140700030101	UM Creek at Forsyth Reservoir	6	38	102
140700030102	Lake Creek / Fishlake Basin at Johnson Valley Reservoir	0	0	46
140700030103	Sevenmile Creek at Johnson Valley Reservoir	3	10	57
140700030304	Sand Creek at National Forest Boundary	1	6	8
160300010603	Birch Creek / Circleville Mountain at National Forest Boundary	3	7	7
160300020102	Otter Creek below National Forest	0	0	0
160300020106	Greenwich Creek at National Forest Boundary	1	1	11
160300020107	Box Creek below National Forest	1	10	67
160300030101	Fish Creek above confluence with Clear Creek	2	6	12
160300030102	Shingle Creek / Upper Clear Creek above confluence with Fish Creek	4	14	22
160300030103	Three Creeks / Pole Creek above confluence with Clear Creek	1	1	12
160300030104	Mill Creek above confluence with Clear Creek	14	27	29
160300030105	Sam Stowe Canyon above confluence with Clear Creek	1	2	3
160300030203	Manning Creek below National Forest	1	19	54
160300030204	Tenmile Creek below National Forest Boundary	0	0	0
160300030205	Pine Creek / Bullion Canyon below National Forest	1	3	4
160300030303	Monroe Creek at National Forest Boundary	0	1	21
160300030308	Squeedunk Canyon below National Forest	6	19	35
160300030308	Water Creek below National Forest	1	28	61
1603000304	**Salina Creek at Salina Canyon Dam**	33	198	444
1603000305	**Lost Creek below National Forest**	16	60	147
160300030504	Little Lost Creek above confluence with Lost Creek	5	14	32

Table D-5				
HUC Number	Cumulative Effects Watershed	Existing Number of Individual Inventoried Dispersed Campsites		
		Encroaching on Channels and Lakes	Within Riparian Influence Zone	Within CEA
160300030505	Lost Creek above confluence with Little Lost Creek	6	24	79
160300030602	Willow Creek / Musina below National Forest	14	44	78
1603000513	**Corn Creek above Private Dam and Diversion**	6	27	36
160300051301	Second Creek above confluence with Corn Creek	1	11	17
160300051302	Corn Creek above confluence with Second Creek	1	3	6
1603000514	**Chalk Creek at National Forest Boundary / Diversion**	2	3	23
160300051401	North Fork of Chalk Creek above confluence with South Fork of Chalk Creek	0	0	11
160300051402	South Fork of Chalk Creek above confluence with North Fork of Chalk Creek	2	3	12
160300070101	Indian Creek / Mt. Baldy at Private Diversion	6	24	28
1603000702	**Beaver River above Private Diversion**	28	87	154
160300070201	Merchant Creek above confluence with Three Creeks	15	43	63
160300070202	Three Creeks above confluence with Merchant Creek	4	12	44
160300070203	South Fork of North Creek above confluence with North Fork of North Creek	0	0	1
160300070205	South Creek / Circleville Mountain below National Forest	20	35	39
160300070206	Birch Creek / Birch Creek Mountain at National Forest Boundary	3	5	5
160300070208	North Fork of North Creek above confluence with South Fork of North Creek	4	19	21
160300070501	Pine Creek / Tushar Mountains at National Forest Boundary	6	11	13

Table D-6						
HUC Number	Cumulative Effects Watershed	Hydrologic - Motorized Route Density (miles per square mile)				
			Alt 2	Alt 3	Alt 4	
140700020101	Ivie Creek / Hilgard Mountain below National Forest	1.9	1.6	1.6	1.3	1.6
140700020103	Quitchupah Creek above confluence with North Fork Quitchupah Creek	1.8	1.2	1.2	1.0	1.2
140700020104	Saleratus Creek below National Forest	0.8	0.5	0.5	0.5	0.5
140700020104	Trough / Mill Hollow below National Forest	1.4	1.4	1.4	1.3	1.4
140700020105	Post Hollow below National Forest	0.5	0.2	0.3	0.2	0.3
1407000301	**Fremont River at Mill Meadow Reservoir Dam**	1.7	1.1	1.1	1.0	1.3
140700030101	UM Creek at Forsyth Reservoir	1.3	0.8	0.9	0.6	0.9
140700030102	Lake Creek / Fishlake Basin at Johnson Valley Reservoir	1.4	1.2	1.2	1.1	1.3
140700030103	Sevenmile Creek at Johnson Valley Reservoir	0.7	0.5	0.5	0.5	0.6
140700030304	Sand Creek at National Forest Boundary	2.1	1.2	1.6	1.1	1.8
160300010603	Birch Creek / Circleville Mountain at National Forest Boundary	1.2	0.8	0.9	0.8	0.9
160300020102	Otter Creek below National Forest	1.0	0.7	1.0	0.6	1.0
160300020106	Greenwich Creek at National Forest Boundary	2.4	2.3	2.0	1.6	2.0
160300020107	Box Creek below National Forest	2.9	2.6	2.5	1.5	2.5
160300030101	Fish Creek above confluence with Clear Creek	1.0	0.7	0.7	0.6	0.7
160300030102	Shingle Creek / Upper Clear Creek above confluence with Fish Creek	1.7	1.4	1.4	1.2	1.3
160300030103	Three Creeks / Pole Creek above confluence with Clear Creek	1.1	0.9	0.9	0.7	0.9
160300030104	Mill Creek above confluence with Clear Creek	2.2	1.5	1.5	1.4	1.7
160300030105	Sam Stowe Canyon above confluence with Clear Creek	2.3	2.1	2.3	1.8	2.4
160300030203	Manning Creek below National Forest	1.4	1.1	1.1	0.7	1.1
160300030204	Tenmile Creek below National Forest Boundary	0.3	0.1	0.1	0.1	0.1
160300030205	Pine Creek / Bullion Canyon below National Forest	1.1	0.8	0.9	0.8	0.9
160300030303	Monroe Creek at National Forest Boundary	0.7	0.5	0.5	0.4	0.5
160300030308	Squeedunk Canyon below National Forest	1.3	1.1	1.1	0.5	1.1
160300030308	Water Creek below National Forest	2.3	1.8	1.7	1.1	1.8
1603000304	**Salina Creek at Salina Canyon Dam**	1.4	1.0	1.0	0.8	1.1
1603000305	**Lost Creek below National Forest**	1.4	0.9	1.0	0.8	1.1

Table D-6						
HUC Number	Cumulative Effects Watershed	Hydrologic - Motorized Route Density (miles per square mile)				
		Alt 1	Alt 2	Alt 3	Alt 4	Alt 5
160300030504	Little Lost Creek above confluence with Lost Creek	1.6	1.1	1.1	0.9	1.1
160300030505	Lost Creek above confluence with Little Lost Creek	1.7	1.1	1.2	1.0	1.3
160300030602	Willow Creek / Musina below National Forest	1.1	0.8	0.8	0.5	0.8
1603000513	**Corn Creek above Private Dam and Diversion**	1.1	1.1	1.1	0.7	1.1
160300051301	Second Creek above confluence with Corn Creek	1.2	1.2	1.2	0.9	1.2
160300051302	Corn Creek above confluence with Second Creek	1.4	1.3	1.3	0.8	1.3
1603000514	**Chalk Creek at National Forest Boundary / Diversion**	1.1	1.0	1.0	0.8	1.0
160300051401	North Fork of Chalk Creek above confluence with South Fork of Chalk Creek	0.9	0.8	0.8	0.4	0.7
160300051402	South Fork of Chalk Creek above confluence with North Fork of Chalk Creek	1.2	1.1	1.2	1.0	1.2
160300070101	Indian Creek / Mt. Baldy at Private Diversion	1.2	0.8	0.8	0.8	0.8
1603000702	**Beaver River above Private Diversion**	1.8	1.5	1.6	1.5	1.6
160300070201	Merchant Creek above confluence with Three Creeks	1.7	1.5	1.5	1.4	1.5
160300070202	Three Creeks above confluence with Merchant Creek	1.9	1.6	1.7	1.5	1.7
160300070203	South Fork of North Creek above confluence with North Fork of North Creek	0.2	0.1	0.1	0.1	0.1
160300070205	South Creek / Circleville Mountain below National Forest	0.8	0.7	0.7	0.4	0.7
160300070206	Birch Creek / Birch Creek Mountain at National Forest Boundary	0.7	0.7	0.7	0.1	0.7
160300070208	North Fork of North Creek above confluence with South Fork of North Creek	1.6	1.1	1.0	1.0	1.0
160300070501	Pine Creek / Tushar Mountains at National Forest Boundary	0.7	0.4	0.4	0.3	0.7

Table D-7						
HUC Number	Cumulative Effects Watershed	Cumulative Effects Area in Open Use Area and in Dispersed Camping Distance Designations (acres)				
		Alt 1	Alt 2	Alt 3	Alt 4	Alt 5
140700020101	Ivie Creek / Hilgard Mountain below National Forest	26632	3970	2069	1650	2151
140700020103	Quitchupah Creek above confluence with North Fork Quitchupah Creek	15104	3236	1641	1396	1720
140700020104	Saleratus Creek below National Forest	3529	354	181	181	183
140700020104	Trough / Mill Hollow below National Forest	5395	1039	512	497	507
140700020105	Post Hollow below National Forest	3648	120	77	61	82
1407000301	**Fremont River at Mill Meadow Reservoir Dam**	68757	9474	5271	4389	5987
140700030101	UM Creek at Forsyth Reservoir	21122	2332	1301	925	1356
140700030102	Lake Creek / Fishlake Basin at Johnson Valley Reservoir	6996	641	372	280	328
140700030103	Sevenmile Creek at Johnson Valley Reservoir	870	412	209	209	264
140700030304	Sand Creek at National Forest Boundary	2324	1070	766	518	799
160300010603	Birch Creek / Circleville Mountain at National Forest Boundary	1147	285	153	139	153
160300020102	Otter Creek below National Forest	6445	1110	802	508	829
160300020106	Greenwich Creek at National Forest Boundary	9466	2757	1292	1081	1301
160300020107	Box Creek below National Forest	18424	4989	2554	1609	2555
160300030101	Fish Creek above confluence with Clear Creek	7765	1483	711	643	697
160300030102	Shingle Creek / Upper Clear Creek above confluence with Fish Creek	9572	1939	1071	871	929
160300030103	Three Creeks / Pole Creek above confluence with Clear Creek	14050	1884	984	725	947
160300030104	Mill Creek above confluence with Clear Creek	11368	1831	954	895	950
160300030105	Sam Stowe Canyon above confluence with Clear Creek	4691	1101	610	491	652
160300030203	Manning Creek below National Forest	14720	1607	806	513	816
160300030204	Tenmile Creek below National Forest Boundary	3084	104	52	48	52
160300030205	Pine Creek / Bullion Canyon below National Forest	5266	953	518	493	468
160300030303	Monroe Creek at National Forest Boundary	8427	1096	576	522	601
160300030308	Squeedunk Canyon below National Forest	4321	915	478	203	490
160300030308	Water Creek below National Forest	4463	2069	1100	732	932
1603000304	**Salina Creek at Salina Canyon Dam**	45412	15410	7984	5654	8129
1603000305	**Lost Creek below National Forest**	32273	6521	3544	2776	3702

Table D-7						
HUC Number	**Cumulative Effects Watershed**	**Cumulative Effects Area in Open Use Area and in Dispersed Camping Distance Designations (acres)**				
		Alt 1	**Alt 2**	**Alt 3**	**Alt 4**	**Alt 5**
160300030504	Little Lost Creek above confluence with Lost Creek	13373	2337	1244	981	1254
160300030505	Lost Creek above confluence with Little Lost Creek	9694	2906	1638	1344	1771
160300030602	Willow Creek / Musina below National Forest	892	1473	794	528	814
1603000513	**Corn Creek above Private Dam and Diversion**	16027	6216	3237	2150	3274
160300051301	Second Creek above confluence with Corn Creek	5179	2472	1261	929	1273
160300051302	Corn Creek above confluence with Second Creek	3326	2866	1524	1002	1546
1603000514	**Chalk Creek at National Forest Boundary / Diversion**	22236	3246	1758	1291	1747
160300051401	North Fork of Chalk Creek above confluence with South Fork of Chalk Creek	10034	1189	616	339	562
160300051402	South Fork of Chalk Creek above confluence with North Fork of Chalk Creek	12048	1985	1095	904	1138
160300070101	Indian Creek / Mt. Baldy at Private Diversion	8293	1000	522	520	503
1603000702	**Beaver River above Private Diversion**	36178	7665	4165	3869	3854
160300070201	Merchant Creek above confluence with Three Creeks	2795	1540	809	764	835
160300070202	Three Creeks above confluence with Merchant Creek	6316	1660	903	804	887
160300070203	South Fork of North Creek above confluence with North Fork of North Creek	975	172	78	76	78
160300070205	South Creek / Circleville Mountain below National Forest	11347	1092	561	309	574
160300070206	Birch Creek / Birch Creek Mountain at National Forest Boundary	98	199	101	23	101
160300070208	North Fork of North Creek above confluence with South Fork of North Creek	7886	1085	508	493	513
160300070501	Pine Creek / Tushar Mountains at National Forest Boundary	4002	188	97	69	165

Table D-8						
HUC Number	Cumulative Effects Watershed	Cumulative Effects Area in Open Use Area and in Dispersed Camping Distance Designations (percent)				
		Alt 1	Alt 2	Alt 3	Alt 4	Alt 5
140700020101	Ivie Creek / Hilgard Mountain below National Forest	90.1%	13.4%	7.0%	5.6%	7.3%
140700020103	Quitchupah Creek above confluence with North Fork Quitchupah Creek	55.5%	11.9%	6.0%	5.1%	6.3%
140700020104	Saleratus Creek below National Forest	50.1%	5.0%	2.6%	2.6%	2.6%
140700020104	Trough / Mill Hollow below National Forest	80.4%	15.5%	7.6%	7.4%	7.6%
140700020105	Post Hollow below National Forest	68.2%	2.2%	1.4%	1.1%	1.5%
1407000301	**Fremont River at Mill Meadow Reservoir Dam**	60.4%	8.3%	4.6%	3.9%	5.3%
140700030101	UM Creek at Forsyth Reservoir	75.5%	8.3%	4.6%	3.3%	4.8%
140700030102	Lake Creek / Fishlake Basin at Johnson Valley Reservoir	39.5%	3.6%	2.1%	1.6%	1.9%
140700030103	Sevenmile Creek at Johnson Valley Reservoir	5.5%	2.6%	1.3%	1.3%	1.7%
140700030304	Sand Creek at National Forest Boundary	28.3%	13.0%	9.3%	6.3%	9.7%
160300010603	Birch Creek / Circleville Mountain at National Forest Boundary	35.3%	8.8%	4.7%	4.3%	4.7%
160300020102	Otter Creek below National Forest	42.6%	7.3%	5.3%	3.4%	5.5%
160300020106	Greenwich Creek at National Forest Boundary	79.1%	23.0%	10.8%	9.0%	10.9%
160300020107	Box Creek below National Forest	92.1%	24.9%	12.8%	8.0%	12.8%
160300030101	Fish Creek above confluence with Clear Creek	31.0%	5.9%	2.8%	2.6%	2.8%
160300030102	Shingle Creek / Upper Clear Creek above confluence with Fish Creek	53.3%	10.8%	6.0%	4.8%	5.2%
160300030103	Three Creeks / Pole Creek above confluence with Clear Creek	68.8%	9.2%	4.8%	3.5%	4.6%
160300030104	Mill Creek above confluence with Clear Creek	73.9%	11.9%	6.2%	5.8%	6.2%
160300030105	Sam Stowe Canyon above confluence with Clear Creek	94.1%	22.1%	12.2%	9.8%	13.1%
160300030203	Manning Creek below National Forest	92.3%	10.1%	5.1%	3.2%	5.1%
160300030204	Tenmile Creek below National Forest Boundary	49.9%	1.7%	0.8%	0.8%	0.8%
160300030205	Pine Creek / Bullion Canyon below National Forest	44.3%	8.0%	4.4%	4.1%	3.9%
160300030303	Monroe Creek at National Forest Boundary	33.4%	4.3%	2.3%	2.1%	2.4%
160300030308	Squeedunk Canyon below National Forest	47.5%	10.1%	5.3%	2.2%	5.4%
160300030308	Water Creek below National Forest	35.5%	16.5%	8.8%	5.8%	7.4%
1603000304	**Salina Creek at Salina Canyon Dam**	24.8%	8.4%	4.4%	3.1%	4.4%
1603000305	**Lost Creek below National Forest**	49.3%	10.0%	5.4%	4.2%	5.7%

Table D-8						
HUC Number	Cumulative Effects Watershed	Cumulative Effects Area in Open Use Area and in Dispersed Camping Distance Designations (percent)				
		Alt 1	Alt 2	Alt 3	Alt 4	Alt 5
160300030504	Little Lost Creek above confluence with Lost Creek	67.2%	11.7%	6.2%	4.9%	6.3%
160300030505	Lost Creek above confluence with Little Lost Creek	37.5%	11.2%	6.3%	5.2%	6.9%
160300030602	Willow Creek / Musina below National Forest	5.0%	8.3%	4.5%	3.0%	4.6%
1603000513	**Corn Creek above Private Dam and Diversion**	28.2%	10.9%	5.7%	3.8%	5.8%
160300051301	Second Creek above confluence with Corn Creek	27.9%	13.3%	6.8%	5.0%	6.9%
160300051302	Corn Creek above confluence with Second Creek	15.0%	12.9%	6.9%	4.5%	7.0%
1603000514	**Chalk Creek at National Forest Boundary / Diversion**	69.9%	10.2%	5.5%	4.1%	5.5%
160300051401	North Fork of Chalk Creek above confluence with South Fork of Chalk Creek	71.9%	8.5%	4.4%	2.4%	4.0%
160300051402	South Fork of Chalk Creek above confluence with North Fork of Chalk Creek	68.4%	11.3%	6.2%	5.1%	6.5%
160300070101	Indian Creek / Mt. Baldy at Private Diversion	68.3%	8.2%	4.3%	4.3%	4.1%
1603000702	**Beaver River above Private Diversion**	61.6%	13.1%	7.1%	6.6%	6.6%
160300070201	Merchant Creek above confluence with Three Creeks	23.5%	13.0%	6.8%	6.4%	7.0%
160300070202	Three Creeks above confluence with Merchant Creek	50.5%	13.3%	7.2%	6.4%	7.1%
160300070203	South Fork of North Creek above confluence with North Fork of North Creek	6.3%	1.1%	0.5%	0.5%	0.5%
160300070205	South Creek / Circleville Mountain below National Forest	80.7%	7.8%	4.0%	2.2%	4.1%
160300070206	Birch Creek / Birch Creek Mountain at National Forest Boundary	3.8%	7.7%	3.9%	0.9%	3.9%
160300070208	North Fork of North Creek above confluence with South Fork of North Creek	86.0%	11.8%	5.5%	5.4%	5.6%
160300070501	Pine Creek / Tushar Mountains at National Forest Boundary	93.2%	4.4%	2.3%	1.6%	3.8%

Table D-9						
HUC Number	Cumulative Effects Watershed	Miles of Motorized Route on Sensitive Soils				
		Alt 1	Alt 2	Alt 3	Alt 4	Alt 5
140700020101	Ivie Creek / Hilgard Mountain below National Forest	65.5	53.7	54.1	45.5	56.0
140700020103	Quitchupah Creek above confluence with North Fork Quitchupah Creek	63.9	40.7	39.9	34.7	42.1
140700020104	Saleratus Creek below National Forest	4.1	1.6	1.6	1.6	1.6
140700020104	Trough / Mill Hollow below National Forest	9.9	9.8	9.4	9.2	9.2
140700020105	Post Hollow below National Forest	0.4	0.2	0.2	0.2	0.2
1407000301	**Fremont River at Mill Meadow Reservoir Dam**	110.4	71.8	77.6	65.3	84.7
140700030101	UM Creek at Forsyth Reservoir	29.0	16.1	17.0	10.9	17.8
140700030102	Lake Creek / Fishlake Basin at Johnson Valley Reservoir	7.1	5.9	5.9	5.8	6.0
140700030103	Sevenmile Creek at Johnson Valley Reservoir	8.4	6.7	6.9	6.9	7.3
140700030304	Sand Creek at National Forest Boundary	19.8	11.7	14.6	10.6	16.8
160300010603	Birch Creek / Circleville Mountain at National Forest Boundary	0.0	0.0	0.0	0.0	0.0
160300020102	Otter Creek below National Forest	11.4	7.6	10.7	7.5	11.4
160300020106	Greenwich Creek at National Forest Boundary	20.1	18.4	16.1	12.9	16.5
160300020107	Box Creek below National Forest	56.6	51.0	48.8	30.1	49.0
160300030101	Fish Creek above confluence with Clear Creek	18.8	13.5	12.0	10.6	12.8
160300030102	Shingle Creek / Upper Clear Creek above confluence with Fish Creek	34.1	28.1	28.5	24.7	26.2
160300030103	Three Creeks / Pole Creek above confluence with Clear Creek	25.9	21.4	21.3	15.6	20.5
160300030104	Mill Creek above confluence with Clear Creek	23.6	19.1	19.1	18.3	19.9
160300030105	Sam Stowe Canyon above confluence with Clear Creek	11.5	10.6	11.1	8.8	11.6
160300030203	Manning Creek below National Forest	11.9	10.9	10.7	8.2	10.9
160300030204	Tenmile Creek below National Forest Boundary	0.3	0.3	0.3	0.3	0.3
160300030205	Pine Creek / Bullion Canyon below National Forest	9.8	6.8	7.2	6.6	7.5
160300030303	Monroe Creek at National Forest Boundary	15.7	9.9	9.9	8.5	10.8
160300030308	Squeedunk Canyon below National Forest	8.2	6.8	6.8	3.7	6.8
160300030308	Water Creek below National Forest	24.7	17.4	17.4	10.8	17.7
1603000304	**Salina Creek at Salina Canyon Dam**	320.4	252.3	253.8	197.4	261.2
1603000305	**Lost Creek below National Forest**	96.3	62.8	65.7	52.8	69.3
160300030504	Little Lost Creek above confluence with Lost Creek	33.1	23.2	23.8	20.4	23.9

Table D-9						
HUC Number	Cumulative Effects Watershed	Miles of Motorized Route on Sensitive Soils				
			Alt 2	Alt 3	Alt 4	Alt 5
160300030505	Lost Creek above confluence with Little Lost Creek	43.2	27.1	29.1	22.9	31.9
160300030602	Willow Creek / Musina below National Forest	27.1	19.5	20.5	13.1	21.3
1603000513	**Corn Creek above Private Dam and Diversion**	77.7	75.3	75.3	54.2	76.3
160300051301	Second Creek above confluence with Corn Creek	30.9	30.9	30.9	24.5	31.2
160300051302	Corn Creek above confluence with Second Creek	36.6	35.0	35.0	24.5	35.5
1603000514	**Chalk Creek at National Forest Boundary / Diversion**	35.9	33.7	33.9	27.3	34.7
160300051401	North Fork of Chalk Creek above confluence with South Fork of Chalk Creek	12.3	11.3	11.3	8.9	10.9
160300051402	South Fork of Chalk Creek above confluence with North Fork of Chalk Creek	22.9	21.8	22.0	17.7	23.1
160300070101	Indian Creek / Mt. Baldy at Private Diversion	14.6	11.5	11.8	11.7	11.2
1603000702	**Beaver River above Private Diversion**	105.3	90.5	93.1	85.3	96.6
160300070201	Merchant Creek above confluence with Three Creeks	25.5	23.6	23.3	22.3	24.3
160300070202	Three Creeks above confluence with Merchant Creek	31.4	25.5	27.4	23.7	28.1
160300070203	South Fork of North Creek above confluence with North Fork of North Creek	1.6	1.5	1.5	1.5	1.5
160300070205	South Creek / Circleville Mountain below National Forest	10.9	9.4	9.4	5.4	9.9
160300070206	Birch Creek / Birch Creek Mountain at National Forest Boundary	1.7	1.7	1.7	0.6	1.7
160300070208	North Fork of North Creek above confluence with South Fork of North Creek	12.8	9.9	9.8	9.6	9.9
160300070501	Pine Creek / Tushar Mountains at National Forest Boundary	3.6	2.7	2.7	1.9	3.8

Table D-10						
HUC Number	Cumulative Effects Watershed	Open Use Areas and Dispersed Camping Distance Designations on Sensitive Soils (acres)				
		Alt 1	Alt 2	Alt 3	Alt 4	Alt 5
140700020101	Ivie Creek / Hilgard Mountain below National Forest	14528	2675	1444	1157	1466
140700020103	Quitchupah Creek above confluence with North Fork Quitchupah Creek	9414	2565	1335	1158	1408
140700020104	Saleratus Creek below National Forest	1689	151	67	67	69
140700020104	Trough / Mill Hollow below National Forest	3341	666	337	326	326
140700020105	Post Hollow below National Forest	499	14	8	8	8
1407000301	**Fremont River at Mill Meadow Reservoir Dam**	16091	3573	2052	1672	2254
140700030101	UM Creek at Forsyth Reservoir	6004	1038	580	387	600
140700030102	Lake Creek / Fishlake Basin at Johnson Valley Reservoir	532	167	97	95	98
140700030103	Sevenmile Creek at Johnson Valley Reservoir	459	197	107	107	127
140700030304	Sand Creek at National Forest Boundary	1634	796	565	377	594
160300010603	Birch Creek / Circleville Mountain at National Forest Boundary	15	0	0	0	0
160300020102	Otter Creek below National Forest	2794	520	375	265	394
160300020106	Greenwich Creek at National Forest Boundary	2952	1028	509	425	514
160300020107	Box Creek below National Forest	7542	2827	1543	997	1544
160300030101	Fish Creek above confluence with Clear Creek	3541	808	385	339	373
160300030102	Shingle Creek / Upper Clear Creek above confluence with Fish Creek	5098	1281	714	588	641
160300030103	Three Creeks / Pole Creek above confluence with Clear Creek	7153	1255	704	514	675
160300030104	Mill Creek above confluence with Clear Creek	3227	901	521	497	517
160300030105	Sam Stowe Canyon above confluence with Clear Creek	2572	705	385	306	406
160300030203	Manning Creek below National Forest	2903	592	340	265	343
160300030204	Tenmile Creek below National Forest Boundary	494	21	11	11	11
160300030205	Pine Creek / Bullion Canyon below National Forest	1414	391	228	216	207
160300030303	Monroe Creek at National Forest Boundary	2035	488	281	246	299
160300030308	Squeedunk Canyon below National Forest	980	395	223	128	222
160300030308	Water Creek below National Forest	1118	760	488	340	453
1603000304	**Salina Creek at Salina Canyon Dam**	25427	11966	6410	4508	6532
1603000305	**Lost Creek below National Forest**	13201	4002	2243	1813	2338

Table D-10						
HUC Number	Cumulative Effects Watershed	Open Use Areas and Dispersed Camping Distance Designations on Sensitive Soils (acres)				
		Alt 1	Alt 2	Alt 3	Alt 4	Alt 5
160300030504	Little Lost Creek above confluence with Lost Creek	5331	1434	812	701	814
160300030505	Lost Creek above confluence with Little Lost Creek	4486	1796	997	791	1076
160300030602	Willow Creek / Musina below National Forest	730	1252	696	456	713
1603000513	**Corn Creek above Private Dam and Diversion**	7874	4874	2580	1877	2602
160300051301	Second Creek above confluence with Corn Creek	3834	2116	1093	874	1100
160300051302	Corn Creek above confluence with Second Creek	2431	2206	1181	839	1194
1603000514	**Chalk Creek at National Forest Boundary / Diversion**	13593	2167	1162	944	1185
160300051401	North Fork of Chalk Creek above confluence with South Fork of Chalk Creek	5496	764	395	324	385
160300051402	South Fork of Chalk Creek above confluence with North Fork of Chalk Creek	8035	1362	742	596	776
160300070101	Indian Creek / Mt. Baldy at Private Diversion	3850	645	356	355	333
1603000702	**Beaver River above Private Diversion**	24139	5081	2772	2550	2722
160300070201	Merchant Creek above confluence with Three Creeks	2261	1238	672	643	689
160300070202	Three Creeks above confluence with Merchant Creek	4817	1317	732	633	715
160300070203	South Fork of North Creek above confluence with North Fork of North Creek	385	136	62	61	62
160300070205	South Creek / Circleville Mountain below National Forest	7930	644	330	187	336
160300070206	Birch Creek / Birch Creek Mountain at National Forest Boundary	58	115	59	21	59
160300070208	North Fork of North Creek above confluence with South Fork of North Creek	2367	547	317	315	318
160300070501	Pine Creek / Tushar Mountains at National Forest Boundary	3350	188	97	69	137

Appendix E

Examples of OHV Impacts to Hydrologic and Aquatic Resources on the Fishlake

Photo E-1. Example of "baby sitter syndrome" near Black Flat Crossing on UM Creek.

Photo E-2. Dispersed campsites in riparian areas and wet meadows with unrestricted travel.

Photo E-3. Example of a non-motorized trail in UM Creek being converted to an ATV trail by users in an area open to motorized cross-country travel. This stream is an important native Colorado River cutthroat fishery.

Photo E-4. Example of a user created trail on the North Fork of North Creek in an area open to motorized cross-country travel. This stream is an important remnant Bonneville cutthroat fishery.

Photo E-5. User created route that intercepted and rerouted streamflow during spring runoff in an open use area on Birch Creek (East). This stream is an important native Bonneville cutthroat fishery.

Photo E-6. User created routes through a wetland in an open use area in the Dairies unit on Monroe Mountain. The use occurred near a corduroy bridge that was built to prevent these types of disturbances through the wet meadow.

Photo E-7. One time pass of an ATV through a wetland occupied by Boreal toads near Barney Lake on Monroe Mountain. This use can directly kill toads in addition to reducing habitat quality. Often times other ATVs follow tracks out of curiosity, resulting in a new trail after repeated use.

Photo E-8. Example of how and why new routes are created when located through riparian areas and wetlands.

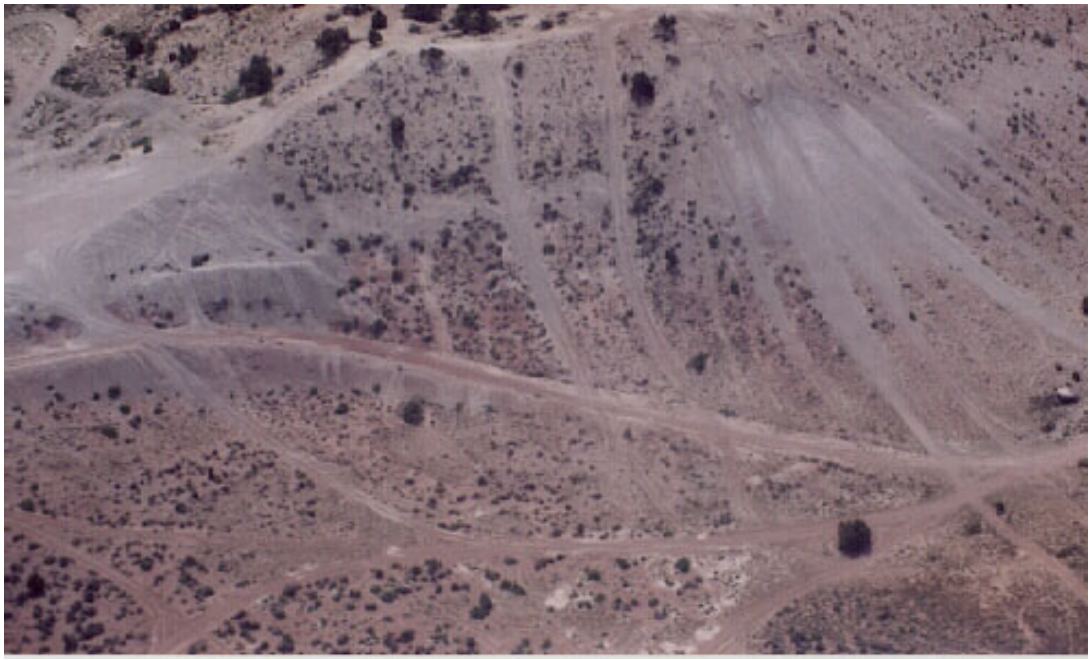


Photo E-9. Example of the "baby sitting syndrome" in an open use area in Flat Canyon just to the west of Richfield, Utah. This is essentially the same phenomenon shown in Photo E-1, but residential housing proxies for dispersed campsites in this case. Much of this use occurs after school or after work.

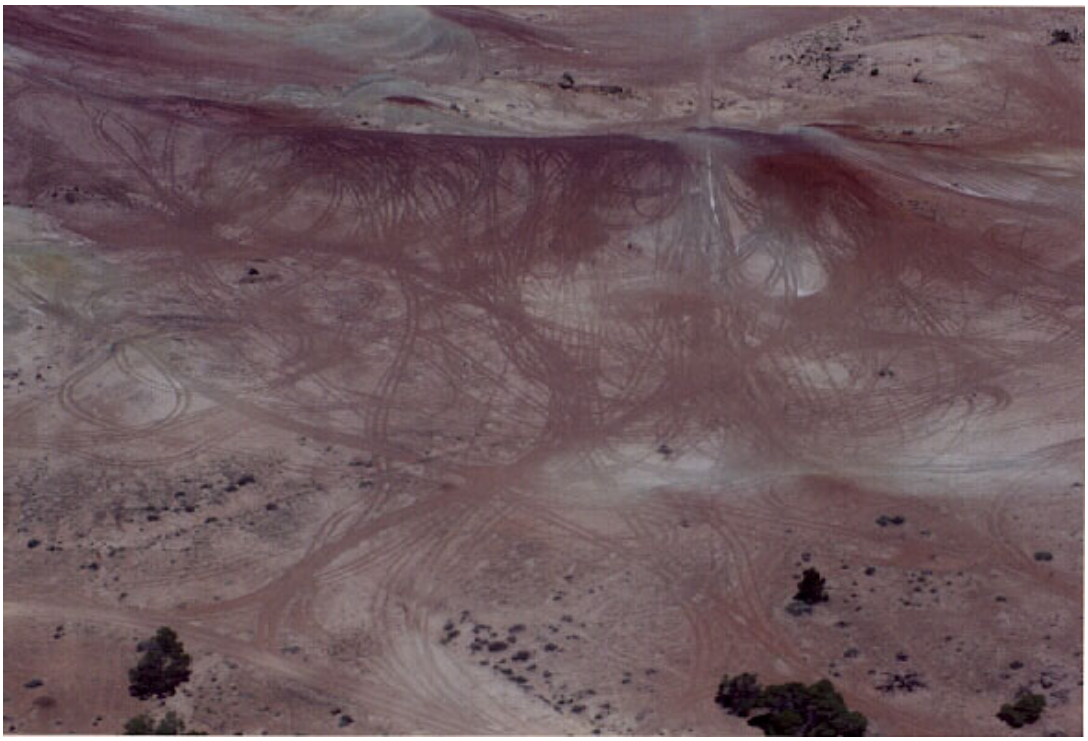


Photo E-10. Existing open use area on the Velvet Ridges by Torrey, Utah.

United States Department of Agriculture | Forest Service | Fishlake National Forest Supervisor's Office Fax: (435) 896-9347 | 115 East 900 North Richfield, UT 84701 Phone: (435) 896-9233

Appendix F

File Code: 1950/2600 Date: December 1, 2006

Route To:

Subject: Aquatics Biota Information Supplemental Report to the Watershed Report for the Fishlake N.F. OHV Route Designation Project Environmental Impact Statement

To: Dale Deiter, Project Lead - OHV Route Designation Project

This report summarizes my review of the potential aquatic biota consequences for the Final Environmental Impact Statement of the Fishlake OHV Route Designation Project. This supplemental report tiers to and incorporates by reference the Watershed Report and its supporting analysis, references, and other documentation in the project file.

If you have questions or need further clarification or discussion of the issues evaluated or rationale provided, please let me know.

Prepared by: \s\ James E. Whelan
Fishlake N.F. Fisheries Biologist

Aquatic Biota Information Supplemental Report to the Watershed Report – OHV Route Designation Project

This report provides supplemental information specific to aquatic biota for the Watershed Report prepared primarily by Dale Deiter, Forest Hydrologist, dated August 16, 2006. It tiers to the watershed report and provides information on aquatic species of interest on the forest that may be affected by the project and their current status. It also discusses what the effects to aquatic biota would be of implementing each alternative; in other words it attempts to look at all the hydrological information in the watershed report and apply it to the aquatic biota to answer, "What does this mean to aquatic biota resources?" for each alternative.

Fishlake N.F. Aquatic Biota

This section summarizes the aquatic biota that occurs on the Fishlake N.F. Aquatic biota on the forest can be broken into four broad categories: sport fish, non-game fish, amphibians, and aquatic macroinvertebrates. Some inventory of aquatic invertebrates has occurred and they are discussed in a separate section below. The smaller and more inconspicuous forms of aquatic biota such as aquatic mollusks and aquatic plants have not generally been studied or are well known across the forest. In the past 10 years there has been only one limited survey of mollusks (both terrestrial and aquatic) on the forest, and almost no aquatic plant work.

Sport Fish

Sport fish on the Fishlake N.F. are generally comprised of cold-water fisheries of resident trout. Resident trout are considered a Management Indicator Species (MIS) in the Fishlake N.F. Forest Plan. The following is a list of common sport fish on the forest:

Native Trout

Bonneville cutthroat trout – The native trout across the portion of the forest, comprising a majority of the forest area, that drains into the Bonneville basin. It is a Forest Service R4 sensitive species and is also considered an emphasis MIS. See Rodriguez (2006) for additional information on life history and forest trend of this species.

Colorado River cutthroat trout – The native trout across the portion of the forest, comprising a minority of the forest area, that drains into the Colorado River basin. It is also is a Forest Service R4 sensitive species. See Rodriguez (2006) for additional information on life history and forest trend of this species.

Bonneville cutthroat trout have been monitored on about a 7-year schedule. They were last monitored in 2002 and the results were summarized in a UDWR publication (Hepworth et al. 2003). Colorado River cutthroat trout have been monitored from 1999-2006 in UM Creek under a UDWR study. Colorado River cutthroat trout in Sand Creek have been periodically checked since they were reintroduced.

Non-native Trout

Rainbow trout – The most common trout on the forest, stocked in the majority of the lakes and occurring wild in many of the streams due to historic stocking. Stocking of rainbow trout in streams was generally phased out in 1999, but has resumed in limited numbers in high use areas such as campgrounds in 2006. The original range of this fish species is the western coast of the North America. See Rodriguez (2006) for additional information on life history and forest trend of this species.

Lake trout – Non-native introduced from northern U.S. Occurs only in Fish Lake where it is an important trophy fishery. See Rodriguez (2006) and Chamberlain and Hepworth (2003) for additional information on life history and forest trend of this species.

Brown trout – Non-native introduced from Europe. Occurs wild in many lower elevation streams. Able to tolerate higher water temperatures and poorer water quality than most trout, and is also most resistant to whirling disease. See Rodriguez (2006) for additional information on life history and forest trend of this species.

Brook trout – Non-native introduced from the eastern United States. Occurs wild in some upper elevation streams and stocked in some small lakes with no natural reproduction. This species has a tendency to over-reproduce and stunt in many waters, but can grow to trophy fisheries in areas where reproduction is limited or absent and numbers are controlled through appropriate stocking. See Rodriguez (2006) for additional information on life history and forest trend of this species.

> Resident trout numbers in popular fishing lakes and reservoirs are periodically monitored by the UDWR by gill netting. Stream monitoring has been more limited but has taken place in popular waters such as the Beaver River. Smaller streams were last intensively monitored in the 1970s, but under a cooperative workplan program with the UDWR the forest has been monitoring many of the small streams since 2000. Since this has been a multi-year effort to cover the forest, in most streams only one year's data has been collected to establish a current baseline. Repeat samples will likely be taken in future years to document trend, however. Professional experience of UDWR biologists has provided some indications of trends across forest streams in areas lacking more quantified data.

Sterile Hybrid Trout

Splake – This in a sterile hybrid created by crossing brook trout and lake trout. It is sometimes characterized as a "catchable lake trout". They are stocked into Fish Lake and Forsyth Reservoir on the forest for sport fishing.

Tiger trout – This is a sterile hybrid created by crossing brown trout and brook trout. They are planted in several reservoirs on the forest including Forsyth Reservoir and Barney Lake, and in some streams under special circumstances. They are a popular fish with anglers.

> Since these fish are sterile, numbers are set by stocking rates and angler harvest and reproduction is not an issue. UDWR periodically monitors if levels of stocking and harvest are appropriate through creel surveys.

Other Game Fish

Yellow perch – Yellow perch were illegally introduced into Fish Lake in the 1970s, and have been responsible for a decline in the lake trout fishery. A popular fish in the mid-west, they often stunt to such small size in western waters due to a lack of predators that anglers are not interested in fishing for them.

Tiger muskie – A sterile cross between northern pike and muskie that have been stocked into Johnson Reservoir in an attempt to control yellow perch and non-game fish and restore a sport fishery to this reservoir.

There is UDWR data on yellow-perch trends in Fish Lake from UDWR forage fish gill netting studies. Some boat electroshocking has been done by the UDWR to see if tiger muskies are surviving in Johnson Reservoir. Limited numbers have been seen.

Non-game Fish

Common native non-game fish
Mountain sucker – Occurs in some lower elevation forest streams. A relatively small sucker adapted for stream life.

Speckled dace – Occurs in some lower elevation forest streams.

Mottled sculpin – Occurs in some forest streams, including UM Creek and the Fremont River.

Leatherside – Occurs in only a couple of forest streams; Salina Creek and lower Lost Creek. They are considered a state sensitive species.

These non-game fish are often not seen by anglers. Mountain suckers and mottled sculpin are adapted to live near the stream bottom making observation and capture by electroshocking more difficult. There is not currently any data on non-game fish trend. Standard trout sampling techniques may not catch a fully representative sample, but the 2000 Salina Creek surveys did note their relative abundance, and as a few stations are being resampled numbers of the non-game fish caught during trout sampling are now being taken to serve as a rough index.

Non-native non-game fish
Utah Chub – Occurs in Fish Lake, Johnson Reservoir, and Lake Creek

Carp – in a few forest waters

Golden Shiner – has been introduced into a few forest waters. Middle and lower Kents Lake were treated in 2004 to remove this fish, which was competing with and impacting the trout fishery.

There is limited trend data on these species, although some data is collected in gill netting work of reservoirs. New distributions are noted, and in some cases where feasible, eradication measures are taken.

Other Aquatic Biota

Amphibians
Boreal toad – Occurs in upper elevation streams, wetlands, and adjacent uplands on Monroe Mountain and Thousand Lake Mountain. They are considered a state sensitive species.

Chorus frogs- Occurs in upper elevation ponds and small lakes in the upper Fishlake Plateau and Monroe Mountain.

Leopard frog – Occurs in mid-elevation zones. Most common on the forest in the upper Clear Creek drainage.

Tiger salamander – Fairly widespread across the forest.

Western toad – Common lower elevation toad.

Spadefoot toad – Common lower elevation toad.

There is limited trend data on amphibians on the Fishlake N.F. Important or new sightings are documented and given to the UDWR for input into a state database. UDWR has been conducting limited boreal toad surveys in important habitats, which provide a rough index of trend.

Aquatic Macroinvertebrates

Aquatic macroinvertebrates are invertebrates that live in water and can be seen by the unaided human eye. They occur in all streams and lakes on the Forest, but the method selected for monitoring by the forest plan applies to streams. The Fishlake Forest Plan schedule is to monitor aquatic macroinvertebrates in 5 streams per year. In the twenty-one year period from 1986-2006 the Fishlake N.F. has sampled an average of 5.7 streams per year (range from 0 to 17 per year), thus meeting the monitoring requirement (Fishlake N.F. file data). For additional information on aquatic macroinvertebrates, the indices used for monitoring, and considerations for interpretation of the lab results, see the aquatic macroinvertebrate effects write-up at the end of this appendix. For additional life history information and monitoring results see Rodriguez (2006).

Methods

The watershed report prepared summarized the effects of the OHV Route Designation Project using 8 hydrologic measures that cover the broad range of known effects from motorized use on the forest. These measures quantify the cumulative changes for each alternative. For analysis purposes, the effects were broken out by sub-watershed. The appropriate scale selected for the sub-watersheds was based on resources values, current condition, hydrologic considerations, with sub-watersheds being lumped at the HUC 5 level in some cases and split out into the HUC 6 level others, resulting in a total of 71 HUC 5 and HUC 6 sub-watersheds.

For this aquatic biota section of the report aquatic biota resource values were summarized for the forest for each of these sub-watersheds describing game fish, non-game fish, and amphibians. This information is shown in **Table AB-1**. Note that in some cases where both HUC 5 and HUC 6 fields were used in the watershed report for hydrologic measures, the aquatic biota information was described only at the HUC6 level (the smaller more specific subwatersheds that make up the larger HUC 5) so it could be more accurately described. In a few cases additional HUC 6 fields were added to the table to better describe the aquatic biota. In a few cases some HUC 5 or HUC 6 fields with minimal aquatic biota resources were eliminated. This resulted in 48 HUC fields as rows in the following tables, the majority being HUC 6 but with some larger HUC 5 fields (shown in blue) included as well.

Table AB-1: Aquatic Biota General Information

HUC Number	Sport fish	Non-game fish	Amphibians	Comments
140700020101 Ivie Creek (North Creek)	Rainbow trout	-	-	North Creek average fishery. Other streams do not support trout.
140700020103 Quitchupah Creek	-	Speckled dace - immediately below forest	-	-
1407000301 Fremont River (see below)	-	-	-	-

HUC Number	Sport fish	Non-game fish	Amphibians	Comments
140700030101 UM Creek	CR cutthroat trout Tiger trout	Mottled sculpin	Chorus frogs	High value stream fishery
140700030102 Fishlake Basin, Johnson V. Res, Lake Creek	Rainbow trout Splake+ Lake trout Brown trout Tiger muskie+	Mottled sculpin Numerous non-native	-	Highest value fishery on forest Trophy lake trout fishery Up to 150,000 angler days/yr.
140700030103 Seven Mile Creek	Brook trout CR cutthroat trout* (Tasha Creek)	-	Chorus frogs	High value stream fishery.
140700030105 Fremont River	Brown trout	Mottled sculpin	-	High value stream fishery High value reservoir fishery
140700030304 Sand Creek	CR cutthroat trout	-	-	Limited trout supporting habitat.
160300010603 Birch Creek E	B cutthroat trout	-	-	Marginal fishery.
160300020102 Upper Otter Creek	Rainbow trout	-	-	Good fishery.
160300020106 Greenwich Creek	-	-	Boreal toad	Minimal fisheries values
160300020107 Box Creek	Rainbow trout Brook trout	-	Boreal toad	Two popular reservoirs.
1603000301 Clear Creek (mainstem)	Brown trout Rainbow trout	Mountain sucker Mottled sculpin Speckled dace	Leopard frog	High value stream fishery
160300030101 Fish Creek	Brown trout Rainbow trout B cutthroat trout*	Mountain sucker	-	High value stream fishery.
160300030102 Shingle Creek	Brown trout Rainbow trout B cutthroat trout*	Mountain sucker	Leopard frog	High value stream fishery.
160300030103 Three Creeks / Pole Creek	Brown trout Rainbow trout B cutthroat trout*	-	Leopard frog	High value stream fishery.
160300030104 Mill Creek	Rainbow trout	-	-	-
160300030105 Sam Stowe Creek	B cutthroat trout	-	-	Important cutthroat stream.
160300030203 Manning Creek	B cutthroat trout	-	Boreal toad Chorus frog	Critical brood stock reservoir High value stream fishery. Two popular reservoirs. Critical amphibian habitat.
160300030204 Ten Mile Creek	B cutthroat trout	-	-	Good steam fishery Import cutthroat stream.
160300030205 Pine Creek (Bullion Canyon)	Rainbow trout Cutthroat trout B cutthroat trout*	-	-	Good stream fishery
160300030303 Monroe Creek	Rainbow trout	-	-	Good stream fishery.
160300030308 Water Creek	Rainbow trout	-	-	Small reservoir fishery.
1603000304 Salina Creek (mainstem)	B cutthroat trout Cutthroat trout Rainbow trout Brown trout	Mountain sucker Speckled dace Mottled sculpin Leatherside	Chorus frogs Tiger salamander	High value stream fisheries. Best non-game fisheries on forest.
160300030401 Yogo / Blackham	Rainbow trout Cutthroat trout	-	-	Good stream fishery
160300030402 Upper Salina Creek	Cutthroat trout Brown trout Rainbow Trout Brook trout -	Mountain sucker Speckled dace Mottled sculpin Leatherside	Tiger salamander	High value stream fishery. Small ponds One reservoir.
160300030403 Niotche Creek	Cutthroat trout	-	-	Good stream fishery

HUC Number	Sport fish	Non-game fish	Amphibians	Comments
160300030404 Water Hollow	Rainbow trout Cutthroat trout Brown trout	Mountain sucker Speckled dace Mottled sculpin Leatherside	-	Stream fishery on main stem of Salina Creek only.
160300030405 Gooseberry Cr.	Rainbow trout Brook trout	-	Chorus frogs Tiger salamander	Good stream fishery. Popular small reservoir fisheries.
1603000305 Lost Creek (mainstem)	Rainbow trout Brown trout Cutthroat trout	Mountain sucker Leatherside chub Speckled dace Mottled sculpin	-	High value fishery
160300030504 Little Lost Creek	Brown trout	Mountain sucker	-	Moderate value stream fishery
160300030505 Upper Lost Creek (ab Little Lost)	Rainbow trout Brown trout Cutthroat trout	-	Tiger salamander	Good stream fishery
160300030602 Willow Creek	Rainbow trout Cutthroat trout B cutthroat trout*	-	-	Moderate value stream fishery
1603000513 Corn Creek (main stem)	Brown trout Rainbow trout	Mountain sucker Mottled sculpin	-	High value stream fishery
160300051301 Second Creek	Brown trout Rainbow trout	Mountain sucker	-	Moderate value stream fishery
160300051302 Upper Corn Creek (above Second Cr.)	Brown trout Rainbow trout	Mountain sucker	-	High value stream fishery
1603000514 Chalk Creek	Rainbow trout Brown trout	-	-	High value stream fishery.
160300051401 North Fork of Chalk Creek	Rainbow trout B cutthroat trout**	-	-	High value fishery near potential condition.
160300051402 Upper S. Fork Chalk Creek (above N.F. CC)	Rainbow trout Brown trout	-	-	Popular recreational stream fishery
160300070101 Indian Creek	Rainbow trout	-	-	Good stream fishery. Popular fishing reservoir.
1603000702 Beaver River	Rainbow trout Brown trout.	Red-sided shiner	Leopard frog	High value and popular recreational stream and small reservoir fisheries.
160300070201 Merchant Creek above Three Creeks	Rainbow trout Brown trout	-	-	Popular recreational fishery
160300070202 Three Creeks above Merchant	Rainbow trout Brown trout	-	-	Popular recreational fishery
160300070203 South Fork of North Creek	Rainbow trout B cutthroat trout*	-	-	High value fishery near potential condition.
160300070205 South Creek	Rainbow trout	-	-	Moderate value fishery.
160300070206 Birch Creek W	B cutthroat trout	-	-	Important cutthroat stream.
160300070208 North Fork of North Creek	B cutthroat trout	Mottled sculpin	-	Important cutthroat stream.
160300070501 Pine Creek (Tusher Mts)	Bonneville cutthroat trout.	-	-	Important cutthroat stream.

Note: cutthroat trout = non-native cutthroat trout, typically Yellowstone cutthroat trout
B cutthroat trout = Bonneville cutthroat trout
CR cutthroat trout = Colorado River cutthroat trout
* = Proposed for reintroduction
** = Potential for remnant population

Next the information regarding the aquatic Management Indicator Species (MIS) of resident trout and aquatic macroinvertebrates was summarized in **Table AB-2**. Management activities that are affecting aquatic habitat are included in the table, as well as a description of limiting factors and a description of the current stream condition. The limiting factors and current condition summary are an assessment made through professional opinion of the forest Fisheries Biologist based on field reviews, fisheries survey data, and the Integrated Riparian Evaluation (IRE) Level II field surveys. The forest has not undertaken a formal process to determine limiting factors on its streams.

Table AB-2: Aquatic Biota Population Levels and Habitat Condition

HUC Number	Macro-invert.	Sport fish		Current habitat impacts	Limiting Factors	Current Condition Summary
140700020101 Ivie Creek (North Creek)	ND	Rainbow trout	Visual inspection	Grazing, prescribed fire	Sedimentation, flow, temperature	Some sedimentation noted during visual inspection.
140700020103 Quitchupah Creek	ND (forest collected)	-	Spot shock 2003	Road, Mine	Pools, flow (sediment storage), passage	Historic downcutting event may have eliminated fish habitat/passage onto National Forest
1407000301 Fremont River (see below)	-	-	-	-	-	-
140700030101 UM Creek	Mostly below S&G. Downward trend at WF	CR cutthroat trout Tiger trout	Electroshock 1999-2006 IRE 2002	Grazing, heavy recreational use, OHV	Sedimentation, temperature, whirling disease	Habitat condition is improving since 2002, esp. in exclosures, but is still below potential. Meadows have lost woody shrubs. Stream is excessively wide in places and stream bottom is excessively silty.
140700030102 Fishlake Basin, Johnson V. Res, Lake Creek	Below S&G. No trend data	Lake trout – stable trend (size issues) Rainbow trout Splake Tiger Muskie	UDWR Gill net studies, ongoing in lakes Electroshock Lake Cr. 2002, 2006 IRE Lake Creek 2004	Heavy recreational use, grazing	Water quality in lakes, water quality, channel morphology, and flow regime in Lake Creek	Decreased fisheries value in Fish Lake due to non-native fish/aquatic plants/water quality but still a high value fishery. Trout fishery in Johnson Res. collapsed due to non-native non-game fish and water quality. Lake Creek only supports trout in limited reaches.
140700030103 Seven Mile Creek (inc. Tasha Cr.)	Mostly above S&G. Down-ward trend	Brook trout	Electroshock 2002, 2006 IRE 2002	Grazing, heavy recreational use	High value stream fishery.	Habitat conditions have improved over last 12 years due to grazing exclosures and pasture fencing. Some impacts from upland tributaries.
140700030105 Fremont River	Near S&G. No trend data	Brown trout	Electroshock 2003 IRE 2004	Grazing, water management, recreation	Sedimentation	Water management and grazing effects to channel profile, but still a productive fishery
140700030304 Sand Creek	ND	CR cutthroat trout	Spot shock 1999, 2004 IRE 2006	Water management Road/route (lower)	Temperature, flashy watershed, sediment (sand), flow	Upper stream in pretty good condition. Lower affected by flooding and water management.

HUC Number	Macro-invert.	Sport fish	Surveys	Current habitat impacts	Limiting Factors	Current Condition Summary
160300010603 Birch Creek E	At or near S&G. Downward trend.	B cutthroat trout	Spot shock 2003, 2004, 2006 IRE 2004	Grazing, wildfire, OHV	Limited flow, pool volume	Wildfire impacts to marginal habitat with grazing effects extripated wild brook trout population in 1996. Habitat improved after 5 years rest but current impacts and marginal habitat limit fisheries.
160300020102 Upper Otter Creek	ND	Rainbow trout	Visual inspection	-	-	Appears to be in generally good condition.
160300020106 Greenwich Creek	ND	-	Visual inspection IRE 2006	Grazing, recreation, OHV	Low flow	Over grazing and beaver are having effect to aspen which may have long-term negative effects to aquatic habitat
160300020107 Box Creek	Upper above, lower below S&G. Static trend	Rainbow trout Brook trout	Electroshock upper 2000, 2001, 2002, 2006 IRE 2006 No reservoir data	Grazing (livestock and wildlife), wildfire, recreation, OHV	Low flows upper, water quality in reservoirs	Upper habitat above reservoirs ranges from good to fair/poor. Believed to be minimal impacts below reservoirs.
1603000301 Clear Creek (mainstem)	Below S&G. No trend data	Brown trout Brook trout	Electroshock 2000, 2003, 2006 IRE 2005	Freeway and highway, Recreation, Some grazing	Temperature, Water quality	Stream in relatively good condition but altered channel and water quality due to road/freeway.
160300030101 Fish Creek	Below S&G. No trend data	Brown trout Rainbow trout B cutthroat trout*	Electroshock 2003, 2006 IRE 2005	OHV, grazing, past flooding damage (1983), historic mining	Sedimentation (upper), Temperature (lower), channel morphology/ few pools (from mill to I-70)	Upper stream is in relatively good condition but is impacted by user created OHV route along stream. Area from mill to I-70 affected by grazing, OHV trail, which has limited recovery from 1983 flooding.
160300030102 Shingle Creek	Below S&G. No trend data	Brown trout Rainbow trout B cutthroat trout*	Electroshock 2002, 2003, 2004 IRE 2005	Grazing (lower), Prescribed fire, recreation, OHV	Sedimentation, temperature, channel/pool (lower)	Upper stream is in relatively good condition. Lower stream affected by grazing and recreational use. Fish distribution appears to be limited by temperature at lower end.
160300030103 Three Creeks / Pole Creek	Slightly below S&G. No trend data	Rainbow trout - good numbers and biomass B cutthroat trout headwaters*	Electroshock 2003 IRE 2005 Genetic samples 2001, 2006	Grazing, OHV use pioneered along stream in 1 mile 2006	Flow, sedimentation	Generally in good condition
160300030104 Mill Creek	ND	Rainbow trout	Electroshock 2003 IRE 2005	Heavy recreational use Grazing Recreational dredging	Sedimentation	Banks in poor condition along road

HUC Number	Macro-invert.	Sport fish	Surveys	Current habitat impacts	Limiting Factors	Current Condition Summary
160300030105 Sam Stowe Creek	Below S&G. Downward trend	B cutthroat trout	Electroshock 2002 IRE 2005	-	Low flow, sedimentation, pool volume	Naturally limited flow, recovering from past impacts
160300030203 Manning Creek	Mostly above S&G. Static trend.	B cutthroat trout – upward trend following reintroduction	Electroshock 2001 IRE 2004	Grazing, high recreational use, OHV	Water quality (reservoirs)	Most of drainage is in good condition. Impacts mainly occurring in upper headwaters around and between reservoirs and on some tributaries
160300030204 Ten Mile Creek	Above S&G. No trend data	B cutthroat trout	Electroshock 2004 IRE 2003	Grazing, OHV	Low flow, pool volume, sedimentation	Stream heavily impacted in past. Much of stream downcut. Succession has also increased conifer shading affecting riparian vegetation.
160300030205 Pine Creek (Bullion Canyon)	ND	Rainbow trout Cutthroat trout	Visual inspection, Electroshock 2005 by UDWR (1 station-upper) IRE 2006	High recreational use (lower), road	Flashy watershed	Upper watershed is in good condition. Some impacts to lower watershed from road. Flashy watershed subject to flooding damage.
160300030303 Monroe Creek	ND	Rainbow trout	Electroshock 2000	Water diversion, road	Water flow (below diversion), channel changes from confinement to road	Trout habitat lost below diversion. Above the upper hydropower diversion stream provides fair habitat but average fish size is small.
160300030308 Water Creek	NA	Rainbow trout	-	Water management	Water fluctuation	Fisheries values in Big Lake primarily affected by water management, winterkill
1603000304 Salina Creek (lower mainstem)	See below for HUC 6	Trout – avg. numbers biomass, unk. trend	Chorus frogs Tiger salamander	Grazing, Roads inc. freeway, Noxious weeds	Water quality, Temperature	High value stream fisheries. Popular small reservoirs. Best non-game stream fisheries on forest (4 species). Freeway impacts channel morphology, fish passage, and water quality, however.
160300030401 Yogo / Blackham	ND	Rainbow trout Cutthroat trout	Spot socking 2000	Grazing	-	-
160300030402 Upper Salina	Slight below S&G. Static trend.	Cutthroat trout Brown trout Rainbow Trout Brook trout -	Electroshock 2000, 2003, 2004 IRE 2003 Genetic Samples 2001, 2004, 2005	Grazing, recreation (lower), road (lower), erosive soils	Water quality, sedimentation, Pools	Upper watershed in relatively good condition. Heavy recreation use affects riparian and stream banks along road. Some grazing impacts. Some road impacts. Some private land in poor condition.
160300030403 Niotche Creek	Above S&G. No trend data	Cutthroat trout	Electroshock 2000 IRE 2003	Grazing, recreation, OHV, erosive soils lower stream	Sedimentation lower	Upper watershed in relatively good condition

HUC Number	Macro-invert.	Sport fish	Surveys	Current habitat impacts	Limiting Factors	Current Condition Summary
160300030404 Water Hollow (mainstem Salina Cr.)	ND	Rainbow trout Cutthroat trout Brown trout	Electroshock 2000, 2004 IRE 2003	Roads (freeway) including coal residues and other vehicle/roadway pollutants, grazing, erosive soils	Water quality, sedimentation, temperature	Poor water quality during floods and spring runoff from erosive soils and cumulative watershed effects. Culverts along freeway affect fish movement.
160300030405 Gooseberry Cr.	Mostly above S&G. Static trend	Good numbers in 2000. Decreased 50% by 2005 due to sedimentation.	Electroshock 2000, 2005, 2006 IRE 2003	Grazing, roads (inc. road improvement construction), recreational use	Sedimentation	Encroaching road affects stream in areas. Road improvements increased sedimentation during construction. Grazing impacts upper watershed. Dam and spillway maintenance flushing sediment into stream.
1603000305 Lost Creek	ND	Rainbow trout Brown trout Cutthroat trout	IRE 2006	-	-	-
160300030504 Little Lost Creek	ND	Brown trout. Native non-game fish.	Electroshock 2000 IRE 2006	Grazing, road	Low flow, sedimentation, pool volume	Impacts from road and grazing.
160300030505 Upper Lost Creek (ab Little Lost)	ND	Rainbow trout Brown trout Cutthroat trout	Spot shocking 2004 IRE 2006 Genetic sample 2003	Grazing	Sedimentation	Upper watershed in relatively good condition
160300030602 Willow Creek	Below S&G. Downward trend.	Rainbow trout Cutthroat trout B cutthroat trout*	Electroshock 2000, 2003 Genetic sample 2003	Grazing, recreational use, road, erosive soils	Sedimentation, erosive soils, pool volume	Upper watershed in relatively good condition. Some impacts from erosive soils. Impacts from road, grazing, and recreation where stream is along road. Sedimentation limits trout population.
1603000513 Corn Creek	Below S&G. Downward trend	Brown trout Rainbow trout Trout biomass trend up since 1996	Electroshock 2000 IRE 2002	Roads, wildfire, recreational use, grazing	Sedimentation, flooding	Relatively good condition habitat. Recovering from massive damage from 1983 floods and 1996 wildfire. Potential for trophy trout.
160300051301 Second Creek	ND	Brown trout Rainbow trout	Spot shocking 2000 IRE 2002	Roads, grazing, recreational use	Sedimentation	Accessible portions have impacts from road and grazing. Other portions are down cut
160300051302 Upper Corn Creek (above Second Cr.)	ND	Brown trout Rainbow trout	Electroshock 2000 IRE 2002	Grazing	-	Generally minimal stream impacts
1603000514 Chalk Creek	ND	Rainbow trout Brown trout	-	Recreational use including encroaching road and motorized trails, OHV	Sedimentation, calcification of stream bottom	-
160300051401 North Fork of Chalk Creek	ND	Rainbow trout B cutthroat trout**	IRE 2004	Small wildfire 2006	-	Stream is near potential condition.

HUC Number	Macro-invert.	Sport fish	Surveys	Current habitat impacts	Limiting Factors	Current Condition Summary
160300051402 Upper S. Fork Chalk Creek (above N.F. CC)	Mixed results No trend data	Rainbow trout Brown trout	Electroshock 2001, 2006 IRE 2004	Recreation, road, OHV route with several stream crossings.	Sedimentation, calcification of stream bottom	Stream in relatively good condition. Damaged in 1983 floods, fish structures installed after flooding.
160300070101 Indian Creek	Above S&G. No trend data	No data	Visual inspection IRE 2003	Encroaching road, grazing, 1993 dam breach, flooding, old mines. Whirling disease recently introduced into reservoir.	-	Good stream fishery. Popular reservoir fishery.
1603000702 Beaver River	ND	Trout – stable total population size, but increased dominance of brown trout and reduced dominance of rainbow trout	Electroshock 2002 IRE 2002	Highway, whirling disease	Hydropower water management, encroaching road, recreation, OHV, whirling disease	High value and popular recreational stream and small reservoir fisheries. Whirling disease did not appear to change total fishery numbers and biomass but possibly species levels from 1990s to 2002.
160300070201 Merchant Creek above Three Creeks	Above S&G. Static trend.	Rainbow trout Brown trout	IRE 2002	Road, recreation, OHV	Road, recreation, OHV	Stream in relatively good condition.
160300070202 Three Creeks above Merchant	Above S&G. Static trend.	Rainbow trout Brown trout	IRE 2002	Road, recreation, OHV	Recreation, grazing, OHV	Stream in relatively good condition.
160300070203 South Fork of North Creek	ND	Unknown numbers and trend but appears to be good fishery	IRE 2002	Dam/water management	-	Stream is near potential condition.
160300070205 South Creek	ND		IRE 2002	Grazing, road, recreation, OHV	Sedimentation, Pool volume	Stream has indications of habitat problems
160300070206 Birch Creek W	Below S&G. Downward trend	B cutthroat trout- trend down to very low numbers	Electroshock 2001 IRE 2002	Grazing	Low flow, pool volume, sedimentation, temperature (lower)	Marginal stream had impacts limiting fish supporting potential. Improved management in 2002, 2003 improved habitat conditions.
160300070208 North Fork of North Creek	Below S&G. No trend data	B cutthroat trout – trend up after reintroduction.	Electroshock 2001 IRE 2002	Road, grazing, recreation, OHV	Pool volumes, sedimentation	Stream has excessive riffles from past watershed impacts. Current impacts from road, grazing, and OHVs. Additional flood impacts in May 2005
160300070501 Pine Creek (Tusher Mts)	Below S&G.	Bonneville cutthroat trout – trend static at low numbers 1995-2001, slightly up by 2005 after grazing rest for prescribed fire.	Electroshock 2001, 2005 IRE 2002	Grazing, road along creek with numerous stream crossings, recreation, prescribed fire	Pool volume, sedimentation	Increased sedimentation and bank damage has limited cover and pools.

Next the hydrological measures in the watershed report were summarized to determine the overall effect to the watershed and hydrology, which would act to affect stream habitat for aquatic biota. Each of these

8 hydrologic measures in the watershed report had specific values for each of the 5 alternatives, which was developed for 71 sub-watersheds. This resulted in a summary table with 2840 values, which was cumbersome for determining effects to fisheries and other aquatic biota. Each hydrologic indicator provides a different measure of potential impacts. To simplify and integrate the measures a relative ranking of the alternative's effects to fisheries and other aquatic biota was created. The specific measure value is replaced by a normalized value. The values in Table AB-3 are an average mean score of the normalized watershed, stream, riparian, and wetland issue indicators. The score was developed for each HUC by taking the lowest value for a given indicator. To normalize the score for that indicator, the alternative with the lowest value is assigned a score of 1.0. The score for the other alternatives is then determined by dividing their index value by the lowest value for the given indicator and HUC. For example, if the lowest riparian route mileage is 3 miles under Alternative 4 in a given watershed, then the score for Alternative 2 with 4 miles would be 4/3 = 1.33. This normalized ratio indicates in that example that Alternative 2 has 33 percent more riparian routes than Alternative 4, which has the fewest miles for the given HUC. Thus the data in Table AB-3 present a summary of the mean score for each of the 48 HUCs used in the aquatic biota report of the 8 watershed, stream, riparian and wetland scale issue indicators.

Table AB-3: Normalized Hydrological measures by alternative

HUC Number	Hydrological Alternative Ranking (comments)				
	Alt 1	Alt 2	Alt 3	Alt 4	Alt 5
140700020101 Ivie Creek	5.1	1.6	1.2	1	1.3
140700020103 Quitchupah Creek	4.3	1.6	1.2	1	1.2
1407000301 Fremont River	5.5	1.5	1.2	1	1.4
140700030101 UM Creek	7.7	2	1.6	1	1.7
140700030102 Fishlake Basin, Johnson V. Res, Lake Creek	12.9	1.4	1.1	1	1.1
140700030103 Seven Mile Creek	3	1.4	1	1	1.1
140700030105 Fremont River	NC	NC	NC	NC	NC
140700030304 Sand Creek	2.7	1.4	1.3	1	1.5
160300010603 Birch Creek E	2.5	1.3	1.1	1	1.2
160300020102 Upper Otter Creek	6.1	1.5	2.3	1	2.3
160300020106 Greenwich Creek	3.6	1.7	1.2	1	1.2
160300020107 Box Creek	5.1	2.6	2	1	2
1603000301 Clear Creek	4.9	1.5	1.1	1	1.1
160300030101 Fish Creek	5.6	1.7	1.1	1	1.1
160300030102 Shingle Creek	4.2	1.5	1.2	1	1
160300030103 Three Creeks / Pole Creek	6.1	1.7	1.3	1	1.2
160300030104 Mill Creek	4	1.3	1	1	1.1
160300030105 Sam Stowe Creek	3.9	1.6	1.2	1	1.2

HUC Number	Hydrological Alternative Ranking (comments)				
	Alt 1	Alt 2	Alt 3	Alt 4	Alt 5
160300030203 Manning Creek	8	1.9	1.4	1	1.4
160300030204 Ten Mile Creek	19.6	1.4	1	1	1
160300030205 Pine Creek (Bullion Canyon)	4.1	1.4	1.1	1	1
160300030303 Monroe Creek	5.2	1.5	1.1	1	1.2
160300030308 Water Creek	3.7	2.4	2	1	2
1603000304 Salina Creek	3.3	1.8	1.3	1	1.4
160300030401 Yogo/Blackham Crs	NC	NC	NC	NC	NC
160300030402 Upper Salina Creek	NC	NC	NC	NC	NC
160300030403 Niotche Creek	NC	NC	NC	NC	NC
16030030404 Water Hollow	NC	NC	NC	NC	NC
160300030405 Gooseberry Creek	NC	NC	NC	NC	NC
1603000305 Lost Creek	4.4	1.7	1.3	1	1.4
160300030504 Little Lost Creek	4.3	1.6	1.3	1	1.3
160300030505 Upper Lost Creek (ab Little Lost)	3.5	1.5	1.2	1	1.5
160300030602 Willow Creek	1.9	1.9	1.5	1	1.6
1603000513 Corn Creek	3.1	2.1	1.7	1	1.7
160300051301 Second Creek	2.3	1.8	1.4	1	1.4
160300051302 Upper Corn Creek (above Second Cr.)	2.4	2.2	1.7	1	1.8
1603000514 Chalk Creek	7	1.7	1.4	1	1.3
160300051401 North Fork of Chalk Creek	23	3.6	2.8	1	2
160300051402 Upper S. Fork Chalk Creek (above N.F. CC)	5.5	1.6	1.3	1	1.3
160300070101 Indian Creek	4.9	1.3	1	1	1
1603000702 Beaver River	3.9	1.4	1.1	1	1.1
160300070201 Merchant Creek above Three Creeks	2	1.4	1	1	1.1
160300070202 Three Creeks above Merchant	3.4	1.4	1.1	1	1.1
160300070203 South Fork of North Creek	5.4	1.6	1.1	1	1.1
160300070205 South Creek	13.3	2.7	2	1	2.1
160300070206 Birch Creek W	3.3	4.6	3.5	1	3.5

HUC Number	Hydrological Alternative Ranking (comments)				
	Alt 1	Alt 2	Alt 3	Alt 4	Alt 5
160300070208 North Fork of North Creek	4.6	1.5	1	1	1
160300070501Pine Creek (Tusher Mts)	16.5	1.6	1.2	1	2.2
Mean Value Summary by Alt. of Table AB-3	5.85	1.78	1.40	1.00	1.43

NC: Indicator data for these six HUC6 sub-watersheds were not calculated. These sub-watersheds were broken out in the aquatic biota report to more specifically describe spatial differences in fisheries resources or describe specific motorized routes in terms of their spatial location in relationship to streams and lakes in the watershed. This helps discuss more specifically the potential for effects to aquatic biota. The HUC5 mean value summarizes the indicators for these subwatersheds.

The mean value was then calculated for the 48 HUCs used in the aquatic biota report, which is shown in the summary row on the bottom of Table AB-3. This summary row clearly shows that Alternative 4, with a value of 1.0, had the lowest overall levels of the quantitative indicator measures that were calculated, such as acres open to cross-country travel, miles of enchroaching road, and number of stream crossings. This would make it the most favorable in terms of the least hydrological/watershed impacts but as noted in the watershed report, there are factors such as implementation issues and lost social and economic values (for example, Alternative 4 would eliminate access to 31% of the currently inventoried dispersed camping sites) which would make this alternative less favorable from a decision maker's perspective when considering all resource values and tradeoffs. Alternatives 3 and 5 were very close in the summary ranking, with Alternative 3 just slightly (by 3%) edging out Alternative 5. One could consider that both of these alternatives have on average about 40% overall more potential for impacts based on the measures quantified by the indicators. Alternative 2 was less favorable than any of the other action alternatives. One reason for its higher summary value (almost 80% higher than Alternative 4 and 40% higher than Alternatives 3 and 5) is that Alternative 2 had a larger area potentially open to travel to access existing dispersed camp sites (300 feet vs. 150 feet for the other action alternatives). As described in the watershed report, this is really an overestimate of the level of impacts that would occur, since use must occur on an existing route to an existing dispersed camp site, but it does illustrate that more impacts could occur under Alternative 2. Over time this potential difference between Alternative 2 and the other action alternatives would narrow, as plans are that this designated distance for travel to dispersed camps will be phased out as routes to dispersed camp sites are actually designated or closed over the next five years. Finally, Alternative 1 - the No Action – existing situation- alternative - ranked highest in its summary value showing it has the highest level of watershed/hydrological type impacts. Alternative 1's overall level of indicators was nearly 600% higher than the lowest ranked Alternative 4. This is due to the damaging user-created routes that are encroaching on streams that are not removed by the action alternatives, as well as the large amount of each subwatershed that currently are and would remain open to cross-country travel if the No Action alternative was chosen. This shows that Alternative 1 has both the highest level of impacts based on the current situation, but would allow even greater potential impacts in the future if OHV use and cross-country travel increased.

Next, effects to aquatic biota (primarily considering fisheries values) were derived. At the HUC 6 sub-watershed scale most of the drainages carry enough flow to support aquatic life in the main stem and perhaps a few simple branch tributaries. While several of the hydrologic variables in the watershed report measure cumulative changes to riparian areas (e.g. miles of encroaching road), others are measures that occur across the entire watershed (route density and open acres). Impacts closest to the stream channel or lake will have the most effects to the aquatic biota. Field experience has allowed observation of which routes are having effects to streams and lakes from motorized recreation and which streams or lakes have

remained relatively unaffected. For this measure (Table AB-4) fisheries survey results, IRE Level II survey and the field experience and professional opinion of the forest fisheries biologist were utilized while looking at maps of specific routes, especially those near aquatic habitat by sub-watershed for each alternative. This step primarily considered current routes, user patterns, and the proposed travel route for each alternative, and was primarily qualitative with greater emphasis on the spatial location of impacts and routes with greater concern/weighting for routes and impacts close to streams and lakes. It did not take into major consideration the differing distances that an OHV could travel on existing non-designated routes to access existing dispersed camp sites (300 feet for Alternative 2 vs. 150 feet in Alternatives 3, 4, and 5). It was felt that Table AB-3, which summarized the quantitative indicators and was strongly influenced by the area open to cross-country travel indicator, already sufficiently captured this difference. Current concerns that have become evident were also documented for each sub-watershed. The forest fisheries biologist has visited the majority of these HUC 6 sub-watersheds during the last 6 field seasons, and many have been re-visited several times. This has aided observation of biological trends and visual observations in changes in OHV use levels. This information is included in **Table AB-4**.

Table AB-4: Fisheries/Aquatic Macroinvertebrate Effects Ranking by Alternative

HUC Number	Current OHV Concerns	Fisheries Alternative Ranking (rationale)				
		Alt 1	Alt 2	Alt 3	Alt 4	Alt 5
140700020101 Ivie Creek	Some impacts from motorized routes- mostly roads	Continued use on existing roads. Potential for increased impacts.	Some improvement due to obliteration of routes and seasonal closures.	Some improvement due to obliteration of routes but less than Alt. 2 as no seasonal closures.	Minor improvement over Alt. 2 due to additional obliteration but most in upper watershed.	Same as Alt. 2.
140700020103 Quitchupah Creek	Existing 2-track road causing some impacts. Cumulative impacts in watershed.	Continued use on existing road along creek. Potential for increased impacts.	No change in use on existing road along creek.	Same as Alt. 2.	Similar to Alt. 2 but minor improvement due to some obliteration in upper watershed.	Same as Alt. 2.
1407000301 Fremont River (see below)	-	-	-	-	-	-
140700030101 UM Creek	Increasing sedimentation to stream from heavy dispersed recreation use including OHV use in riparian areas and wetland meadows and OHV use on foot and horse trails along stream. Potential for contamination of upper Right Fork with whirling disease.	Motorized use levels are increasing. OHV use is creating additional routes and OHV use is increasing on former foot and horse trails. Increased impacts and continued decline in habitat conditions expected.	Improved conditions due to elimination of OHV use on foot and horse trails along stream and preventing the creation of new routes. Some obliteration of routes in lower watershed.	Slightly less improvement compared to Alt. 2 due to less obliteration in lower watershed. Areas of most concern are addressed by this alternative, however.	Most improvement due to the greatest amount of route obliteration. Elimination of the Left Fork route reduces disease transmission risk.	Similar to Alt. 3. Slightly less improvement compared to Alt. 2 due to less obliteration in lower watershed. Areas of most concern are addressed by this alternative, however. Left Fork route still open.
140700030102 Fishlake Basin, Johnson V. Res, Lake Creek	Minimal concerns at present due to OHV closure in Fishlake Basin	Same as current condition, as basin already generally closed to motorized recreation.	Same as Alt. 1	Some changes in use. OHV use increased due to opened route access to south end of basin (street legal already allowed) but change to day use and fencing may offset increase OHV use.	Same as Alt. 3	Same as Alt. 3

HUC Number	Current OHV Concerns	Fisheries Alternative Ranking (rationale)				
		Alt 1	Alt 2	Alt 3	Alt 4	Alt 5
140700030103 Seven Mile Creek	A minimal concern at present but use is increasing.	Potential for increased impacts.	Slightly less than current condition due to opening of 7 mile road to OHVs, likely offset by closure to cross country travel.	Same as Alt. 2	Same as Alt. 2	Same as Alt. 2
140700030105 Fremont River	Minimal concerns at present along main stream, more use headwaters.	Potential for increased impacts.	Slight improvement from route obliteration.	Same as Alt. 2	Same as Alt. 2	Same as Alt. 2
140700030304 Sand Creek	OHV route parallels stream. Some impacts to lower potential habitat but most impacts from routes (and hydro diversions) are below potential trout habitat.	Increased impacts.	Closure to cross-country travel and barriers should maintain habitat conditions.	Same as Alt. 2	Closure of route below the confluence with Hells Hole may improve lower potential habitat slightly.	Same as Alt. 2
160300010603 Birch Creek E	OHV use in upper watershed has increased sedimentation and captured stream, reducing potential habitat.	Increased impacts.	Improved conditions due to route closure above campground.	Same as Alt. 2	Same as Alt. 2	Same as Alt. 2
160300020102 Upper Otter Creek	Some OHV trail use.	Potential for increased impacts.	Upper watershed closure to cross-country travel and barriers should maintain habitat conditions; slight improvement in lower watershed.	Slightly less improvement in lower watershed than Alt. 2	Same as Alt. 2	Same as Alt. 3
160300020106 Greenwich Creek	Fairly heavy route density in headwaters, many are system roads. Several stream crossings.	Increased impacts.	Closure to cross-country travel and barriers should maintain habitat conditions.	Slight improvement due to minor amounts of route obliteration in upper watershed.	Same as Alt. 3	Same as Alt. 3
160300020107 Box Creek	Fairly heavy route density in headwaters. Several stream crossings.	Increased impacts.	Slight improvement due to minor amounts of route obliteration.	Slightly more improvement than Alt. 2 due to additional route obliteration in upper watershed.	Slightly more improvement than Alt. 3 due to route obliteration in lower watershed.	Same as Alt. 3
1603000301 Clear Creek (main stem)	Some concerns with OHVs using non-motorized trails and creating new routes.	Potential for increased impacts.	Slight improvement due to restrictions in upper watershed to street legal only vehicles.	Same at Alt. 2	Same as Alt. 2	Same as Alt. 2
160300030101 Fish Creek	Formerly un-roaded drainage has user created OHV route along majority of the stream with numerous stream crossings.	Increased impacts.	Improvement due to OHV use limited to about 3 miles of stream from Old Mill to access point S of I-70.	Greater improvement due to elimination of OHV use along all of stream. One stream crossing remains. Majority of Fish Creek will be able to reach its potential.	Same as Alt. 3	Same as Alt. 3

HUC Number	Current OHV Concerns	Fisheries Alternative Ranking (rationale)				
		Alt 1	Alt 2	Alt 3	Alt 4	Alt 5
160300030102 Shingle Creek	Most of drainage does not have a motorized route near stream. Access at lower and one upper site.	Increased impacts.	Slight improvement due to Street Legal only designation in upper watershed.	Same as Alt. 2	Very slight improvement over Alt. 2 due to elimination of one stream crossing.	Same as Alt. 2
160300030103 Three Creeks / Pole Creek	Most of the fish-supporting stream currently receives almost no OHV use, access currently by foot trail. However, OHV use pioneered along 1 mile of Pole Cr. In 06. Some impacts in upper watershed above Three Creeks Reservoir.	Increased impacts.	Closure to cross-country travel and barriers should maintain current conditions.	Same as Alt. 2	Very slight improvement over Alt. 2 due to route obliteration in upper watershed.	Same as Alt. 2
160300030104 Mill Creek	Lower drainage impacted by multiple uses. OHV use is a lesser concern.	Increased impacts.	Closure to cross-country travel and barriers should maintain current conditions.	Same as Alt. 2	Same as Alt. 2	Same as Alt. 2
160300030105 Sam Stowe Creek	Most of the drainage is too vegetated and rugged for OHV use. Some access into headwaters.	Potential for increased impacts in headwaters or after fire.	Closure to cross-country travel and barriers should maintain current conditions.	Same as Alt. 2	Improvement in headwaters due to route obliteration along upper drainage bottom.	Same as Alt. 2
160300030203 Manning Creek	Most of the drainage is too rugged for OHV use, but impacts are increasing in the headwaters, especially around Barney Reservoir.	Increased impacts to lake water quality and critical amphibian habitat.	Closure to cross-country travel and barriers should slightly improve current habitat conditions.	Same as Alt. 2	Improvement in water quality at Barney Reservoir due to route closure past lake.	Same as Alt. 2
160300030204 Ten Mile Creek	OHV use is pioneering along stream bottom and could increase impacts to marginal but important stream.	Increased impacts.	Slight improvement due to closure of route beyond Bumblebee Spring.	Same as Alt. 2	Same as Alt. 2	Same as Alt. 2
160300030205 Pine Creek (Bullion Canyon)	Popular OHV loop but lower section on system road and upper away from creek. Upper watershed has no motorized use.	Potential for increased impacts.	Partial closure of Bullion pasture, closure to cross-country travel and barriers should slightly improve habitat conditions. There may be slight additional improvement in water quality due to slightly greater over snow closure.	Partial closure of Bullion pasture, closure to cross-country travel and barriers should slightly improve current conditions.	Same as Alt. 3	Complete closure of Bullion pasture to motorized use, closure to cross-country travel, barriers should improve habitat conditions. Greater over snow closure should result in slight improvement in water quality.

HUC Number	Current OHV Concerns	Fisheries Alternative Ranking (rationale)				
		Alt 1	Alt 2	Alt 3	Alt 4	Alt 5
160300030303 Monroe Creek	Moderate OHV use.	Potential for increased impacts.	Closure to cross-country travel and barriers should maintain habitat conditions.	Same as Alt. 2	Same as Alt. 2	Same as Alt. 2
160300030308 Water Creek	Moderate OHV use.	Potential for increased impacts.	Closure to cross-country travel and barriers should maintain habitat conditions.	Same as Alt. 2	Slight improvement due to route obliteration reducing watershed sediment to lakes.	Same as Alt. 2
1603000304 Salina CreeK (see below)	-	-	-	-	-	-
160300030401 Yogo Creek	Some route and stream crossings	Potential for increased impacts.	Slight improvement due to seasonal closures.	Closure to cross-country travel and barriers should maintain habitat conditions.	Slight improvement due to route obliteration but most in upper watershed.	Same as Alt. 3
160300030402 Upper Salina Cr.	Some OHV use and concerns in dispersed rec sites but much of upper watershed already closed to OHV use.	Potential for increased impacts.	Slight improvement.	Slight improvement but less obliteration than Alt. 2	Slightly more improvement than Alt. 2 due to minor additional obliteration.	Same as Alt. 3
160300030403 Niotche Creek	Some OHV use in watershed and crossings but current concerns minimal.	Increased impacts.	Closure to cross-country travel and barriers should maintain habitat conditions.	Same as Alt. 2	Same as Alt. 2	Same as Alt. 2
160300030404 Water Hollow Browns Hole	Some OHV use in upper watershed. Erosive soils. Fisheries only in main stem of Salina Creek.	Increased impacts.	Closure to cross-country travel and barriers should maintain habitat conditions.	Same as Alt. 2	Slight improvement due to upper watershed route obliteration.	Same as Alt. 2
160300030405 Gooseberry Cr.	Some OHV use in upper watershed.	Increased impacts.	Slight improvement.	Same as Alt. 2	Slightly more improvement than Alt. 2 due to closure of route past lakes.	Same as Alt. 2
1603000305 Lost Creek	OHV use mostly on existing route.	Potential for increased impacts.	Closure to cross-country travel and barriers should maintain habitat conditions.	Same as Alt. 2	Same as Alt. 2	Same as Alt. 2
160300030504 Little Lost Creek	Road and vehicle /OHV use along Little Lost Creek has some impacts.	Potential for increased impacts.	Slight improvement due to seasonal closures.	Same as Alt. 2	Slightly more improvement than Alt. 2 due to obliteration near Rose Spring.	Same as Alt. 2
160300030505 Upper Lost Creek (ab Little Lost)	Some impacts occurring with some stream crossings.	Potential for increased impacts.	Slight improvement + due to obliteration of some routes in watershed.	Slight improvement but less than Alt. 2 due to less obliteration.	Improvement due to closure of route crossing upper tributaries.	Same as Alt. 3
160300030602 Willow Creek	Minor impacts occurring at some dispersed recreation sites.	Increased impacts.	Closure to cross-country travel and barriers should maintain habitat conditions.	Same as Alt. 2	Same as Alt. 2	Same as Alt. 2
1603000513 Corn Creek	OHV use mostly on existing routes.	Potential for increased impacts.	Closure to cross-country travel and barriers should maintain habitat conditions.	Same as Alt. 2	Same as Alt. 2	Same as Alt. 2

HUC Number	Current OHV Concerns	Fisheries Alternative Ranking (rationale)				
		Alt 1	Alt 2	Alt 3	Alt 4	Alt 5
160300051301 Second Creek	-	Potential for increased impacts.	Slight improvement from route obliteration.	Same as Alt. 2	Same as Alt. 2	Same as Alt. 2
160300051302 Upper Corn Creek (above Second Cr.)	-	Potential for increased impacts.	Closure to cross-country travel and barriers should maintain habitat conditions.	Same as Alt 2.	Improvement due to obliteration of 1 mile of route along stream.	Same as Alt 2.
1603000514 Chalk Creek (see below)	-	-	-	-	-	-
160300051401 North Fork of Chalk Creek	Most of drainage receives no use. Some pioneering use up from bottom of canyon.	Potential for increased impacts.	Closure to cross-country travel and barriers should maintain habitat conditions.	Same as Alt. 2	Slight improvement due to obliteration of about 1.5 miles of route on ridge above stream.	Same as Alt. 2
160300051402 Upper S. Fork Chalk Creek (above N.F. CC)	OHV trail along old roadway up stream bottom has some sedimentation, crossing impacts.	Potential for increased impacts.	Closure to cross-country travel and barriers should maintain habitat conditions.	Same as Alt. 2	Same as Alt. 2	Same as Alt. 2
160300070101 Indian Creek	Some impacts are occurring.	Potential for increased impacts.	Slight improvement due to reduced OHV impacts in upper watershed due to Street Legal only designation.	Same as Alt. 2	Same as Alt. 2	Same as Alt. 2
1603000702 Beaver River	Some concerns with road damage during wet periods.	Potential for increased impacts.	Closure to cross-country travel and barriers should maintain habitat conditions.	Slight improvement due to gates and seasonal closures reducing road damage and erosion.	Same as Alt. 3	Same as Alt. 3
160300070201 Merchant Creek above Three Creeks	-	Potential for increased impacts.	Closure to cross-country travel and barriers should maintain habitat conditions.	Same as Alt. 2	Same as Alt. 2	Same as Alt. 2
160300070202 Three Creeks above Merchant	-	Potential for increased impacts.	Closure to cross-country travel and barriers should maintain current conditions. Same as current condition.	Same as Alt. 2	Same as Alt. 2	Same as Alt. 2
160300070203 South Fork of North Creek	Minimal OHV impacts at present.	Potential for increased impacts.	Closure to cross-country travel and barriers should maintain habitat conditions, except greater snow closure in headwaters may have slight protection for water quality.	Closure to cross-country travel and barriers should maintain habitat conditions.	Same as Alt. 3	Same as Alt. 2
160300070205 South Creek	Some concerns with motorized use on non-motorized trails and route proliferation.	Potential for increased impacts.	Slight improvement due to barriers restricting use on non-motorized trails.	Same as Alt. 2	Same as Alt. 2	Same as Alt. 2

HUC Number	Current OHV Concerns	Fisheries Alternative Ranking (rationale)				
		Alt 1	Alt 2	Alt 3	Alt 4	Alt 5
160300070206 Birch Creek W	Minimal impacts occurring at present. One OHV trail crossing in headwaters.	Potential for increased impacts.	Closure to cross-country travel and barriers should maintain habitat conditions.	Same as Alt. 2	Similar to Alt. 2 with very slight improvement due to one trail closure in headwaters.	Same as Alt. 2
160300070208 North Fork of North Creek	Impacts from road, vehicles, and OHV use occurring along majority of occupied habitat.	Increased impacts.	Closure to cross-country travel and barriers should slightly improve habitat conditions.	Same as Alt. 2	Similar to Alt. 2 with slightly improved conditions due to minor obliteration.	Same as Alt. 2
160300070501 Pine Creek (Tusher Mts)	Impacts from road and OHV use occurring along majority of occupied habitat.	Increased impacts.	Improved conditions due to closure of motorized route above S. Fork of Pine Creek.	Same as Alt. 2	Same as Alt. 2	Continued impacts along most of occupied habitat. Slight potential for short-term improvement due to no street legal motorized vehicles above S. Fork of Pine Creek. Less impact than Alt. 1 but more than Alts. 2, 3, and 4. Potential for long-term increase in impacts if motorized use levels increase.

To develop the final summary table of combined effects to aquatic biota the professional experience and professional opinion of the forest Fisheries Biologist was utilized, taking into account field experience on the forest and aquatic biota survey data including fisheries survey results, IRE Level II survey results and aquatic macroinvertebrate samples. The forest Fisheries Biologist compared Table AB-3, which displayed the effects to aquatic biota based on ***quantified*** hydrologic indicator measures across the entire sub-watershed, and Table AB-4, which more ***qualitatively*** described the known and potential effects to aquatic biota from routes considering their spatial arrangement across the landscape, i.e. with heavier weighting for routes that were within close proximity to aquatic resources. These tables are relatively consistent but this is somewhat of an "apple vs. oranges" comparison. As such, there is no quantifiable equation to mathematically combine them and calculate a mean value. The comparison is a qualitative exercise that compares the similarities and differences to create a summary description, which is displayed in **Table AB-5**, below.

Table AB-5: Combined Hydrology/Biota Alternative Cumulative effects summary by alternative

HUC Number	Summary of Effects				
	Alt 1	Alt 2	Alt 3	Alt 4	Alt 5
140700020101 Ivie Creek	Potential for increased impacts	Slight improvement	Slight improvement+	Slight improvement++	Slight improvement+
140700020103 Quitchupah Creek	Potential for increased impacts	Proposed actions maintain habitat condition	Proposed actions maintain habitat condition	Slight improvement +	Proposed actions maintain habitat condition
1407000301 Fremont River (see below)	-	-	-	-	-
140700030101 UM Creek	Increased impacts	Improvement	Improvement +	Improvement++	Improvement+

HUC Number	Summary of Effects				
	Alt 1	Alt 2	Alt 3	Alt 4	Alt 5
140700030102 Fishlake Basin, Johnson V. Res, Lake Creek	Potential for increased impacts	Slight improvement	Slight improvement	Slight improvement+	Slight improvement
140700030103 Seven Mile Creek	Potential for increased impacts	Slight improvement	Slight improvement++	Slight improvement++	Slight improvement+
140700030105 Fremont River	Potential for increased impacts	Slight improvement	Slight improvement	Slight improvement	Slight improvement
140700030304 Sand Creek	Increased impacts	Slight improvement	Slight improvement+	Slight improvement++	Slight improvement
160300010603 Birch Creek E	Increased impacts	Improvement	Improvement	Improvement+	Improvement
160300020102 Upper Otter Creek	Potential for increased impacts	Slight improvement +	Slight improvement	Improvement	Slight improvement
160300020106 Greenwich Creek	Increased impacts	Slight improvement	Slight improvement+	Slight improvement++	Slight improvement+
160300020107 Box Creek	Increased impacts	Slight improvement	Slight improvement +	Slight improvement++	Slight improvement+
1603000301 Clear Creek	Potential for increased impacts	Slight improvement	Slight improvement ++	Slight improvement ++	Slight improvement++
160300030101 Fish Creek	Increased impacts	Improvement	Improvement+	Improvement++	Improvement+
160300030102 Shingle Creek	Increased impacts	Slight improvement	Slight improvement+	Slight improvement++	Slight improvement++
160300030103 Three Creeks / Pole Creek	Increased impacts	Slight improvement	Slight improvement+	Slight improvement++	Slight improvement+
160300030104 Mill Creek	Increased impacts	Slight improvement	Slight improvement+	Slight improvement+	Slight improvement+
160300030105 Sam Stowe Creek	Potential for increased impacts	Slight improvement	Slight improvement+	Slight improvement+	Slight Improvement+
160300030203 Manning Creek	Increased impacts	Slight improvement	Slight improvement+	Improvement	Slight improvement+
160300030204 Ten Mile Creek	Increased impacts	Slight improvement+	Slight improvement++	Slight improvement++	Slight improvement++
160300030205 Pine Creek (Bullion Canyon)	Potential for increased impacts	Slight improvement	Slight improvement	Slight improvement	Slight improvement+
160300030303 Monroe Creek	Potential for increased impacts	Slight improvement	Slight improvement+	Slight improvement+	Slight improvement+
160300030308 Water Creek	Potential for increased impacts	Proposed actions maintain habitat condition	Slight improvement	Slight improvement+	Slight improvement
1603000304 Salina Creek	Potential for increased impacts	Slight improvement	Slight improvement+	Slight improvement++	Slight improvement+
160300030401 Yogo/Blackham Crs	Potential for increased impacts	Slight improvement	Slight improvement	Slight improvement+	Slight improvement
160300030402 Upper Salina Creek	Potential for increased impacts	Slight improvement	Slight improvement	Slight improvement+	Slight improvement
160300030403 Niotche Creek	Increased impacts	Slight improvement	Slight improvement	Slight improvement	Slight improvement
16030030404 Water Hollow	Increased impacts	Slight improvement	Slight improvement	Slight improvement+	Slight improvement
160300030405 Gooseberry Creek	Increased impacts	Slight improvement	Slight improvement	Slight improvement+	Slight improvement
1603000305 Lost Creek	Potential for increased impacts	Slight improvement	Slight improvement+	Slight improvement++	Slight improvement+
160300030504 Little Lost Creek	Potential for increased impacts	Slight improvement	Slight improvement+	Slight improvement++	Slight improvement+
160300030505 Upper Lost Creek (ab Little Lost)	Potential for increased impacts	Slight improvement+	Slight improvement	Improvement	Slight improvement
160300030602 Willow Creek	Increased impacts	Proposed actions maintain habitat condition	Slight improvement	Slight improvement+	Slight improvement
1603000513 Corn Creek	Potential for increased impacts	Slight improvement	Slight improvement+	Slight improvement++	Slight improvement+

HUC Number	Summary of Effects				
	Alt 1	Alt 2	Alt 3	Alt 4	Alt 5
160300051301 Second Creek	Potential for increased impacts	Slight improvement	Slight Improvement+	Slight improvement++	Slight improvement+
160300051302 Upper Corn Creek (above Second Cr.)	Potential for increased impacts	Proposed actions maintain habitat condition	Slight improvement	Slight improvement++	Slight improvement
1603000514 Chalk Creek	Potential for increased impacts	Slight improvement+	Slight improvement+	Slight improvement++	Slight improvement+
160300051401 North Fork of Chalk Creek	Potential for increased impacts	Slight improvement+	Slight improvement	Slight improvement++	Slight improvement+
160300051402 Upper S. Fork Chalk Creek (above N.F. CC)	Potential for increased impacts	Slight improvement	Slight improvement+	Slight improvement+	Slight improvement+
160300070101 Indian Creek	Potential for increased impacts	Slight improvement	Slight improvement++	Slight improvement++	Slight improvement++
1603000702 Beaver River	Potential for increased impacts	Slight improvement	Slight improvement+	Slight improvement++	Slight improvement+
160300070201 Merchant Creek above Three Creeks	Potential for increased impacts	Slight improvement	Slight improvement++	Slight improvement++	Slight improvement++
160300070202 Three Creeks above Merchant	Potential for increased impacts	Slight improvement+	Slight improvement++	Slight improvement++	Slight improvement++
160300070203 South Fork of North Creek	Potential for increased impacts	Slight improvement	Slight improvement+	Slight improvement+	Slight improvement+
160300070205 South Creek	Potential for increased impacts	Improvement	Improvement	Improvement+	Improvement
160300070206 Birch Creek W	Potential for increased impacts	Proposed actions maintain habitat condition	Proposed actions maintain habitat condition	Slight improvement	Proposed actions maintain habitat condition
160300070208 North Fork of North Creek	Increased impacts	Slight improvement	Slight improvement+	Slight improvement+	Slight improvement+
160300070501Pine Creek (Tusher Mts)	Increased impacts	Improvement	Improvement	Improvement	Slight improvement
Summary	**Increased impacts.**	**Slight improvement**	**Slight improvement+**	**Slight improvement ++**	**Slight improvement+**

Discussion

Background

On the Fishlake National Forest major effects to aquatic biota are occurring due to system roads, non-system roads, and motorized trails, which generally run alongside streams and riparian zones and canyon bottoms in areas where locations for routes are constrained, and often run near water even in unconstrained upper mountain headwaters and plateaus. The effects of motorized routes include increased stream channel confinement, reduced stream sinuosity, increased gradient, increased sedimentation, reduced riparian shading and decreased amounts of large woody debris (LWD). Easy access also generally increases the degree of land management activities in an area, such as grazing or timber harvest, and increases human activity such as recreation. All of these aspects can increase effects to aquatic habitat that in turn affect aquatic biota. Examples of potential effects are reduced carrying capacity due to the loss of cover, increased water temperature, degradation of water quality, and introduction of non-native organisms, or aquatic nuisance species (ANS).

An example of how pervasive motorized routes are in low elevation stream corridors was the calculation of road density in yellow-billed cuckoo habitat. This species uses multi-storied cottonwood galleries along low elevation streams up to 7,000 feet. GIS analysis for the Wildlife Report showed a road density of 12.4-miles/sq mile in potential yellow-billed cuckoo habitat, which totaled 2,664 acres. This high road density is a result of a linear road within a narrow linear habitat corridor. It is also indicative of high impacts to the streams within this habitat block.

These motorized routes have become established over a long period and support many important social and economic uses, however. While nearly all system roads are in cases being used by OHVs, the additional use of OHVs on these established routes have little additional impacts over the established use by full-sized vehicles that are already occurring when the road is properly maintained. This is especially true if the road has proper design, drainage features, and surface hardening. A large percentage of the forest route network, primarily Forest Roads, is not being addressed by this project. There will be less existing system routes available for OHVs under all of the action alternatives. There is some obliteration of system routes under all action alternatives, however, with Alternative 5 having the most obliteration of system routes.

Another major effect to aquatic biota is grazing, since it is a widespread management activity that occurs across the majority of the forest. The primary concerns from grazing are sedimentation due to stream bank damage, channel changes such as increasing W-D ratios, and loss of woody riparian shrub vegetation. Actual effects are highly variable depending on the stream type, vegetative cover, grazing density, grazing system, herding, and weather patterns. Steep canyon streams with limited access and dense vegetation generally have minor to no impacts, while low gradient herbaceous meadows have the greatest impacts from grazing across the forest. Moderate gradient streams with some established shrub cover have intermediate effects.

Recreation is an increasing impact to aquatic biota across the forest. Recreation use levels are variable across the forest, ranging from low to very high. Many of the higher value areas for aquatic biota are also popular with recreationists. Recreational activities are often concentrated in riparian areas and along stream banks, which leads to stream bank damage, water quality problems, and potential transfer of Aquatic Nuisance Species (ANS) or the spread of diseases such as whirling disease. The action alternatives would reduce recreational impacts from dispersed camping in riparian areas by restricting OHV use to access to and from the camp site along existing routes while prohibiting travel between multiple dispersed sites, play areas, race tracks and travel across wet meadows and riparian areas.

OHV use is an increasing component of the motorized and dispersed camping recreational activity on the forest. At present it is not a major problem on most streams, but over the last 6 years field work has found more and more areas and incidents of OHV use in riparian areas, along streams, in wetlands, and even up stream channels. If use levels continue to increase and new routes continue to be pioneered in sensitive areas, OHV use could become a major problem on many streams in the near future.

Summary of the effects of the No Action Alternative (Alternative 1)

Under Alternative 1 a large percentage of most sub-watersheds are open to cross-country OHV travel. Depending on the watershed slope, terrain, and vegetation, the actual amount of this open travel area that may receive OHV use varies. In some sub-watersheds with gentle terrain and open vegetation, OHVs may be able to travel across a large percentage of the area. This can lead to higher rates of erosion across broad areas, but may also diffuse impacts. In other sub-watersheds with steep terrain and dense vegetation, OHV use is often physically restricted to major ridgetops and drainage bottoms. Ridgetop use will generally be far enough away from streams to reduce sedimentation, but drainage bottom use can affect fisheries due to the direct proximity to streams, including sedimentation, stream bank damage, and damage to vegetation. Besides these negative effects to fisheries, these drainage bottoms are often important passageways for amphibians. Sub-watersheds which are currently experiencing problems to streams and lakes from current OHV use are shown in Table AB-4. Relative levels of OHV use by stream name are shown in Table 6.

Table AB-5 summarizes the effects of the No Action Alternative. In all of the sub-watersheds across the forest that contain fisheries, amphibian, and other aquatic biota values, Alternative 1 will likely lead to increasing degradation of aquatic habitat from increasing OHV use and cross-country travel.

Summary of the effects of the Action Alternatives (Alternative 2, 3, 4, and 5)

The primary effect of implementing all action alternatives will be a major reduction in areas open to cross-country OHV use, which should reduce current ongoing and future impacts and reduce the proliferation of new unplanned user created routes. All action alternatives attempt to improve compliance and prevent motorized use of non-motorized use areas by installation of barriers. One factor of route design and selection was the ability to place barriers in effective sites. Finally, all of the action alternatives have obliteration of routes that are unneeded and/or have high resource impacts. Therefore, there is a relatively large change between the No Action alternative and all four of the action alternatives.

The differences between the action alternatives are relatively minor between themselves, when compared to the No Action alternative. Generally speaking, there is a slight reduction (or improvement) of such measures of enchroaching road, riparian influenced road, area open to cross-country travel and other hydrological values as one compares the later action alternatives to Alternative 2. When the hydrologic (Table AB-3) and aquatic biota (Table AB-4) measures are ranked and summarized across all HUCs (Table AB-5), Alternative 4 ranks first (best). Alternative 3 and 5 ranked 2nd overall, in part due to the smaller (150') designation for travel to reach established campsites. (There are some individual HUCs where Alternative 2 would be more beneficial than Alternatives 3 or 5, as some popular routes proposed for closure or obliteration under Alternative 2 were kept open under Alternatives 3 and 5). Alternative 5 does have small changes that opened short sections of routes that had been closed in Alternative 3, but not enough to cause a major difference in the rankings. Alternative 2-ranked 4th, mostly due to the larger area potentially open to travel (300 feet vs. 150 feet) on existing routes to reach established campsites. Again, all 4 action alternatives are much better in terms of the hydrologic and aquatic biota measures than the No Action alternative. As Table AB-5 shows, all of the action alternatives would overall result in at least a slight improvement from current aquatic habitat conditions, while the No Action alternative would have increased impacts and continued degradation from current aquatic habitat conditions. At the individual HUC level the action alternatives effects would range from maintaining current habitat conditions to greatly improved habitat conditions.

Effects Specific to Alternative 4

There are a few specific areas where Alternative 4 would have additional benefits to fisheries. These are UM Creek, where closure of the Left Hand Fork trail would reduce some sedimentation and disease transfer risk, Manning Creek where closure of the trail past Barney Lake would help reduce sedimentation and impacts to boreal toads, and Sam Stowe and upper Lost Creek where motorized route closures in the upper watersheds would reduce sedimentation impacts to these streams.

Effects Specific to Alternative 5

In Alternative 5, the upper Pine Creek (Tusher Mts.) route that was closed to motorized travel in Alternatives 2, 3, and 4 will be designated as a motorized trail left open to OHVs with widths less than 50 inches. This route is currently little traveled and is actually brushing in over time, making travel in full sized vehicles difficult. There are management considerations for allowing motorized access for fuels management, livestock management, and livestock exclosure maintenance. Alternative 5 would likely result in a small improvement from current conditions by eliminating the full-sized vehicle use on the route and by closing the watershed to cross-country travel. This route is in close proximity to the creek, contributes sediment directly to the stream in numerous areas, and has several stream crossings.

Therefore, if OHV use levels increase in the future, there could be an increase in effects from this route to the aquatic habitat. Monitoring of OHV use levels and impacts to the stream will be necessary to ensure that long-term effects are not negative. If monitoring indicates concerns, management adjustments may be needed.

Sensitive Fish Species – Bonneville cutthroat trout and Colorado River cutthroat trout

Because motorized use will continue in watersheds containing Bonneville cutthroat trout and Colorado River cutthroat trout, motorized use under all of the action alternatives may impact Bonneville or Colorado River cutthroat trout but will not likely lead to a trend towards federal listing of these cutthroat trout sub-species. Under the No Action alternative native trout habitat will continue to be impacted by OHVs in several of the key native cutthroat streams such as UM Creek, Birch Creek (E), North Fork of North Creek, and Pine Creek, although some impacts are occurring in other native cutthroat watersheds. Under all of the action alternatives there would be some improvement to native cutthroat trout habitat, especially in the watersheds mentioned above. Tables AB-6 and AB-7 summarize the effects to Bonneville and Colorado River cutthroat trout watersheds, respectively.

Effects Specific to Alternative 4

There are a few specific areas where Alternative 4 would have additional benefits to cutthroat trout. These are UM Creek, where closure of the Left Hand Fork trail would reduce some sedimentation and disease transfer risk to Colorado River cutthroat trout, Manning Creek where closure of the trail past Barney Lake would help reduce sedimentation and impacts to Bonneville cutthroat trout, and Sam Stowe Creek where motorized route closures in the upper watersheds would reduce sedimentation impacts to the stream and Bonneville cutthroat trout.

Effects Specific to Alternative 5

In Alternative 5, the upper Pine Creek (west Tusher Mts.- Bonneville cutthroat trout) route that was closed to motorized travel in Alternatives 2, 3, and 4 will be designated as a motorized trail left open to OHVs. This route is currently little traveled and is actually brushing in over time, making travel in full sized vehicles difficult. There are management considerations for allowing motorized access for fuels management, livestock management, and livestock exclosure maintenance. Alternative 5 would likely result in a small improvement from current conditions by eliminating the full-sized vehicle use on the route. This route is in close proximity to the creek, contributes sediment directly to the stream in numerous areas, and has several stream crossings. Therefore, if OHV use levels increase in the future, there could be an increase in effects from this route to the aquatic habitat. Monitoring of OHV use levels and impacts to the stream will be necessary to ensure that long-term effects are not negative. If monitoring indicates concerns, management adjustments may be needed.

See the Biological Evaluation for additional information on Bonneville and Colorado River cutthroat trout stream conditions, trends, and risks to these populations persistence.

Table AB-6: Bonneville Cutthroat Trout summary

HUC Number	Bonneville Cutthroat Trout Effects				
	Alt 1	Alt 2	Alt 3	Alt 4	Alt 5
160300010603 Birch Creek E	Increased impacts	Improvement	Improvement	Improvement+	Improvement
160300030101 Fish Creek*	Increased impacts	Improvement	Improvement+	Improvement++	Improvement++
160300030102 Shingle Creek*	Increased impacts	Improvement	Slight improvement+	Slight improvement++	Slight improvement++

HUC Number	Bonneville Cutthroat Trout Effects				
	Alt 1	Alt 2	Alt 3	Alt 4	Alt 5
160300030103 Three Creeks / Pole Creek*	Increased impacts	Slight improvement	Slight improvement+	Slight improvement++	Slight improvement+
160300030105 Sam Stowe Creek	Potential for increased impacts	Slight improvement	Slight improvement+	Slight improvement+	Slight improvement+
160300030203 Manning Creek	Increased impacts	Slight improvement	Slight improvement+	Improvement	Slight improvement+
160300030204 Ten Mile Creek	Increased impacts	Slight improvement+	Slight improvement++	Slight improvement++	Slight improvement++
160300030205 Pine Creek (Bullion Canyon)*	Potential for increased impacts	Slight improvement	Slight improvement	Slight improvement	Slight improvement+
160300030402 Upper Salina Creek	Potential for increased impacts	Slight improvement	Slight improvement	Slight improvement+	Slight improvement
160300030602 Willow Creek*	Increased impacts	Proposed actions maintain habitat condition	Slight improvement	Slight improvement+	Slight improvement
160300070203 South Fork of North Creek*	Potential for increased impacts	Slight improvement	Slight improvement+	Slight improvement+	Slight improvement+
160300070206 Birch Creek W	Potential for increased impacts	Proposed actions maintain habitat condition	Proposed actions maintain habitat condition	Slight improvement	Proposed actions maintain habitat condition
160300070208 North Fork of North Creek	Increased impacts	Slight improvement	Slight improvement+	Slight improvement+	Slight improvement+
160300070501 Pine Creek (Tusher Mts)	Increased impacts	Improvement	Improvement	Improvement	Slight improvement

* = Proposed for reintroduction

Table AB-7: Colorado River Cutthroat Trout summary

HUC Number	Colorado River Cutthroat Trout Effects				
	Alt 1	Alt 2	Alt 3	Alt 4	Alt 5
140700030101 UM Creek	Increased impacts	Improvement	Improvement +	Improvement++	Improvement+
140700030103 Seven Mile Creek (Tasha Creek*)	Potential for increased impacts	Slight improvement	Slight improvement++	Slight improvement++	Slight improvement+
140700030304 Sand Creek	Increased impacts	Slight improvement	Slight improvement+	Slight improvement++	Slight improvement

* = Proposed for reintroduction

Aquatic MIS Species – Resident Trout

Effects to resident trout are the same as and fully covered by those generally described for aquatic biota above in Table AB-5. Because motorized use will continue in watersheds containing resident trout, motorized use may impact resident trout but will not likely lead to a loss of population viability for any resident trout populations under all of the action alternatives. Under the No Action alternative resident trout habitat will be increasingly impacted by OHV use resulting in a downward trend in habitat conditions. Under all of the action alternatives, some of the motorized use that is currently occurring along several streams creating habitat concerns would be eliminated. Route closures of high impact routes along several streams, route obliteration, restricting travel to designated routes, and barriers and other enforcement measures would reduce sedimentation, improving aquatic habitat conditions for resident trout overall. When looking at specific sub-watersheds, restricting OHV use to designated routes and barriers and other enforcement measures would at least maintain current resident trout habitat conditions. In the majority of the sub-watersheds, especially those that also have route closures, relocations, or route obliteration there would be a slight improvement to major improvement of resident trout habitat. Overall resident trout habitat would be static (in a few cases) or slightly upward in trend (in the majority of cases).

Aquatic MIS Species – Aquatic macroinvertebrates

Aquatic macroinvertebrates are invertebrates that live in water and can be seen by the unaided human eye. They provide an important ecological link between microscopic food organisms and fish. Because of their strict habitat requirements they are useful indicators of aquatic habitat conditions and changes (Mangum 1986). Aquatic macroinvertebrates include insects, such as the commonly thought of mayflies, stoneflies, caddisflies, and diptera (two-winged flies), crustaceans, mollusks, and freshwater earthworms (Mangum 1986).

Aquatic macroinvertebrates were labeled a Management Indicator Species (MIS) for the Fishlake N.F. as an indicator for stream habitat (FP IV-18). There is also a Standard and Guideline relating to aquatic macroinvertebrates under the General Direction of "Manage waters capable of supporting self-sustaining trout populations to provide for those populations." (FP IV-18), which states "D. Maintain a Biologic Condition Index (BCI) of 75 or greater." (FP IV-19).

The Fishlake Forest Plan monitoring schedule is to monitor aquatic macroinvertebrates in 5 streams per year to see if streams meet the aquatic Standard and Guideline of a Biotic Condition Index (BCI) of 75 or above. In the twenty-one year period from 1986 to 2006, the Fishlake N.F. has sampled an average of 5.7 streams per year (range from 0 to 17 per year), thus meeting the monitoring requirement. Sampling location selection has primarily been driven by interest in key watersheds on the Forest for baseline data and for monitoring of specific project activities. For specific results of this Forest aquatic macroinvertebrate monitoring since 1986, see Rodriguez (2006).

The Biologic Condition Index is just one of many potential indices that can be used to assess ecological health. Since the Fishlake Forest Plan was signed additional aquatic macroinvertebrate indices have been developed. The following is a list of indices that the Dixie and Fishlake National Forests have recently found useful to assess aquatic ecological health:

BCI (Biologic Condition Index)
CTQd (dominance weighted Community Tolerance Quotient)
Simpson's Diversity index
Shannon Diversity index
Total number of taxa
Number of Ephemoptera (mayfly) **taxa**
Number of Trichoptera (caddisfly) **taxa**
Number of Plecoptera (stonefly) **taxa**
Number of long-lived taxa
Number of intolerant taxa (i.e. clean water taxa)
Percent tolerant taxa (i.e. poor water taxa)
Percent predator taxa
Number of clinger taxa
Percent dominance of the top 3 taxa
BIBI (Karr Benthic Index of Biological Integrity – a scoring/weighting of the 10 benthic community metrics just above BIBI)

The Fishlake N.F. will be adding some of these metrics to future analyses as new laboratory data becomes available. If resources allow, these metrics will be added to analyses of past macroinvertebrate samples on the Forest.

Another method used for sample analysis is comparison of taxa lists to ensure individual taxa, especially

clean water or rare taxa, are not lost. This is usually done as monitoring for specific projects, as was done by Whelan (2002). The small areas sampled can make results somewhat problematic, by confusing sampling error with project effects, but positive (i.e. present) post-project taxa documentations are definitive.

Note that the suggested sampling protocol used by the Buglab (M. Vinson) has changed; they currently recommend compositing 8 square feet samples into one sample bottle for analysis. The Fishlake N.F. is continuing to sample using the older methodology of 3 one square foot samples in 3 separate bottles to maintain sampling consistency, ensure BCI results are comparable (compositing has increased BCI values in some cases of duplicate sampling trails), and allow some rudimentary statistical calculations, despite the higher cost.

Aquatic macroinvertebrate sample processing laboratories sort through the samples and develop a taxa list identifying each taxon and their density (number / sample area converted to number / square meter). Taxa are generally identified to genus, but sometimes only to a higher level such as family or order and sometimes to the species level, depending on the availability of keys and the condition of the sample organism. All of the indices and metrics are then calculated from this taxa/density list (although some like the BCI require supplemental data on water quality, gradient, or substrate).

Aquatic macroinvertebrate data is quantitative data, and is sometimes the only quantitative aquatic biotic data on streams. This data could be used to calculate future indices or be used in ways not yet forseen, such as tracking long-term changes in aquatic macroinvertebrate communities in the face of climate change.

Notes on the Biotic Condition Index (BCI):

The Biotic Condition Index (BCI), developed by Winget and Mangum (1979), provides a quantitative measure of aquatic health due to overall watershed condition, land management activities, and natural disturbances. The intent of the Fishlake N.F. Forest Plan to use the actual index (BCI) rather than population levels of specific macroinvertebrate taxa as the trend indicator is shown in the Forest Plan Standard and Guideline "Maintain a Biologic Condition Index (BCI) of 75 or greater" (page IV-19). The BCI incorporates water quality (sulfate and alkalinity), stream habitat (substrate and gradient), and a database of environmental tolerances of aquatic macroinvertebrate taxa. The environmental tolerances database is a rating of each taxon's tolerance to organic enrichment and sedimentation. Originally this result was calculated as a simple arithmetic mean, called CTQa. Since about the mid-80s this result has been weighted by the relative dominance of the taxa of the site, with the result expressed as CTQd. This is important as usually only a few taxa dominate the site, while the majority of taxa are present in low numbers. On the Fishlake N.F., CTQd values are usually a little higher (i.e. show poorer water quality) than the CTQa for a given station as the clean water taxa are often less dominant. This would generally result in a slightly lower but more representative BCI value than one calculated using CTQa.

The BCI is calculated by dividing the predicted community tolerance quotient (CTQp) based on the water quality and stream habitat by the actual sampled community tolerance quotient (CTQd). I.e.:

$$BCI = (CTQp/CTQd)*100$$

Advantages of the BCI is that it is sensitive to different types of stress and it gives a linear assessment of conditions from unstressed through all levels of stressed, and it evaluates a streams condition against its own potential (Winget and Mangum 1979). A BCI rating of 100 would indicate that the stream is at its biological potential, based on the aquatic macroinvertebrates. A BCI rating above 90 is considered excellent, 80-90 good, 72-79 fair, and below 72 poor (Mangum, various date lab reports).

Since the BCI measures the average community tolerance quotient based on all of the taxa found at a site, it is robust to changes in individual taxon population levels. While one taxon may be temporarily absent due to the recent emergence of adults and reproduction, other taxa with similar tolerance quotients will still be collected. Averaging the individual tolerance quotients to obtain the community tolerance quotient creates a mean representative value which has minimal fluctuation despite changes in individual taxon population levels.

Professional opinion of the forest fisheries biologist, based on collecting aquatic macroinvertebrate samples since 1991 and interpreting the laboratory results, is that the BCI is a useful tool to quantify stream health, but that there are factors that need to be taken into consideration during result interpretation.

Aquatic macroinvertebrate communities are naturally variable due to weather patterns and natural events such as droughts, natural wildfires, storm events, floods, yearly snowmelt runoff, etc. These natural events can affect BCI values and confound making interpretations of changes due to land management actions (Whelan 2002). The forest generally tries to sample stations at comparable times across years, to prevent fluctuation in scores from yearly spring runoff events.

The BCI rating shown in tables and specialists reports are an average of the BCI ratings for the 3 sample bottles sent in for each station. It is important to understand that there is some variation in these individual ratings and the average number given is not an absolute value. Analyzing the BCI scores for the individual sample bottles collected by the Forest in 2003 and early 2004 found a mean standard deviation for the 3 sample bottles at each station of about 3 points. The confidence intervals for these samples are plus or minus 3.8 at the 20% alpha level, 4.9 at the 10% alpha level, and 5.9 at the 5% alpha level.

One weakness of the BCI index is the relative coarseness of the predicted Community Tolerance Quotient (CTQp) values given by Winget and Mangum (1979). Typical CTQp values determined for forest samples are usually 50, occasionally 66, and rarely 55, 72, or 80. Common sense indicates that site potential is not that uniform. Minor changes in true site potential that are not reflected in the literature chart would add another source of potential variation in BCI scores.

Reviewing Winget and Mangum (1979) shows that the regression line for alkalinity used to help develop the CTQp value may be somewhat weak. It almost appears for the range of the graph that there are two levels/lines more specific to low and moderate alkalinities. This could also add some variability into the BCI values.

Due to the cost of aquatic macroinvertebrate sampling, many areas on the forest are not sampled until new potential land management actions are proposed in an area. Other areas are finally just being sampled even with long-term plans to sample there. Care must be made in interpreting single point in time samples, since trend cannot be determined based on one sample. I.e. a sample may be slightly under the Forest Plan level of 75, but management at the site may be fostering aquatic recovery, with the actual trend being upwards. Thus no management changes are needed, despite a sample result under 75.

A final note is that there has been some inconsistency between labs in calculating the CTQp since 1999. This could create changes in the BCI, even when actual field conditions as measured by CTQd have not changed. The forest has had to correct CTQp values and thus the BCI in some of the lab results since 1999. The Forest now routinely calculates the CTQp for the lab samples it submits.

Because of these concerns noted in the previous paragraphs, using the actual CTQd values would be

better and more accurate for monitoring actual trend of the aquatic macroinvertebrate communities. The BCI is still useful, however, to express the streams current condition relative to the streams potential.

Interpretation of Aquatic Macroinvertebrate Data:

It is important to realize that the BCI is just one of many available metrics. While results will generally be comparable or consistent when viewed across the whole, there will be occasions where there will be some variation between individual indices. Professional experience has taught the forest fisheries biologist that each riparian/aquatic monitoring method tells one part of the whole picture. There is not one perfect measure that incorporates all factors into one score. Each method result is one piece of a puzzle. So it also is with the aquatic macroinvertebrate indices. They are generally comparable and overall result in consistent interpretations, but any individual index could be lower. I.e. the BCI could be somewhat below the Forest Plan level of 75 while other indices indicate better conditions, or vice versa. Low scores across many of the metrics would be more cause for concern. Initial results that are low should trigger additional field visits, aquatic macroinvertebrate sampling, or other riparian and aquatic sampling to determine if management changes are necessary. Further sampling may show an upward trend, indicating site and watershed management is good. If long-term trend monitoring indicates downward trends, then that would be a sign that management adjustments may be needed.

Concerns due to natural variations and confounding variables can be minimized both through good study design (such as including a control station above a study area where management changes will occur) and detailed notes taken during sampling that describe both ongoing land management activities and natural events and changes.

The forest does not have high quality aquatic reference areas identified in unmanaged landscapes. Sampling unmanaged reference areas could help calibrate samples on the forest to see if CTQp values given in Winget and Mangum (1979) are realistic and validate that forest streams can reach a BCI of 100 under natural conditions. Most forest samples have either been located to capture potential project effects or in "response reaches" where changes in management would be expected to cause a change in aquatic habitat conditions. Areas where less management occurs or where less response is expected due to the stream's geomorphology are not typically sampled, in part due to the cost. Thus the lab results may indicate conditions that are worse then typical or average for the stream. The forest has talked about identifying aquatic reference areas during the Forest Plan revision process. The forest is also considering conducting random or stratified random aquatic macroinvertebrate sampling of stream channel types in the future to determine more average reach conditions and to allow extrapolation of aquatic conditions across the forest for a given channel type, should funding for such an intensive sampling project be obtained.

Since the BCI monitoring is under the General Direction to "Manage waters capable of supporting self-sustaining trout populations to provide for those populations." (FP IV-18) this biologic reason or goal should be considered when interpreting the BCI scores. The goal behind the monitoring method is to maintain a diverse, healthy aquatic macroinvertebrate community to provide food and ecosystem linkages to maintain a self-sustaining trout population. In other words, if a BCI value is slightly below 75 but the stream habitat appears to be in good condition and trout numbers and biomass are above average for the forest, this indicates that the aquatic macroinvertebrate community is not limiting the trout population.

In the professional opinion of the forest fisheries biologist, it is best to use aquatic macroinvertebrate data as ancillary data in concert with other riparian and aquatic monitoring data, such as fish population data, R1-R4 fish habitat data, Integrated Riparian Evaluation (IRE) Level II and Level III (such as greenlines) data, and hydrologic monitoring (channel cross-sections, channel profiles, and sediment monitoring). Low values in an aquatic macroinvertebrate index, where other monitoring data indicates satisfactory

habitat values, may be little cause for concern. In contrast, an example where low BCI values were tied to low values in other aquatic macroinvertebrate metrics and indications of habitat concerns from other riparian and aquatic monitoring would be cause for concern. The greatest concern would be for areas that show a downward trend in aquatic macroinvertebrate metrics as well as downward trends in other monitoring such as fish population levels, along with visual indications of habitat concerns and IRE data showing habitat problems. This scenario would be a strong indication that management adjustments are probably needed.

While there have been some concerns raised by recent monitoring both in terms of BCI scores and trends, OHV use is not believed to be a major contributor to the low BCI scores or declining trend at this time. If OHV use in sensitive riparian areas and along streams continues to increase as it has in the past 6 years based on field observations, however, it does have the potential to become a major concern for aquatic macroinvertebrates on many streams in the near future.

Under the No Action alternative OHV use will likely increase in sensitive areas, leading to a reduction of aquatic macroinvertebrate BCI scores on many forest waters. This could potentially cause a downward trend on some waters to below the Forest Plan Standard and Guideline of 75 where it is currently above, and a further downward trend on waters already below the Forest Plan Standard and Guideline.

Under all of the action alternatives (Alt. 2, 3, 4, and 5) some of the motorized use that is currently occurring along several streams creating habitat concerns would be eliminated. These and other closures and route obliteration would thus reduce sedimentation, improving aquatic habitat conditions for macroinvertebrates. Restricting motorized use to designated routes will also prevent increased impacts in the future and reduce erosion occurring from current cross-country use. Under all of the action alternatives there would be a slight improvement to major improvement in BCI scores on streams with current impacts where route changes, closures, or route obliteration is proposed. On other streams the closure to cross-country travel, barriers, and other enforcement action to keep motorized travel on designated routes in all of the action alternatives would at least maintain the current condition. Thus overall BCI scores under the action alternatives would be static or slightly upward in trend.

Cumulative Impacts

This write-up tiers to and incorporates by reference the cumulative impacts section of the main body of the watershed report, including its table of reasonably foreseeable actions. Table AB-5 made consideration of the actions listed in the watershed report table of reasonably foreseeable actions and effects from past actions when making the final determination of aquatic biota cumulative effects trend by watershed for each alternative.

Summary

Under the current OHV management situation OHV impacts are becoming a problem on several important forest aquatic habitats supporting fisheries, amphibians and other aquatic biota. While the concerns are currently secondary to those caused by National Forest roads and other management activities such as livestock grazing, this pattern of increasing use and impacts, especially in areas along streams, lakes and waterways will continue to increase cumulative effects to fisheries and other aquatic biota. In time, it could become a primary issue of concern to these resources on many waters.

All of the action alternatives are greatly preferable to the existing situation (No Action alternative). All make considerable improvements in hydrologic measures such as miles of encroaching road, watershed acres open to cross-country travel, numbers of stream crossings, etc. There are relatively minor differences between Alternatives 2, 3, 4, and 5. Alternatives 3, 4, and 5 are generally preferable for fisheries and aquatic biota due to the smaller distance designation for access to dispersed camping sites and several changes to address specific fisheries concerns. There are some areas proposed for closure and obliteration or seasonal closure in Alternative 2 that are opened in Alternatives 3, 4 and 5, however. The most important specific change in Alternatives 3, 4, and 5 is the elimination of OHV travel from along all of Fish Creek. This user created OHV trail is the major impact to the stream in the upper watershed.

Alternative 4 is most favorable for aquatic biota overall, because it has the most obliteration of routes within riparian areas (see the last row in Table 3-17 for relative comparisons of alternatives). There are a few specific areas where Alternative 4 would have additional benefits to fisheries. These are UM Creek, where closure of the Left Hand Fork trail would reduce some sedimentation and disease transfer risk, Manning Creek where closure of the trail past Barney Lake would help reduce sedimentation and impacts to boreal toads, and Sam Stowe and upper Lost Creek where motorized route closures in the upper watersheds would reduce sedimentation impacts to these streams. Alternatives 2, 3, and 4 would result in less impacts from motorized travel on upper Pine Creek (west side of the Tusher Mts) than Alternative 5, but this may be partially offset by increased impacts from other land uses if access for needed administrative activities is lost. Under Alternative 5 Pine Creek OHV use levels and road impacts should be monitored to be sure impacts do not increase if OHV use levels increase.

Additional photographs:

Photo AB-1: Pioneering OHV damage to the previously grass covered north shoreline of Barney Lake, increasing sedimentation to the lake and impacting boreal toad habitat. Notice the dual OHV routes in the background, including one directly along the shoreline.

Photo AB-2: OHV use directly along the shoreline of Barney Lake seen in the background of the above photo.

Photo AB-3: OHV use along the top and face of Barney Dam at Barney Lake. June 2006.

Photo AB-4: New pioneering OHV use above Pole Creek. July 2006.

Photo AB-5: Newly created OHV crossing on Pole Creek. Prior to the creation of this crossing, the flowing stream had no motorized crossing on public land until the highway just above its confluence with Clear Creek. July 2006.

Photo AB-6: An OHV user crossing Black Flat on UM Creek. This system route (road) crossing increases sedimentation of the creek and increases the risk of infecting the Right Fork with whirling disease. August 2006.

Photo AB-7: OHVs have been crossing this small tributary stream of upper Left Fork of UM Creek below the trail, causing erosion that contributes sediment into UM Creek. August 2006.

Photo AB-8: One of the OHV crossings on lower Chalk Creek. July 2006.

Photo AB-9: One of several OHV crossings on lower Chalk Creek that actually capture the streamflow. Note water flowing down OHV trail in photo center, while stream flows off to the right. This can increase erosion, increase sedimentation of the stream, and reduce habitat available for trout. July 2006.