3.2 AQUATIC RESOURCES

Existing Conditions

Introduction

The purpose of this Section is to provide detailed information and analysis regarding aquatic resources. This Section will discuss key assumptions and methodologies used in the analysis; identify existing monitoring used in the analysis; describe desired conditions and site-specific resource conditions; discuss resource impacts and effects of the alternatives; and document conclusions regarding direct, indirect, and cumulative effects for each alternative.

Key Assumptions and Methodologies

To compare the environmental effects by alternative it was necessary to make the following assumptions.

- Treatments are carried out as described in the prescriptions (no mechanical treatment on slopes over 40%, prescribed fire burning 30 to 40% of prescription area, etc.).
- Existing system roads in Project Area would be improved (graveled, graded and reshaped, and drainage structures installed).
- Temporary and intermittent roads would be constructed properly and obliterated/closed and rehabbed at the end of the project.

Baseline conditions were determined through review of literature, topographical maps, aerial photos, and field observations. The review of literature provided a brief description of general effects of vegetative treatments on aquatic resources. Aerial photography, topographic maps, and GIS provided an indication of the proximity of prescription areas to aquatic resources, and the steepness and vegetative condition of the land between the treatment area and water feature. Field observations were conducted to identify and quantify fish and amphibian populations, and to characterize habitat conditions within the proposed project area. These characteristics were taken into consideration when determining effects to aquatic resources.

Issues

One issue was identified through public scoping and the ID Team related to aquatic species. It was:

- How would the proposed project affect Bonneville cutthroat trout (*Oncorhynchus clarki utah*) populations (Sensitive Species, Management Indicator Species) and boreal toad populations (Utah State Sensitive Species)? Indicator: Proximity to Riparian Habitat Conservation Area.

Management Direction

The Revised Forest Plan (USDA Forest Service 2003) standards and guidelines that apply to this project are listed in Chapter 1, Tables 1.7.1 and 1.7.2.

Mitigation Measures/Design Elements

To protect aquatic and semi-aquatic species, the establishment of Riparian Habitat Conservation Areas (RHCAs) as described by the Revised Forest Plan, Wasatch-Cache National Forest and by the Inland Native Fish Strategy (INFISH) is recommended. Riparian Habitat Conservation Areas include traditional riparian corridors, wetlands, intermittent streams, and other areas that help maintain the integrity of aquatic ecosystems by 1) influencing the delivery of coarse sediment, organic matter, and woody debris to

streams, 2) providing root strength for channel stability, 3) shading the stream, and 4) protecting water quality.

The mitigation measures/design elements applicable to this project are listed in Chapter 2, under Design Elements and Mitigation Measures Common to Alternatives 1 and 3, Table 2.2.1b.

Project Analysis Area

The general analysis area for aquatic and semi-aquatic species is the Big Creek watershed (Hydrologic Unit Code #1610010106, 5th Code HUC). This watershed is approximately 171,100 acres and lies along the west side of the Upper Bear River subbasin. Specific information will be presented and analyzed at the subwatershed level (6th level HUC).

Specific treatments (prescriptions) and acreages associated with them by alternative can be found in Table 3.2.1.

Table 3.2.1. Prescription types and approximate acreages associated with them by alternative.

Prescription	% Veg Removal on Treated Acres	% Acres Treated	Alt. 1 Acres within Prescriptions	Alt. 1 Veg Removed (Acres)	Alt. 3 Acres within Prescriptions	Alt. 3 Veg Removed (Acres)
Clearcut	95	95	206	186	137	124
Conifer Removal with patch	95	95	27	24	27	24
Conifer Removal followed by Fire	95	95	556	502	343	310
Group Selection	10/95	60/20	256	64	183	46
Groups and Patches	95	20	150	29	0	0
Irregular Shelterwood (IRSW)	33	95	71	22	211	66
IRSW with groups / patches	33/95	75/20	140	61	0	0
Overstory Removals	40*	95	130	49	130	49
Prescribed Fire / herbicide / mechanical	95	40	2,513	955	2,469	938
Prescribed Fire mosaic	95	40	681	259	681	259
Shelterwood Prep	33	95	32	10	9	3
Commercial Thin w/groups	33/95	75/20	38	17	0	0
Timber Harvest Acres Subtotal			1,606	964	1,040	622
Total Treated Acres			4,800	2,178	4,190	1,819

*Note: In the overstory removal most of the existing overstory would be removed. On the order of 95% of this, however in these areas there is also a young stand underneath which would remain. Skidding and falling would be designed to minimize damage to this new stand.

Affected Environment

The Big Creek Vegetation Treatment project area is contained in the Big Creek watershed (Hydrologic Unit Code #1610010106). This watershed is approximately 171,100 acres and lies along the west side of the Upper Bear River subbasin. The proposed project area is found at the head of four sixth code subwatersheds. From north to south these are Otter Creek, Little Creek, Lower Big Creek, and Upper Big Creek. Water features of these subwatersheds are presented in Table 3.2.2. Very little surface water occurs on National Forest System lands within the analysis area as indicated by the limited number of perennial and ephemeral streams and the few springs that occur.

Table 3.2.2. Water features of subwatersheds on National Forest System lands within analysis area.

	Total Sub Watershed Area (acres)	National Forest (acres)	Water Features on National Forest System Lands
Otter Creek	27,992	904	Streams: 5 ephemeral stream channels Springs: 1 spring (Otter Creek Spring)
Little Creek	23,895	6,735	Streams: 15 ephemeral streams Springs: none Impoundments: Green Fork Reservoir, Lodgepole Reservoir
Lower Big Creek	18,859	651	Streams: 1 ephemeral stream (Dry Canyon Creek) Springs: 1 spring (Campground Spring)
Upper Big Creek	28,516	8,058	Streams: 21 ephemeral streams, 2 perennial (Big Crawford Creek and stream below Stove Spring {total of 0.41 miles}) Springs: 7 springs (Lamb Canyon Spring, unnamed spring 1,500 feet east of Bob Kiddys Hole, Six Bit Spring, Dry Fork Spring, unnamed spring in Randolph Creek, Stove Spring and Red Spring in Pole Canyon)

Note: Source of information is review of USGS 1:24,000 topography maps.

Threatened, Endangered, or Sensitive Aquatic Species

No threatened or endangered aquatic species occur on the Wasatch-Cache National Forest; therefore, threatened or endangered aquatic species will not be analyzed further.

Bonneville Cutthroat Trout (Sensitive Species, Management Indicator Species)

Historically, Bonneville cutthroat trout (BCT) occupied all perennial streams within the Big Creek Watershed (UDWR 2005, p.106). This population of BCT was part of the Upper Bear Watershed and likely contained both resident and fluvial forms of cutthroat trout which utilized both the smaller tributaries and the main-stem Bear River. Currently, BCT are only found in Big Creek below the Forest boundary (no habitat occurs on the Forest within the project area) in this watershed. The Utah Division of Wildlife Resources last surveyed Big Creek in 2006, and BCT appeared to have experienced a considerable increase in abundance since 2003 (Table 3.2.3). Other aquatic species that occur in Big Creek include sculpin (*Cottidae sp*) and mountain sucker (*Catostomus platyrhynchus*). Brook trout (*Salvelinus fontinalis*) and brown trout (*Salmo trutta*) were observed in the 2003 survey but not in 2006 (Table 3.2.3).

As a Management Indicator Species (MIS) for the Wasatch-Cache National Forest, BCT have been monitored annually across the Forest. Results of this monitoring along with BCT population trends can be found in the Project Record (USDA Forest Service 2007b).

Table 3.2.3. Population comparisons for species sampled in Big Creek in 2003 and 2006. BCT = Bonneville cutthroat trout, BKT = brook trout, BNT = brown trout.

	Species	# per mile - 2006	# per mile - 2003
Big Creek	Age-1+ BCT	559 (+/- 96)	48 (+/- 0)
	Age-1+ BKT	0	211 (+/- 16)
	Age-1+ BNT	0	32 (+/- 0)
	Mountain Sucker	Common	Common
	Sculpin	Common	Abundant

Boreal Toad (State Sensitive Species, Forest Service Species at Risk)

Boreal toad occupied wetlands in Utah are surrounded by a variety of upland vegetation communities, including sagebrush and grassland, pinyon/juniper, mountain shrubs, and coniferous forest (Scott et al. 1993). Extensive observations of upland and winter habitat use in Utah have not been completed. However, toads have been observed using small mammal burrows in drier upland areas (Campbell 1970). Radio-telemetry studies in Colorado indicate that toads occupy upland montane forests and rocky areas near spring seeps (Jones et al. 1998). Campbell (1970) noted that boreal toads are relatively independent of water compared to other amphibians, but they must re-hydrate daily. In Utah, breeding habitats include low velocity, low gradient streams, off-channel marshes, beaver ponds, small lakes, reservoirs, stockponds, wet meadows, seeps, and associated woodlands (Fridell et al. 2000; Thompson and Chase 2001).

Little is known about the historical distribution and abundance of boreal toad in the Big Creek watershed. Ongoing surveys have identified one occupied site within the proposed project area and two others just outside (see Appendix A, Maps 4 and 5). No breeding sites are known to occur within the proposed project area. Since 2001, most springs, ponds, streams, and reservoirs in the proposed project area have been surveyed (Thompson and Chase 2001; Thompson et al. 2003; Thompson and Chase 2005). Boreal toads have been observed in 21 separate sites within the Monte Cristo Range. Most documented breeding sites consist of springs that have been dammed for use as stock ponds. Within the proposed project area, springs, beaver ponds, and stock ponds may provide habitat for boreal toad, and with their ability to move over three kilometers overland, it is likely that most of this area is utilized in low densities.

Environmental Consequences

a. General Environmental Effects

Timber harvesting and road construction can affect aquatic species through increased sedimentation, reduction of large woody debris (LWD), increases in temperature variation, and changes in stream flow (Meehan 1991). The distance from cutting units and roads to watercourses, the topography and vegetation types between disturbance sites and streams, and amount of disturbance are all important variables in determining effects to aquatic species.

Similarly, the effects of fire to aquatic species is dependent on numerous factors including fire severity, its extent and location within a watershed, the amount and type of fuel consumed and left, soil type, and the frequency, timing, and intensity of subsequent precipitation events. The duration of effect to aquatic biota is dependent on adjacency and connectivity to water bodies, the condition and health of watersheds prior to fire introduction, and any post-fire activities that may occur.

b. Effects Common to Alternatives 1 and 3

Sensitive Aquatic Species – The Intermountain Region Sensitive Species list was last updated in December 2003 and is available: http://fsweb.r4.fs.fed.us/unit/bpr/bpr_web/r4_tes_lst_03.rtf. The Colorado River cutthroat trout, Bonneville cutthroat trout, and the Columbia spotted frog (Rana luteiuentris) are the only aquatic sensitive species listed for the Wasatch-Cache National Forest. Neither Colorado River cutthroat trout

nor Columbia spotted frog are found on the Ogden Ranger District. Therefore, all Alternatives result in a "No Impact" determination for Colorado River cutthroat trout and Columbia spotted frog.

c. Alternative 1 – Proposed Action

1. Direct and Indirect Effects

Bonneville Cutthroat Trout – Bonneville cutthroat trout are not found in the proposed project area. They are found in Big Creek on private property below the proposed project area. This population has experienced an apparent increase in numbers in the last three years while non-native trout species numbers have decreased (Table 3.2.3).

Ephemeral streams within the Upper Big Creek subwatershed would have RHCAs of 100 feet (Category 4) established around them, while the small amount of perennial stream would have RHCAs of 150 feet (Category 2). This would be a hard buffer for any mechanical or herbicide treatments. If prescribed fire is used, ignition would occur outside of the RHCA. Most of the vegetative treatment in the Upper Big Creek subwatershed would include prescribed fire and/or herbaceous treatment. A limited amount of timber harvest would occur, mostly in the upper end of the drainage (see Appendix A, Map 4). A total of approximately 994 acres would be harvested (estimated 609 timber harvest acres removed) while approximately 2,057 acres would be treated through prescribed fire/herbicide treatment/mechanical treatment (estimated 782 acres of vegetation removed) in this drainage (see Table 3.2.4).

With established RHCAs, no impacts to BCT are expected. Recent studies have found that prescribed fires have had limited impacts to riparian areas with no post-fire change in large woody debris volume and recruitment, or fine sediment inputs (Bêche et al. 2005). Timber harvesting in similar topography (Slideout Canyon) on the Wasatch-Cache NF have also had limited sediment movement (Hydrologist Report, Condrat 2007). Further, erosion modeling using the FS WEPP methodology indicates that the average annual erosion rate for all proposed timber treatments and for all proposed fire treatments are either at or below the allowable soil loss ("t" value) for the soil type, and that none of the proposed treatment units would experience detrimental soil erosion as a result of the most probable type of rainstorm. Long-term soil quality and productivity would therefore not be impaired by the any of the proposed treatments under this alternative (see Soils Report, Flood 2007). With less than 20% of the subwatershed being treated, moderate topography, low to moderate severity of prescribed fire, and relatively low precipitation and stream flows, no changes in water temperature, sedimentation rates, or recruitment of large woody debris to perennial streams below the proposed project area would be expected.

Herbicide treatment would involve using tebuthiuron (Spike®), 2,4D (2,4-dichlorphenoxy acetic acid), and/or picloram (Tordon K®) to kill some of the sagebrush and other shrubs. While tebuthiuron (Spike®) is practically nontoxic to freshwater fish and invertebrates (Stavola 2004), 2,4D (2,4-dichlorphenoxy acetic acid), and picloram (Tordon K®) are moderately to highly toxic to fish. However, given the large RHCAs, relatively small application areas, and ground-based (no aerial) application, little to no herbicide movement (via drift, overland flow, or groundwater infiltration) is expected, and no effect to fish are anticipated.

Activities proposed under Alternative 1 in the Little Creek, Otter Creek, and Lower Big Creek subwatersheds would not have any impacts to BCT because the species is not present.

Boreal Toad – Boreal toad have been observed at one spring within the proposed project area and two springs adjacent to this area. Observations at these sites have included one to three adults at infrequent intervals. Riparian habitat conservation areas are established around all water features within the proposed project area (300 foot buffer around known boreal toad sites Category 1 RHCAs) (see Appendix A, Map 4). In upland areas outside of RHCAs, boreal toad would be vulnerable to activities conducted from May through September. Since boreal toad utilize this area in such low densities, overall impacts to this population would be low.

Table 3.2.4. Approximate acres treated by prescription in each subwatershed for Alternative 1.

Prescription Alternative 1	% Veg Removal on Treated Acres	% Acres Treated	Alt. 1 Acres within Prescriptions Little Creek	Alt. 1 Veg Removed (Acres) Little Creek	Alt. 1 Acres within Prescriptions Otter Creek	Alt. 1 Veg Removed (Acres) Otter Creek	Alt. 1 Acres within Prescriptions Upper Big Creek	Alt. 1 Veg Removed (Acres) Upper Big Creek	Alt. 1 Acres within Prescriptions Lower Big Creek	Alt. 1 Veg Removed (Acres) Lower Big Creek
Clearcut	95	95	92	83	85	77	20	18	0	0
Con Rem w/patch	95	95	0	0	8	7	15	14	0	0
Con Rem w/Fire	95	95	26	23	5	5	518	467	7	6
Group Selection	10/95	60/20	0	0	0	0	256	64	0	0
Groups & Patches	95	20	60	11	0	0	90	17	0	0
Irregular Shelterwood	33	95	0	0	0	0	71	22	0	0
IRSW group & patch	33/95	75/20	120	53	0	0	0	0	19	8
Overstory Removal	40*	95	27	10	0	0	1	0	102	39
Rx Fire/herb/mech	95	40	313	119	0	0	2,057	782	143	54
Rx Fire mosaic	95	40	643	244	38	14	0	0	0	0
Shelterwood Prep	33	95	9	3	0	0	23	7	0	0
Com Thin w/groups	33/95	75/20	38	16	0	0	0	0	0	0
Timber Harvest Acres Subtotal			372	199	98	94	994	609	128	53
Total Treated Acres			1,328	562	136	108	3,051	1,391	271	107

d. Alternative 2 – No Action

1. Direct and Indirect Effects

Bonneville Cutthroat Trout – Bonneville cutthroat trout are not found in the proposed project area. Taking no action would maintain BCT trout habitat lower in the Big Creek drainage at current levels. Riparian vegetation would continue to undergo changes to ecological succession through normal aging, fire (limited extent), and insect pathology. No changes in water temperature, sedimentation rates, stream flow, or recruitment of large woody debris to perennial streams below the proposed project area would be expected.

Boreal Toad – Boreal toad have been observed at one spring within the proposed project area and two springs adjacent to this area. Taking no action would maintain amphibian habitat at current conditions. Vegetation providing amphibian habitat would continue to undergo changes to ecological succession through normal aging, fire (limited extent), and insect pathology. This alternative would have no impact to boreal toad habitat or to boreal toad.

e. Alternative 3 – Reduced Treatment and Wildlife Emphasis

1. Direct and Indirect Effects

Bonneville Cutthroat Trout – Bonneville cutthroat trout are not found in the proposed project area. They are found in the Big Creek watershed on private property below the proposed project area. This population has experienced an apparent increase in numbers in the last three years while non-native trout species numbers have decreased (Table 3.2.3).

Ephemeral streams within the Upper Big Creek subwatershed would have RHCAs of 100 feet (Category 4) established around them, while the small amount of perennial stream would have RHCAs of 150 feet (Category 2). This would be a hard buffer for any mechanical or herbicide treatments. If prescribed fire is used, ignition would occur outside of the RHCA. Most of the vegetative treatment in the Upper Big Creek subwatershed would include prescribed fire and/or herbaceous treatment. A limited amount of timber harvest would occur, mostly in the upper end of the drainage (see Appendix A, Map 5). Approximately 575 acres would be harvested (estimated 357 timber harvest acres removed) while approximately 2,014 acres would be treated through prescribed fire/herbicide treatment/mechanical treatment (estimated 765 acres of vegetation removed) in this drainage (see Table 3.2.5).

With established RHCAs, no impacts to BCT are expected. Recent studies have found that prescribed fires have had limited impacts to riparian areas with no post-fire change in large woody debris volume and recruitment, or fine sediment inputs (Bêche et al. 2005). Timber harvesting in similar topography (Slideout Canyon) on the Wasatch-Cache NF have also had limited sediment movement (Hydrologist Report, Condrat 2007). Further, erosion modeling using the FS WEPP methodology indicates that the average annual erosion rate for all proposed timber treatments and for all proposed fire treatments are either at or below the allowable soil loss ("t" value) for the soil type, and that none of the proposed treatment units would experience detrimental soil erosion as a result of the most probable type of rainstorm. Long-term soil quality and productivity would therefore not be impaired by the any of the proposed treatments under this alternative (see Soils Report, Flood 2007). With less than 20% of the subwatershed being treated, moderate topography, low to moderate severity of prescribed fire, and relatively low precipitation and stream flows, no changes in water temperature, sedimentation rates, or recruitment of large woody debris to perennial streams below the proposed project area would be expected.

Herbicide treatment would involve using tebuthiuron (Spike®), 2,4D (2,4-dichlorphenoxy acetic acid), and/or picloram (Tordon K®) to kill some of the sagebrush and other shrubs. While tebuthiuron (Spike®) is practically nontoxic to freshwater fish and invertebrates (Stavola, 2004), 2,4D (2,4-dichlorphenoxy acetic acid), and picloram (Tordon K®) are moderately to highly toxic to fish. However, given the large RHCAs,

relatively small application areas, and ground-based (no aerial) application, little to no herbicide movement (via drift, overland flow, or groundwater infiltration) is expected, and no effect to fish are anticipated.

Activities proposed under Alternative 3 in the Little Creek, Otter Creek, and Lower Big Creek subwatersheds would not have any impacts to BCT because there are no BCT in the subwatershed.

Boreal Toad – Boreal toad have been observed at one spring within the proposed project area and two springs adjacent to this area. Observations at these sites have included one to three adults at infrequent intervals. Riparian habitat conservation areas are established around all water features within the proposed project area (with a 300 foot buffer around known boreal toad sites Category 1 RHCAs) (Appendix A, Map 5). In upland areas outside of RHCAs, boreal toad would be vulnerable to activities conducted from May through September. Since boreal toads utilize this area in such low densities, overall impacts to this population would be low. With fewer acres being treated then in Alternative 1, Alternative 3 has even less chance of impacting individuals.

Table 3.2.5. Approximate acres treated by Prescription in each subwatershed for Alternative 3.

Prescription	% Veg Removal on Treated Acres	% Acres Treated	Alt. 3 Acres within Prescriptions Little Creek	Alt. 3 Veg Removed (Acres) Little Creek	Alt. 3 Acres within Prescriptions Otter Creek	Alt. 3 Veg Removed (Acres) Otter Creek	Alt. 3 Acres within Prescriptions Upper Big Creek	Alt. 3 Veg Removed (Acres) Upper Big Creek	Alt. 3 Acres within Prescriptions Lower Big Creek	Alt. 3 Veg Removed (Acres) Lower Big Creek
Clearcut	95	95	92	83	36	32	0	0	0	0
Con Rem w/patch	95	95	0	0	8	7	15	14	0	0
Con Rem w/Fire	95	95	26	23	5	5	305	275	7	6
Group Selection	10/95	60/20	0	0	0	0	183	46	0	0
Groups & Patches	95	20	0	0	0	0	0	0	0	0
Irregular Shelterwood	33	95	120	38	0	0	71	22	19	6
IRSW group & patch	33/95	75/20	0	0	0	0	0	0	0	0
Overstory Removal	40*	95	27	10	0	0	1	0	102	39
Rx Fire/herb/mech	95	40	313	119	0	0	2,014	765	143	54
Rx Fire mosaic	95	40	643	244	38	14	0	0	0	0
Shelterwood Prep	33	95	9	3	0	0	0	0	0	0
Com Thin w/groups	33/95	75/20	0	0	0	0	0	0	0	0
Timber Harvest Acres Subtotal			274	157	49	44	575	357	128	45
Total Treated Acres			1,230	520	87	58	2,589	1,122	271	99

f. Cumulative Effects

Area of Consideration for Cumulative Effects

Bonneville Cutthroat Trout – For Bonneville cutthroat trout, the area of consideration is the Upper Big Creek subwatershed. Bonneville cutthroat trout are only found in Big Creek below the Forest boundary. Activities conducted in other subwatersheds will have no impact on this population. Since there were no direct and indirect effects for Bonneville cutthroat trout, there will be no cumulative effects and this species will not be discussed further.

Boreal Toad – The area of consideration for boreal toad is the whole project area. While boreal toad have only been observed at one site within the project area, their ability to move long distances makes it likely they utilize most of this area.

Certain natural processes such as drought and flood are outside the influence of the USDA Forest Service and have the potential to result in cumulative effects to aquatic resources, both negative and positive, across land ownership boundaries. It is difficult to predict effects to aquatic resources over the short or long term, whether direct, indirect, or cumulative, due to natural processes that operate on aquatic resources at this spatial scale.

Existing conditions are the result of past and ongoing management activities such as forest roads, forest and rangeland management, as well as the natural processes discussed above. Given the nature of these activities, the primary cumulative impacts to aquatic habitat and aquatic/semi-aquatic species can be summarized into the following categories:

- Livestock grazing
- Timber harvest
- Fire (prescribed, natural and human caused)
- Travel Plan (road and trail management)
- Recreation

Grazing – Grazing in riparian areas can have numerous direct and indirect effects on aquatic species including: reductions in abundance, habitat, and diversity (Platts and Nelson 1985). To reduce or eliminate both direct and indirect effects to aquatic species and their habitat, several grazing strategies have been implemented on the Wasatch-Cache National Forest as well as several Standards and Guidelines (see Tables 1.7.1 and 1.7.2). In addition, an exclosure is planned for construction in Dry Canyon (Lower Big Creek subwatershed) to improve riparian conditions.

Grazing has occurred within the proposed project area since the late 1800s. High impacts to aquatic resources occurred from the late 1800s through the 1930s when active management was started. A gradual improvement in land conditions has occurred as indicated by increased ground cover and absence of active soil erosion in most of the proposed project area.

Stock ponds in the area are likely beneficial to boreal toad in that they provide needed habitat for breeding and hydration. In contrast, boreal toads may be vulnerable to trampling by livestock in these same areas. Therefore, both Alternatives 1 and 3 in combination with effects from past, present, and reasonably foreseeable grazing may have a small cumulative effect.

Timber Harvest – Timber harvesting and road construction can affect aquatic species through increased sedimentation, reduction of large woody debris (LWD), increases in temperature variation, and changes in stream flow (Meehan 1991). The distance from cutting units and roads to watercourses, the topography

and vegetation types between disturbance sites and streams, and amount of disturbance are all important variables in determining effects to aquatic species.

Within the proposed project area, several historical timber projects have occurred. Currently, past harvest units have been restocked and show very little to no soil erosion. Therefore, there will be no cumulative effects from past, present, and reasonably foreseeable timber harvest.

Fire – Effects of fire are difficult to predict due to the variation inherent to wildfires (intensity, size, location). Fire effects to vegetation and watersheds influencing hydrologic and temperature regimes and erosion may persist for years. Boreal toad populations have evolved with fire, and have developed characteristics that provide for resilience in the face of such events. In the case of small, isolated populations, wildfires could extirpate entire populations.

Two large wildland fires (Dry Canyon 2 [1994] and Green Fork [1999]) have occurred in and adjacent to the proposed project area. These areas have stabilized and have no effect on aquatic resources.

Approximately 763 acres have been burned due to prescribed fire in and adjacent to the proposed project area. These burns occurred in the early 1990s and are not impacting aquatic resources. Therefore, there will be no cumulative effects from past, present, and reasonably foreseeable wildland and prescribed fire activity.

Travel Plan (road and trail management) – Erosion can be expected from roads and trails that are not adequately maintained. Roads also provide access, and the activities that accompany access, and magnify their negative effects on aquatic habitats. Activities associated with roads within the analysis area include recreation, timber harvest, livestock grazing, prescribed fire, and fire suppression.

Numerous roads occur within the proposed project area, most of which occur a long distance from water features and have very little effects on aquatic resources. Roads with sediment concerns within the proposed project area include the Dry Fork Road (Road # 20162), Campground Springs (Road # 20082), and Otter Creek Private. In September 2007 the Record of Decision for the Ogden Ranger District Travel Plan Revision was signed. Under the selected modified version of Alternative 5 from the FEIS, the Dry Fork Road (Road # 20162) would be closed and rehabilitated. Otter Creek Private will be signed closed on both ends and managed for administrative use only road. The Campground Spring (Road # 20082) will be managed as open to motorized use. None of these are near any sites with known boreal toad. Therefore, there will be no cumulative effects from past, present, and reasonably foreseeable road and trail management.

Recreation – Most recreation within the proposed project area occurs in association with roads. Most roads occur along ridgelines and away from water (with the exception of the three roads identified above). Therefore, no cumulative impacts to boreal toad will occur from past, present, and reasonably foreseeable recreational activities.