

Topic 2 – Biodiversity and Viability

Aquatic and Semi-Aquatic Resources

Introduction

Management of aquatic and semi-aquatic species on the Wasatch-Cache National Forest requires a coordinated effort between the Utah Division of Wildlife Resources, Wyoming Game and Fish and the USDI Fish and Wildlife Service. This section addresses the Laws and Policies, the general condition of aquatic resources, the species that inhabit the aquatic and semi-aquatic habitats and how the individual alternatives may affect these resources.

The WCNF is critical in providing for the long-term preservation of June sucker and Bonneville and Colorado River cutthroat trout in the Intermountain West. The Forest also provides important habitat for spotted frogs and other amphibians.

Laws, Policy, and Direction

The Endangered Species Act. 1972. Endangered Species Act of December 28, 1973, (87 Stat. 884 as amended; 16 U.S.C 1531, 1532, 1533, 1536, 1540) declares that "...all Federal departments and agencies shall seek to conserve endangered species and threatened species and shall utilize their authorities in furtherance of the purposes of this Act."

The National Forest Management Act. 1976.

Policy and direction are outlined for riparian and aquatic resources can be found in Forest Service Manuals 2500 and 2600, and the following Forest Service Handbooks: 2510, 2511, 2521, 2526, 2527, 2531, 2532, 2541, 2542, 2552, 2554, 2601, 2603, 2604, 2620, 2621, 2622, 2623, 2624, 2625, 2670, 2672, 2676, 2509.18, and 2509.22.

Affected Environment

Habitat

The Wasatch-Cache National Forest (WCNF) includes approximately 1,200 miles of perennial streams and 2,200 miles of intermittent streams. The Forest also contains 4,700 acres of lakes and ponds, 4,400 acres of reservoirs and 2,300 acres of marshes. Habitat conditions across the forest are good with many stream and lakes containing trout. In a number of cases, man has altered the habitat to meet needs of the time. These alterations include the construction of roads across streams, the construction of dams and diversions, and the modification of stream channels to minimize flooding and to provide a means to transport railroad ties to the market. Timber harvest, grazing, and recreational activities have also impacted aquatic and semi-aquatic species habitats.

From the **Status Review For Bonneville Cutthroat Trout (*Oncorhynchus Clarki Utah*)**, it states, "Trout, regardless of their evolutionary history, require 4 types of habitat during various

stages of their life history: spawning habitat, nursery or rearing habitat, adult habitat and overwintering habitat. Spawning gravels are required for spawning success and can be a limiting factor in high gradient streams where the current carries off suitable spawning gravel (Behnke 1992). Conversely, an even greater concern may be accumulation of fine sediments into interstitial spaces of spawning gravels which prevents egg incubation and reduces larval survival. Such fines can become dominant in the sediments when poor land-use practices alter flow regimes, remove riparian vegetation, and/or degrade overall watershed conditions. These human-induced activities can aggravate already fragile soils and geology in vulnerable desert climates.”

Fish

There are at least 24 fish species that occur in the waters of the WCNF. Eight of these were historically found within the planning area (Table AQ-1). More than 14 fish species have been introduced to enhance sport-fishing opportunities. In the 1985 Forest Plan Analysis of Management Situation (AMS) there are 24 species of fish listed. Of the fish species listed, it is questionable if lake trout, redbreast shiner and Utah chub were ever found on the Forest. None of these species have been found in surveys conducted over the past 8 years. Many of the fish species found on the Forest are considered economically important from a recreation and/or sport fishing perspective. While these fish may never have been found on the Forest, literature sources (Sigler 1963, Sigler 1987, Sigler 1996) do not distinguish between National Forest System (NFS) lands and non-NFS lands. The Paiute sculpin, Tiger Muskie and the June Sucker have been added to the species list. The Paiute sculpin has been identified in the lower Logan River. Tiger muskies have been introduced into Pineview Reservoir and provide a large predator to maintain sunfish sizes. June sucker were stocked in Red Butte Reservoir in the early 1990 for holding and have since successfully reproduced.

Bonneville Cutthroat Trout (*O. clarki utah*) [Status: Petitioned for listing as “Threatened”—ESA; “Conservation Species”—State of Utah, “Native Species Status 2”—State of Wyoming, S2-Natural Heritage Rank]

In 1997, Utah’s Governor signed a bill making the Bonneville cutthroat trout the state fish of Utah (Utah State Library, 1997). Historically, Bonneville cutthroat trout occupied approximately 90 percent of the Bonneville Basin (Duff 1996). Bruce May, (Personal communication, Inland Cutthroat Trout Conservation Coordinator, May 2000) in a rough estimate, suggests that Bonneville cutthroat trout are presently found in about 5 percent of their historic habitat. Further, 80 to 90 percent of the remaining populations currently reside on NFS lands (ibid.). This subspecies is found on seven national forests in Wyoming, Idaho, Nevada and Utah. In the spring of 1999, of the 129.4 miles of stream currently occupied by Bonneville cutthroat trout in Utah, 70.4 miles (54%) are found on the WCNF. Thus, preserving the Bonneville cutthroat trout on the Forest is essential to the long-term preservation of this subspecies within the range of the species. Based on geologic history and location, Bonneville cutthroat trout was split into two management areas by the Bonneville Cutthroat Trout Conservation and Recovery Team: the Bear River Geographic Management Unit (BRGMU) and the Northern Geographic Management Unit (NGMU).

The BRGMU starts in the Uinta Mountains of Utah, drains into Wyoming, back into Utah, back into Wyoming, into Idaho (with connection to Bear Lake in Utah and Idaho), and then back into

the Wasatch Front of Utah before draining into the Great Salt Lake. Many of the small headwater tributaries are diverted for agricultural and municipal uses preventing species from migrating from the side tributaries into the mainstem Bear River and isolating populations into small headwater streams. A number of reservoirs have been installed providing for late summer irrigation flows. However, there are a few drainages that have a number of interconnected tributaries. On the Wasatch-Cache National Forest these include: Mill Creek (Summit County), upper mainstem Bear River, Woodruff Creek, Logan River, and the Blacksmith Fork River.

Table AQ-1. Fish believed to have been found pre-settlement (1845) on the land currently administered by the Wasatch-Cache National Forest. Fish found downstream from the Wasatch-Cache National Forest that may be affected by land management activities. Fish introduced on the land administered by the Wasatch-Cache National Forest that continue to persist as of January 2002.

a. Fish	b. Scientific Name	Historically	Downstream	Introduced
Cutthroat Trout, Bonneville	<i>Oncorhynchus clarki utah</i>	X		
Cutthroat Trout, Colorado	<i>Oncorhynchus clarki pleuriticus</i>	X		
Long Nose Dace	<i>Rhinichthys cataractae</i>	X		
Mottled Sculpin	<i>Cottus bairdi</i>	X		
Paiute sculpin	<i>Cottus beldingi</i>	X		
Mountain Whitefish	<i>Prosopium williamsoni</i>	X		
Mountain Sucker	<i>Catostomus platyrhynchus</i>	X		
Bluehead Sucker	<i>Catostomus discobolus</i>	X		
Colorado Pikeminnow	<i>Ptychocheilus lucius</i>		X	
Colorado River Roundtail Chub	<i>Gila robusta robusta</i>		X	
Humpback Chub	<i>Gila cypha</i>		X	
Bonytail Chub	<i>Gila elangas</i>		X	
Razorback Sucker	<i>Xyrauchen texanus</i>		X	
June Sucker	<i>Chasmistes liorus mictus</i>		X	X
Arctic Grayling	<i>Thymallus arcticus</i>			X
Black Crappie	<i>Pomoxis nigromaculatus</i>			X
Bluegill	<i>Lepomis macrochirus</i>			X
Brook Trout	<i>Salvelinus fontinalis</i>			X
Brown Trout	<i>Salmo Trutta</i>			X
Common Carp	<i>Cyprinus carpio</i>			X
Golden Trout	<i>Oncorhynchus aguabonita</i>			X
Kokanee (lacustrine sockeye salmon)	<i>Oncorhynchus nerka</i>			X
Largemouth Bass	<i>Micropterus salmoides</i>			X
Rainbow Trout	<i>Oncorhynchus mykiss</i>			X
Smallmouth Bass	<i>Micropterus dolomieu</i>			X
Tiger Muskie	<i>Esox</i> ♀ <i>masquinongy</i> X ♂ <i>lucius</i>			X
Yellow Bullhead Catfish	<i>Ameiurus melas</i>			X
Yellow Perch	<i>Perca flavescens</i>			X
Yellowstone Cutthroat Trout	<i>Oncorhynchus clarki bouvieri</i>			X

(Adapted from Lentsch et al. 1995)

The NGMU includes the tributaries along the Wasatch Front from Perry Creek, near Brigham City, Utah on the north, to Salt Creek, near Nephi on the south. This area includes a number of large river, many steep headwater tributaries, reservoirs and natural lakes. On NFS lands, the populations of Bonneville cutthroat trout in the NGMU are restricted to small headwater tributaries. Many of these tributaries are diverted at the forest boundary for agricultural or municipal use. Many of these small populations have been lost since the coming of the European settler. Some of the populations were lost as a direct result of habitat alteration from the 1983 floods. In the spring of 1983, mudflows out of Willard and Parish Creeks were believed to be of such magnitude that the cutthroat trout populations were lost. In other tributaries this was less the case. For unknown reasons, cutthroat trout have also been lost from a number of other tributaries. A good example is Big Cottonwood Creek. Once a source of eggs for Bonneville cutthroat trout (Sigler 1987), it is now void of a cutthroat trout population. Habitat alteration from mining, road construction, private development, timber harvest, stocking of non-native fish and exploitation may have all played a part in this loss. More than 10 non-native species of fish have been stocked in the Salt Lake Valley starting as early as 1871 (Sigler 1987).

On February 5, 1998, Bonneville cutthroat trout was petitioned to be listed as “Threatened” under the Endangered Species Act 5 U.S.C. 553(e) and 50C.F.R. 424.14 (Carlton, 2000.) On December 8, 1998 the 90-day finding identified that the petition had merit. The U.S. Fish and Wildlife Service found that a listing was not warranted on October 9, 2001.

Colorado River Cutthroat Trout (*O. clarki pleuriticus*) [Status: Petitioned for listing as “Threatened”—ESA; “Conservation Species”—State of Utah, “Native Species Status 2”—State of Wyoming, S2-Natural Heritage Rank]

Historically Colorado River cutthroat trout occupied all accessible cool waters of the upper Colorado River Drainage, including the Green, Yampa, Gunnison, Dolores, San Juan, Duchesne, and Dirty Devil Rivers (Young et al. 1996). Bruce May, in a rough estimate, suggests that Colorado River cutthroat trout are presently found in about 1-2% of their historic habitat (2000). Of the remaining populations, 95 to 100 percent currently reside on NFS lands (May 2000). This subspecies is found on eight national forests in Wyoming, New Mexico, Colorado and Utah. In the spring of 1999, of the 120 miles of stream currently occupied by Colorado River cutthroat trout in Utah, 35 miles (29%) (ibid.) are found on the Forest, making it an important forest for the long-term preservation of Colorado River cutthroat trout in Utah and within the range of the species. The Colorado River cutthroat trout are contained in the Northeastern Geographic Management Unit (NEGMU) (Lyntsch 1997b). The NEGMU boundary is based on geology and location.

The portion of the NEGMU that is on the Forest starts with the Blacks Fork on the northeast side of the Uinta Mountains and continues east to include the Burnt Fork and Muddy Creek drainages. It drains north from the High Uinta Wilderness in Utah, into Wyoming. Few of the small headwater tributaries have been diverted, for agricultural and municipal uses, on National Forest Lands. Most of these diversions occur where the streams leave public lands. Connectivity among streams on the WCNF is still relatively good, allowing for populations to be biologically connected. The major streams in the NEGMU include but are not limited to Muddy Creek, Blacks Fork, Smiths Fork, Henrys Fork, Burnt Fork and Beaver Creek. Brook, rainbow and Yellowstone cutthroat trout have been stocked in many of these drainages.

In December 1999, Colorado River cutthroat trout was petitioned to be listed as “Threatened” or “Endangered” under the Endangered Species Act 5 U.S.C. 553(e) and 50C.F.R. 424.14 (Petition to List the Colorado River Cutthroat Trout, 1999). The U.S. Fish and Wildlife Service is currently conducting their 90-day initial finding to identify if the petition has merit.

June Sucker (*Chasmistes liorus*) [Status: “Endangered”—ESA;—State of Utah, Native Species Status 1]

The June Sucker historically inhabited Utah Lake and migrated up large tributary streams to spawn. Commercial fishing, dewatering of Provo River, and severe drought historically decimated this species. Pollution, predation by nonnative species, and hybridization with other species have been identified as major threats.

June sucker were stocked in Red Butte Reservoir, on the Wasatch-Cache National Forest, in 1992. Red Butte Reservoir is found in the Red Butte Natural Research Area. The purpose of this stocking was to provide a holding area for the fish. Since then the fish have successfully reproduced. It is suspected that there are currently more juvenile fish in the reservoir than its historic habitat of Utah Lake.

Viability Assessments of Bonneville cutthroat trout and Colorado cutthroat trout.

A viability assessment for fish species was conducted and is presented in Appendix B. All fish species on the WCNF were considered, although a viability assessment was not conducted for all. Several species were determined to have habitats that are more affected by activities outside of the WCNF, and others have such limited occurrence on the WCNF that maintenance of their habitats are assumed to be addressed by meeting standards and guidelines for water quality and riparian areas. Several native species share systems with the Bonneville cutthroat trout and Colorado cutthroat trout and are assumed to share their viability requirements. For these, the Bonneville cutthroat trout and Colorado cutthroat trout serve as indicators of viability. A review of the individual species and their habitat needs are found in Appendix B of the FEIS.

At the subbasin (4th level hucs) level, the Wasatch-Cache National Forest is expected to continue to provide habitat for the Bonneville and Colorado River cutthroat trout and many other aquatic and semi-aquatic species (Table AQ-2). There were assumptions made about effects to viability through risks and threats described above because of the lack of all the data and basic understanding of life history stages. Risks are viewed as those things occurring naturally in nature where a threat is man caused. In addition to not having a long population data set, data are also not available for these species’ genetic variability, sex ratios, movements within and among populations and meta-populations. As such, assessments were made based on potential threats relative to current risk and status of the populations.

Based on the viability assessment, the species are believed to be able to persist on the WCNF under current risks and threats, although losses of some populations and declines in some metapopulations are expected. The small very isolated populations appear to be at the greatest risk of extirpation. Some of these populations will probably be lost through the actions or lack thereof of man (Table AQ-3), while other may be lost as a result of natural consequences from past actions and/or natural events. There are seven populations of cutthroat trout that we have lost or are expecting to lose over the next 15 years (Table AQ-2). A number of other populations

could be lost due to natural uncharacteristic events such as high intensity fires, debris flow, or even chemical spill. This has occurred in the past with limited documentation.

Table AQ-2. Cutthroat trout populations on the Wasatch-Cache National Forest that are believe to be headed for extirpation during the next 15 years.

6 th Level HUC	Population Name	Suspected Cause	Potential Additional Action
160101010103	Hayden Fork	Limited population size. Non-native fish competition. Loss of complexity from historic tie hacking.	Treatment to remove non-native fish and habitat enhancement to restore complexity could decrease threats.
160102020403	High Creek	Interbreeding with non-native rainbow trout. No connectivity with other populations. Only hybridized cutthroat/rainbow trout have been found in the drainage.	Additional drainage wide surveys could be completed to verify if all native, pure cutthroat trout have been lost from this drainage
160102030306	Saddle Creek	Lack of water, habitat impacts from roads, non-native fish and grazing upstream of the population. No connectivity with other populations due to intermittent stream flows. Current year class failures.	Site-specific analysis to identify exact location of the problems and potential corrective solutions need to be identified.
160201010105	South Fork Weber River	Limited population size. Non-native fish competition. Interbreeding with non-native rainbow trout.	Additional drainage wide surveys could be completed to verify if all native, pure cutthroat trout have been lost from this drainage.
160202040102	Little Cottonwood Creek	Limited population size. Poor water chemistry (heavy metals). Upstream access to the stream and the potential for toxic spills are moderate.	Efforts to explore correction of the water chemistry problem are being made.
160202030101	Soapstone Creek	The stream has been dry by late June in 2001 and 2002, which would cause year class failures. Lack of habitat complexity. No connectivity with other populations. Limited population size.	Additional drainage wide surveys could be completed to verify if all native, pure cutthroat trout have been lost from this drainage.
160202030101	Rock Creek	Limited habitat and water. No connectivity with other populations (suspected biological barrier).	Additional drainage wide surveys could be completed to verify if a biological barrier exists for this population.

Current threats to aquatic species include grazing, poor timber practices, road construction, recreational uses, special uses, fire suppression, energy development, water development and non-native species to name a few.

Table AQ-3. The 15- and 100 year expectations regarding the likelihood of the cutthroat trout subspecies to maintain viability at the 4th level HUC under current management.

Watershed Code	Watershed Name	15 Year Call	100 Year Call	Comments
14040106	Henrys Fork River	Viable	Viable	
14040107	Blacks Fork River	Viable	Viable	
14040108	Muddy Creek	Viable	Viable	Contingent on private land stewardship
14060003	Duchesne River	no cutthroat trout on forest	no cutthroat trout on forest	surveyed in 2001
16010101	Upper Bear River	Viable	Viable	Loss of a population
16010201	Bear Lake	Off forest	Off forest	No fish on forest
16010202	North Cache Valley	Viable (declining)	Nonviable	Loss of a population
16010203	South Cache Valley	Viable	Viable	Some populations nonviable
16010204	West Wellsville Mountains	No fish	No fish	
16020101	Upper Weber River	Viable	Viable (declining)	Loss of a population
16020102	Ogden Front	Viable	Viable (declining)	
16020203	Provo River	Viable (declining)	Viable (declining)	Loss of populations
16020204	Jordan River	Viable (declining)	Viable (declining)	Loss of populations
16020304	Rush-Tooele Valleys	No cutthroat	No cutthroat	
16020305	Skull Valley area	No cutthroat	No cutthroat	

Amphibians

In the 1985 Forest Plan AMS there are 7 species of amphibians listed (Table AQ-4). Only the spotted frog (*Rana luteiventris*) is on the sensitive species list. The Wasatch Front population was reviewed for listing and found not warranted on 23 August 2002. Boreal toad (*Bufo boreas*) identified as warranted listing but precluded in Colorado is not listed in the Utah portion of its range. Amphibians are probably not a good group of species for monitoring management actions because they appear to be declining across the west in record numbers (Koch et al., 1996). This decline would affect the interpretation of any monitoring results.

Table AQ-4. Amphibians historically present on the Wasatch-Cache National Forest, January 2000.

Amphibians	Scientific Name
Tiger Salamander	<i>Ambystoma tigrinum nebulosum</i>
Great Basin Spadefoot Toad	<i>Spea intermontana</i>
Boreal Toad	<i>Bufo boreas boreas</i>
Boreal Chorus Frog	<i>Pseudaris triseriata maculata</i>
Northern Leopard Frog	<i>Rana pipiens brachycephala</i>
Spotted Frog	<i>Rana luteiventris</i>
Woodhouse Toad	<i>Bufo woodhousei</i>

(Adapted from Lentsch et al. 1995)

Threats identified in the spotted frog 12 month finding, that would be applicable to all amphibians, include loss of habitat (caused by dam and reservoir construction, alteration of drainage patterns, urban and agricultural use of water, and high and bridge construction), introduction of exotic species, lack of inventories of native wetland animals, insufficient impact analysis conducted prior to development and inadequate mitigation activities (Federal Register Vol. 67. No. 169). Loss of habitat is the primary threats to amphibians on the Wasatch-Cache National Forest. This occurs as vegetation around water sources is removed through grazing, recreational use, and timber harvest, or that reduce riparian vegetation and water. As riparian vegetation and water quality and quantity is maintained the amphibians should persist.

There is insufficient information on the current distribution, the species range across the forest or the importance of the Wasatch-Cache National Forest in the conservation of these species to conduct an analysis as to the long-term preservation of amphibian species. It is believed that with the existing standards and guidelines and the identification of riparian habitat conservation areas and the recognition of the importance of riparian areas that amphibians will persist. This assumption is made when viewing that all alternative with the exception of alternative 5 recognize the importance of clean water, riparian habitat and downed large wood than does alternative 4 or the existing conditions (Table AQ-7).

Spotted Frog

Spotted frogs are generally found in small springs, ponds or slough with a variety of herbaceous emergent, floating and submergent vegetation. Spotted frogs emerge from hibernation in the spring and tend to use different habitat. Primary prey for spotted frogs are insects. Historically, spotted frogs were found in the Beaver Creek Drainage, Summit County. Spotted frogs were last found on the WCNF in June 2002 in the Prove River Drainage below Soapstone Creek. Prior to that they a single individual was found in July 1996 at Farmington Ponds in Davis County.

In the status review (Federal Register Vol. 67. No. 169) it states "Given the habitat protection already in place, habitat loss is not likely to put the frog in danger of extinction in the foreseeable future. Overutilization is not viewed as a threat to the species because of current regulations. Disease and predation is a greater concern as a number of non-native fish species have been introduced into the area. On the Wasatch-Cache National Forest fish do not inhabit the ponds where toads are found. Mosquito fish are identified as a primary predator of concern. No mosquito fish are found on Forest. It is currently unknown as to the impact that diseases such as Chytrid fungus may have on the spotted frogs on the Forest. The status review for the Wasatch Front spotted frog, found "the trajectory of the Wasatch Front spotted frog status continue to be towards more secure populations, reduced threats, and improved habitat conditions." Riparian Habitat Conservation Areas around ponds and streams should provide additional protection to the limited number of spotted frogs that are found on the Forest.

Boreal Toad (Western Toad)

Tanner (1931) stated that, "This species is far more common in the northern part of the state than in the southern. It is the common species in the canyons and mountains of central and northern Utah." Boreal toads have been found in the Forest in recent years as far north as Temple Fork, Cache County to Little Cottonwood Creek, Salt Lake County in the south. They have also been found in the headwaters of the Bear River, in the Uinta Mountains. However, they do not appear to be as common as Tanner suggested they were in 1931. The Forest Service

has conducted limited survey work. The Utah Division of Wildlife Resources and the Forest has recently been conducting surveys for boreal toads.

Stebbins (1985) gives a good description of habitat used by boreal toads. They use a wide variety of habitats that range from desert streams and springs, grassland, woodland, and mountain meadows. They live in and near ponds, lakes, reservoirs, rivers, springs and streams and are active at night in warm, low-lying areas; diurnal at high elevations and in the north. Their elevation range is from sea level to over 11,800 feet. Muths et al. (2000) found that boreal toads are also known to travel up to 2.5 km between breeding sites.

Disturbance: Boreal toad eggs are generally laid in vegetation along the edge or in the middle of water. The eggs remain in incubation for up to 40 days in late May and June. During this time, the eggs can easily be crushed through hoof action by cattle or other animals. Toads also seek shelter in vegetation and large wood. If this vegetation is removed, the toads become more easily accessible for predation. The removal of vegetation can also impact the egg survival due to ultraviolet-B radiation from the sun (Blaustein and Wake, 1995). Shading is a critical part of the survival of eggs during incubation.

Tiger Salamander

Tiger salamanders have been found throughout the Forest in a variety of habitat, including stock watering ponds, river and streams and high elevation, pristine lakes. This species is of little value in monitoring management actions because of the diverse conditions in which it can survive.

Great Basin Spadefoot Toad

The Great Basin spadefoot toad inhabits a wide range of habitats from sagebrush flats to the spruce fir timber. Little is known of its occurrence on Forest.

Boreal Chorus Frog

The boreal chorus frog uses grassy ponds, lakes and marshes of prairies and mountains. It is well adapted to humans and is found on many farms (Stebbins, 1985). It would most likely not be a good management indicator because of its adaptability.

Northern Leopard Frog

The northern leopard frog inhabits grasslands, brush lands and woodlands and ranges high into the mountains. It frequents springs, slowly flowing streams, marshes, bogs, ponds, canals and reservoirs, usually where there is permanent water and growth of cattails or other aquatic vegetation (Stebbins, 1985).

Woodhouse Toad

The woodhouse toad frequents a great variety of habitats from grasslands, sagebrush flats, woods, desert streams, valleys, floodplains, farms, and city backyards. It prefers sandy areas near marshes, streams, ponds and irrigation ditches (Stebbins, 1985).

Conservation Approaches

Much of the management of native aquatic and semi-aquatic species involves minimizing risks and threats. We do not fully understand all of the complex relationships that cause these species

to expand or contract their geographic range, how species and individuals act and react to each other and how habitat alterations may affect individuals and populations. Therefore, threat management consists of managing above population-loss thresholds. The further above these thresholds, the more secure a population and species is. There have been several proposals made in the past to minimize the risks for fish and amphibians. These include: (1) The establishment of fish reserves (Rahr et. al., 1998), (Spangler, 1994); (2) The elimination of actions within riparian zones without site specific analysis; (3) The elimination of man's actions within known habitat; (4) The fencing of important areas to preclude livestock, wildlife and human caused trampling.

There are a number of guiding documents, directives and processes currently in-place that will aid in the long-term conservation of aquatic ecosystems and pertinent to the Bonneville and Colorado River cutthroat trout on the Wasatch-Cache National Forest. The existing documents that guide the management of the general water quality conditions may be found in this document. The existing documents that provide direction for the long-term persistence of the cutthroat trout include:

1. "Fish Stocking and Transfer Procedures" of the Utah Division of Wildlife Resources (UDWR 1997). This document set out the general policy and procedures for stocking and transplanting of fish in the State of Utah. In its policy direction it states, "Fish stocking . . . will only be conducted in a manner that does not adversely affect the long-term viability of native aquatic species or their habitat, aids native species conservation, and enhances fish populations in existing aquatic habitats and aids the efficient and effective management of recreational fisheries to provide angling diversity and participation."
2. The Conservation agreement and strategy for Bonneville Cutthroat Trout in the State of Utah" (UDWR 1997). This conservation strategy identifies the major threats and actions to be taken to preserve this species. It is generally a fish management document with minimal emphasis on habitat protection and enhancement.
3. The "Conservation agreement and strategy for Colorado River Cutthroat Trout in the State of Utah" (UDWR 1997). This conservation strategy identifies the major threats and actions to be taken to preserve this species. It is generally a fish management document with minimal emphasis on habitat protection and enhancement.
4. The "Conservation agreement and strategy for Colorado River cutthroat trout (*Oncorhynchus clarki pleuriticus*) in the States of Colorado, Utah and Wyoming" (CRCT Task Force 2001) provides an interagency approach for the conservation of Colorado River cutthroat trout.
5. The "Range-wide conservation agreement and strategy for Bonneville cutthroat trout (*Oncorhynchus clarki utah*)" (Lentsch et al. 2000) provides a interagency approach for the conservation of Bonneville cutthroat trout across its range.
6. The Final Environmental Impact Statement on Rangeland Health (WCNF, 1996), as ammended with this EIS, provides recognition of the value of waters with native cutthroat trout. These waters are containing native cutthroat are identified class I

riparian values.

7. The goals, standards and guides in this document also provide conservation measures along with the Forest Service Manual section 2600. As part of this direction, prior to approval of any ground disturbing activity, a biological evaluation/assessment must be prepared. This document must then be signed by the botanist, terrestrial and aquatic ecologists identifying the consequences of those activities.
8. A major action that has taken place is merely the general recognition of the value of the streams on the Wasatch-Cache National Forest to the long term preservation of the cutthroat trout in the states of Utah and Wyoming. In Alternative 7 this had been done by designating all areas inhabited by cutthroat trout as prescription 3.1A riparian. This sets forth the objectives for the area and the importance of the Wasatch-Cache National Forest in preserving these species. A 3.1A designation was also placed on the lower Provo River to recognize the importance of the spotted frog populations found there.

In an effort to address the threats to aquatic and semi-aquatic species, the Forest staff reviewed all existing and proposed standards and guidelines. This review is documented in a 10 July 2002 white paper by Paul Cowley, the Forest Fish Biologist. The WCNF has authority and direction to implement some if not all of the actions identified in the above documents 2 through 8, through cooperation with the Utah Division of Wildlife Resources and Wyoming Game and Fish. We also have provided input into activities relating to document 1. The Forest Plan, when approved, is expected to provide additional direction and conservation measures for reducing risks and threats. Item 8 will be implemented if alternative 7 is selected along with prescription category specific standards and guidelines.

Environmental Consequences

Effects on Aquatic and Semi-aquatic Species and Their Habitat from Timber Harvesting.

The factor used to compare alternatives is the amount of land tentatively suitable for timber harvest and allowed (by prescription) across the forest. Timber harvest which is allowed in management prescription 3.1A, 3.1W and 3.2D is not included because it is assumed that actions would be carried out to meet aquatic habitat or watershed improvement/restoration purposes only and to implement a project that would impact these resources would not meet the objective of the prescription. The greatest potential impact as timber harvest occurs is from additional road construction that often requires stream crossings. This increases the potential for direct and indirect mortality to aquatic and semi-aquatic species. Direct mortalities occur, due to surface compaction, as roads are constructed through areas where frogs may hibernate. Eggs of both fish and amphibians are impacted as sediment from roads covers and suffocates them. Indirect impacts occur as concealment areas and shade is lost and water temperatures increase. Predators, because of increased access, may also find it easier to locate these species. Alternatives 4 and 5 have the greatest potential impact followed by Alternative 3, 7, 6, 2 and 1 in that order (Table AQ-5). Alternative 7 would have about the same level of impact as alternative 3 with 3.1 prescriptions being applied to all cutthroat trout populations.

Proposed standards and guidelines for location and design of timber harvest activities can reduce impacts to aquatic habitat. Guideline 3 limits percent of equivalent clearcut area based on stability ratings at the 7th HUC level. This should decrease the potential for excessive runoff and soil movement preventing sediment impacts described above. Guideline 4 maintains large woody debris naturally found in riparian zones after projects are implemented, thus protecting concealment areas and shade. Guideline 65 allows for the removal of trees, in other than suitable lands, for restoration activities. These are an important part of riparian habitat improvement where conifer cover can be removed to allow aspen regeneration with subsequent benefits to aquatic habitats from increased beaver activity.

Timber sale contract also provide additional, site-specific direction prior to implementing the projects.

Table AQ-5. Acres of the Wasatch-Cache National Forest, which are available for commercial timber harvest, vegetation treatments, road construction, wildland fire, use, the development of new recreational facilities and prescribed fire. Acreages are in thousands of acres (e.g., 122=122,000)

Activity	Alternatives						
	1	2 ⁽¹⁾	3 ⁽¹⁾	4	5	6 ⁽¹⁾	7
Commercial Timber Harvest	0	122	336	757	754	162	393
Total Suitable Grazing Acres	278	252	300	300	300	288	286
Maximum Suitable Grazing Acres in Respect to Capable Grazing Acres (%)	75%	68%	76%	76%	76%	75%	75%
Vegetation Treatment	0	783	879	930	932	859	740
Acres Where Road Construction is Allowed	3	279	494	793	799	317	555
Wildland Fire Use	1,239	1,238	1,239	997	951	1,238	1,225
New Recreation Development	0	291	467	795	803	333	284
MPC 1.1-1.4	309	309	309	309	309	309	309
MPC 1.5	389	146	51	0	0	69	61
MPC 2.4	6	6	5	6	5	6	6
MPC 3.1 or 3.1A and W	138	182	159	106	70	186	190
total for above MPC	842	643	524	421	384	570	566

MPC=Management Prescription Category

⁽¹⁾ Road building numbers are less than shown as roadless areas are excluded from road construction.

Effects on Aquatic and Semi-aquatic Species and Their Habitat from Livestock Grazing.

Direct effects on aquatic and semi-aquatic species from *livestock* grazing include the trampling of eggs and juvenile fish. Cutthroat and rainbow trout eggs are in the gravel from mid May through mid August. There is sufficient overlap in the grazing season that direct mortality can occur as cattle and sheep cross through the streams. Indirect impacts can consist of loss of overhanging vegetative cover, loss of bank stability, increase sedimentation, and increases in temperature and stream width. Potential threats from grazing have been identified by “head

month use per mile of stream” in a sixth code HUC analysis (see FEIS Appendix B). Field observations validate that higher use levels do affect riparian habitat conditions. This information will assist in identifying the highest priority needs for revising allotment management plans from an aquatic habitat perspective. Additional adjustments may need to take place during allotment management planning to reduce threats and provide for the conservation of these aquatic and semi-aquatic species and to protect watershed conditions.

A number of measures can be taken to reduce the threats to aquatic and semi-aquatic species and their habitat from livestock grazing including changes in timing, season of use, and standards and guidelines for aquatic habitat. Steps taken to reduce potential threats in all alternatives through the Revised Forest Plan are: (1) the riparian class rating system used to set stubble heights recognizes the importance of conserving species-at-risk; (2) riparian class 1 requires a stubble height of 5 inches on key species and sets utilization standards for range in satisfactory condition; (3) in areas mapped with prescription 3.1A, grazing livestock must meet the standard for riparian Class 1 utilization; (4) a guideline to modify grazing practices that prevent attainment of desired future conditions for vegetation and/or aquatic resources. Site-specific desired conditions can also be developed.

The following are steps taken to reduce threats to aquatic and semi-aquatic habitats that vary by Alternative in this FEIS. Alternative 2 removes approximately 26,000 acres of 6th order watersheds within seven allotments (Blacks Fork, Gilbert Creek, Logan Canyon, Middle Fork, Poison Mountain, Walker and West Fork Smiths Fork) from the suitable range acres. These watershed have both existing populations of Colorado River or Bonneville cutthroat trout and at least 20 acres of riparian acres identified in the INFRA database as either estimated or verified as not meeting Forest Plan objectives. Livestock grazing would be removed from these areas for achievement of site-specific objectives developed to meet needs for these fish populations. Effects on aquatic habitats in these areas would be positive with full rehabilitation expected because livestock grazing could be removed from these large contiguous areas and riparian areas are known to improve relatively rapidly with exclusion of livestock grazing. No other alternatives remove entire portions of watersheds within allotments.

In Alternatives 1, 2, 3, and 6 about 2,100 acres of riparian habitat not meeting objectives are subtracted from suitable grazing acres to achieve rehabilitation of these areas. Rehabilitation of these areas will vary depending on effectiveness of herding, salting, and/or fencing of these areas to prevent livestock grazing. Effects on aquatic habitats would be positive with a range of results from full rehabilitation to slower and less consistent improvement in areas with difficult or expensive livestock management needs. Without site-specific information the exact improvement probability for each area is not known. In Alternative 7 only, rehabilitation of these riparian areas is achieved through implementation of a lower forage utilization allowance (30-40% rather than 50%) on the areas. This will require monitoring and movement of livestock upon reaching the lower utilization. Improvement of aquatic habitats would be more consistent overall than in Alternatives 1, 2, 6, and 3 because a lower utilization standard could be applied to all the areas more easily than total avoidance of the areas. However, even this approach's success will depend on diligence in herding, salting, range improvement maintenance, and monitoring of utilization. Alternatives 4 and 5 do not remove areas in unsatisfactory condition nor do they implement a lower forage utilization allowance for these areas. Some improvement of these areas is expected through implementation of management direction from the 1996 Rangeland Health Amendment, however it is expected that it would be more gradual and less

consistent than in any of the other Alternatives. Slow progress would be expected in rehabilitating unsatisfactory aquatic and semi-aquatic habitats.

Closure of vacant allotments provides long-term aquatic habitat benefits including maintenance of watersheds, and maintenance of ungrazed riparian habitat conditions for strongholds and benchmarks. The relative amount of aquatic and semi-aquatic habitats within vacant allotments defines the degree of benefit. Given that the Allotments are currently vacant, there is no immediate or direct effect on aquatic and semi-aquatic habitats from these allotment closures. It is also important to note that experienced budget levels in recent years have been inadequate to complete site-specific analyses on active allotments, making vacant allotments an even lower priority for analysis. Even in alternatives where vacant allotments are left open, it is highly unlikely that resources would be available to conduct the required site-specific analysis for re-introducing livestock grazing. Therefore, the short-term on-the-ground consequences of these alternatives would be similar to closure- i.e. the vacant allotments would remain in ungrazed condition. Given this, closure of vacant allotments is considered only as a long-term effect. Alternatives 1 and 2 provide the most long-term aquatic habitat benefits closing all vacant allotments. Alternative 7 provides somewhat less long-term benefits than 1 and 2 because it focuses closures only on Salt Lake and Davis County watersheds and on the three vacant allotments in the Eastern Uinta Mountains Management Area. Alternative 6 provides the long-term benefits for these three allotments but not for the other vacant allotment areas. Alternatives 3, 4, and 5 do not close vacant allotments thus not providing for long-term benefits although as explained above, short-term the allotments would likely continue to remain in ungrazed condition accruing those aquatic and semi-aquatic habitat benefits for the short-term.

Effects on Aquatic and Semi-aquatic Species and Their Habitat from Travel Management.

The greatest potential impact as travel management occurs is the form of additional public access, unauthorized road and trail development and road construction that often requires stream crossings. This increases the potential for direct and indirect mortality to aquatic and semi-aquatic species. Direct mortalities occur, due to surface compaction, as roads are constructed through areas where frogs may hibernate. Eggs of both fish and amphibians are impacted as sediment from roads covers and suffocates them. Indirect impacts occur as concealment areas and shade is lost and water temperatures increase. Predators, because of increased access, may also find it easier to locate these species.

The primary factor used to compare the alternatives is the area where road construction is allowed. It is recognized that the total additional miles of road to be constructed will be far less than what could be perceived by the use of acres where road construction is allowed. Alternative 1 has the least land available for road construction and would minimize the threats to aquatic species and their habitat. Alternatives, in order of least threat to greatest potential threat, are 1, 2, 6, 3, 7, 4 and 5 (Table AQ-5). Trail development is assumed to be similar to road construction in the degree of potential impacts. Alternative 1 has the fewest acres where new trails would be allowed and Alternative 5 has the greatest potential for new trails. Alternative 7 does provide additional benefits with only crossings being allowed in MPC 3.1A and a stronger emphasis on providing prescription direction for MPC 3.1A both inside and outside of roadless areas.

Under all alternatives it is assumed that efforts will be made to reduce impacts associated with existing roads. Alternative 2 is the most aggressive in restoring properly functioning conditions associated with existing roads.

Changes in amount, location, and design of trails and roads could allow recovery of riparian and stream channel functioning condition. Standards and guidelines that provide direction include: (S2) runoff will be controlled; (S3) unclassified roads and trails will be closed; (S4) sources of chemical and pathogenic pollutants will be stored correctly (this refers to oils and fuels used in heavy equipment); (S16) all decommissioned road/trails will be properly drained; (S19) new roads and trails will be constructed to minimize sediment discharge; (G4) beneficial volumes of large woody debris will be maintained in riparian areas; (G28) stream crossing will provide for desirable aquatic passage; (G40) effects from constructing roads and trails are to be minimized with regard to species-at-risk and their habitat; (G41) access routes will minimize impacts to riparian vegetation and in channel habitat; (G42) water supply points and supply points will be identified and controlled; and (G43) while grading roads, sidecasting will be minimized in order to reduce the amount of material entering the stream course.

Effects on Aquatic and Semi-aquatic Species and Their Habitat from Recreation Management.

The impacts from recreation are in the form of loss of riparian vegetation from bank trampling, bank destabilization, removal of large wood, and direct fuelwood harvest. This increases the potential for direct and indirect mortality to aquatic and semi-aquatic species. Direct mortalities occur as people are attracted to the waters edge to play, explore and fish. Eggs of both fish and amphibians are impacted as sediment from disturbed banks covers and suffocates them. Harvest of fish and amphibians also has a direct impact on populations. Indirect impacts occur as concealment areas and shade are lost and water temperatures increase.

Listed in order of increasing level of threat from potential recreational development are Alternatives 1, 7 and 2, 6, 3, 4, and 5. Alternative 1 has no new recreational facilities while two new facilities are allowed in the other alternatives. The major difference between alternatives is the differing number of acres where new facilities may be allowed (Table AQ-5). By limiting the acres where new facilities are allowed the potential impacts from the new facilities should also be limited.

With existing facilities, under all alternatives it is assumed that efforts will be made to reduce impacts from developed recreational facilities. This assumption is based on what has been accomplished over the last 15 years with a number of sites being moved away from the stream and concentrated closer to roads within developed sites. Alternative 2 is the most aggressive in reducing impacts to aquatic ecosystems. It is assumed, that some of the greatest threats to aquatic resources from recreation will come in the form of undeveloped recreation. As trailers are improved to carry increased volumes of water, with higher clearance and the public search for less urbanized setting, more people will be looking for area away from campgrounds to stay for extended periods. This is especially true as construction of new recreation facilities slows or stops.

Areas under special use permit can also have effects on aquatic resources depending on the degree to which they allow activities and facilities with direct and indirect effects on habitats. These vary in hydroelectric plants, ditches for irrigation withdrawals, ski resorts, and summer homes. Most of these impacts will continue in place. Alternative 4, implementing the 1985 Forest Plan provides the most restrictive and specific direction for special uses. Site-specific management plans and permit conditions will be the primary tools to provide protection of aquatic resources in these areas under other alternatives and the Revised Forest Plan.

Changes in amount, location and design of recreational facilities including campgrounds and trailheads may allow recovery of riparian and channel functioning condition. Excluding users from rehabilitated sites adjacent to streams and campgrounds is becoming increasingly difficult. Even with fences it is sometimes difficult to exclude the public from these areas. Standards and guidelines identified for the protection of aquatic resources include: (S19) new facilities will be constructed to minimize sediment discharge; (G4) beneficial volumes of large woody debris will be maintained in riparian areas; (G40) effects from constructing facilities are to be minimized to protect species-at-risk and their habitat; (G42) water supply points will be identified and controlled; (G48) facilities will be designed, constructed and operated to minimize adverse effects; and (G50) if riparian objectives cannot be met, the plan directs the period, type and location of use to be adjusted.

Effects on Aquatic and Semi-aquatic Species and Their Habitat from Vegetation Treatment (Excluding Timber Harvest and Wildland Fire Use and Prescribed Fire).

Vegetation treatments can have a positive or negative impact on aquatic systems depending on the treatment and how and under what conditions it is implemented. Treatments could include prescribed fire, thinning, seeding, and cut and scattering or cut and let lay vegetation. For aquatic systems this can have a positive affect by restoring properly functioning conditions in riparian zones across the forest. Although alternative 2 has fewer acres available for vegetation treatments than Alternatives 5, 4, 3, and 6 the focus would be directed more towards riparian restoration and not just fuels reduction which may be the emphasis in other alternatives. For aquatic ecosystems, Alternative 2 emphasizes restoration efforts for aquatic and terrestrial systems. The major treatment would be the removal of conifers in areas that were historically dominated by aspen. This would allow for beavers to re-colonize areas they historically used. Beaver have been identified as a management indicator species, which will allow for effectiveness monitoring of vegetation treatment in riparian habitat conservation areas. Alternative 2 is therefore identified as the most beneficial for aquatic resources. Alternatives, listed in order of greatest to least opportunity, or area available for vegetative treatment beneficial to aquatic species, are Alternatives 2, 5, 4, 3, 6, 7, and 1 (Table AQ-5).

Effects on Aquatic and Semi-aquatic Species and Their Habitat from Oil and Gas Activities

(Note: The following description of effects relates only to the area identified as “the appeal settlement zone” as described in Topic 9. It is estimated to be about 68,300 acres).

The decision being made in the Forest Plan affects new leases only. No existing leases are affected. In all alternatives (except Alternative 4), 19,000 currently leased acres in the Table Top

Unit, could be explored with possible effects to soil and water resources. The degree to which exploration is predictable within the Table Top Unit is affected by whether or not new leases could be issued and what stipulations would be included in those leases.

Fish resources could be affected by the construction of access roads and well pads. Effects could be short-term decrease in fish productivity due to increased stream sediment loads from new crossings and road construction. All alternatives also carry some risk of direct mortality to fish if toxic materials are accidentally spilled into streams. The application of lease terms, stipulations and mitigation to protect water quality and riparian habitats reduce the risk of effects on fish habitat.

Though Alternative 1 does not allow new leasing in the Appeal Settlement Zone, development of existing leases within the Table Top Unit could affect aquatic and semi-aquatic species as a result of oil and gas exploration activities on an estimated 20 acres (Table OG-2). Impacts could be also result from oil and gas development on private minerals. As existing leases expire, lands would no longer be available for leasing and the threat to aquatic species would be reduced.

Alternative 2 is very similar to Alternative 1. Again, development of existing leases within the Table Top Unit could disturb about 20 acres (Table OG-2). Once existing leases expire, leasing availability in areas recommended for wilderness is precluded. On remaining available acres, new leases could be issued but surface occupancy would not be allowed. The potential effects from new leases to aquatic and semi-aquatic species would not increase with this leasing option.

Alternative 3 precludes leasing in areas recommended for future wilderness designation in the future and does not allow new leases with surface occupancy in areas managed for undeveloped and backcountry recreation values and terrestrial habitat (see Prescriptions 2.6, 4.1, 4.2, and 3.2). Additional new leases could be issued outside the areas listed above with stipulations applied to protect sensitive resources. An estimated 10,500 acres are available under Standard Lease Terms. Oil and gas activities are estimated to disturb about 75 acres (Table OG-2). Some of this development is predicted on existing leases within the Table Top Unit. Within the large areas that allow no surface occupancy, the effects to aquatic and semi-aquatic species are not increased; however, because this alternative allows occupancy on about 12,900 acres, the chances for adverse impacts are not totally eliminated.

Alternative 4 does not make a leasing decision. Because lessees would not be able to effectively develop a field should one be discovered due to nearby unleased parcels, future activities are not likely. No effects to aquatic and semi-aquatic species are predicted.

Alternative 5 would provide for leasing with standard lease terms and therefore provide the greatest opportunity for full field development. Oil and gas activities are estimated to disturb about 105 acres (Table OG-2). Some of the effects could last 20-30 years because of field development. Standard Lease Terms include moving the site up to 200 meters (656 feet) if the site could be better located. This would allow for location outside the Riparian Habitat Conservation Area (RHCA). Although this leasing option appears to have the highest potential to result in adverse impacts to surface waters, compliance with the Clean Water Act and implementing State and Federal regulations is mandatory. This leasing option is the least restrictive and offers the greatest potential threat to aquatic and semi-aquatic species.

In Alternative 6 leasing availability is precluded in areas recommended for wilderness. In new leases issued as a result of the leasing decision made in the plan revision, surface occupancy is not allowed. However, existing leases in the Table Top Unit that expire would be immediately renewed in areas not precluded by management plan direction. Leases would be renewed in areas managed for motorized recreation values and terrestrial habitat. Oil and gas activities are estimated to disturb about 75 acres (Table OG-2). Some of this development is predicted on existing leases within the Table Top Unit. In this alternative most areas are leased with no surface occupancy. In areas leased that allow surface occupancy, wetlands and riparian areas over 40 acres are protected in new leases with no surface occupancy so the effects to aquatic and semi-aquatic species are similar to Alternative 2. Leasing stipulations would also provide protection of stream environments.

Alternative 7 would preclude leasing on 20,400 acres recommended for wilderness. On the remaining 47,900 acres available for leasing, surface occupancy would be allowed on 27,000 acres. Of this acreage, oil and gas activities are estimated to disturb about 85 acres (Table OG-2). Areas associated with field development could be affected for 20-30 years. Some development (included in the 85 acre estimate) is predicted within the Table Top Unit because of existing leases and new leases being offered with surface occupancy.

Alternative 7 is the second least restrictive and offers a higher potential risk to aquatic and semi-aquatic species than most other alternatives. Oil and gas well pads would be required to be outside the Riparian Habitat Conservation Area (RHCA); however, the risk for adverse impacts would not be totally eliminated. Road crossings would also introduce additional risk to aquatic habitats.

Ranked by potential threats, alternative 4 would have the least threats followed by alternatives 1 and 2, 6, 3, 7, and 5 (Table AQ-7). Alternative 6 does allow surface occupancy on 3,600 acres where alternative 3 allows for surface occupancy on 12,900 acres, and thus alternative 3 poses a greater threat.

Effects from oil and gas activities will be reduced as standards and guidelines are followed. Standard 1 (S1) allow not surface occupancy on slopes greater than 40%. S2 applies runoff controls. S4 provides direction to reduce potential spills. S27 requires the Forest to follow the standard lease term of which some allow greater aquatic resource protection. G6 allows for the use of best management practices to meet water quality guidelines. G7 precludes soil-disturbing activities in wetlands or riparian area.

Effects on Aquatic and Semi-aquatic Species and Their Habitat from Fire Management Activities

Fire management activities include wildland fire use, prescribed fire and fire suppression. Wildland fire use is the allowing a naturally ignited fire to continue to burn when other resource goals are being met and the fire is within designated parameters. Prescribed fire is where the Forest Service ignites a fire to meet specific resource objectives and the burn takes place within designated parameters. Parameters, under which prescribed and wildland fires take place, are identified as part of the NEPA process on a site-specific basis and will provide the necessary levels of protection to preserve aquatic species. It is assumed that while in prescription aquatic

resources are protected. Both wildland fires and prescribed fires have been known to burn out of prescribed parameters and be reclassified as wild fires therefore the effects are treated as part of the effects of wildfire and fire suppression.

Effects from fire and fire suppression activities include direct mortality and indirect effects. Mortality can come from overheating the water to lethal levels, the dropping of retardant into water bodies causing death and the running of equipment through streams crushing eggs. Indirect effects range from dewatering eggs as water is siphoned for suppression efforts to increased sedimentation and debris flows.

During wild fires the greatest threats to aquatic ecosystems comes in the form of fire suppression activities and/or when a fire burns extremely hot causing the soil to become hydrophobic, and runoff potential increases. In an ideal world, if a fire were to start a resource specialist or specialists would be called in to provide information to the fire management team to help reduce impacts to all resources. A Forest-level fire management plan would be in place listing all of the objectives and standards and guidelines that would need to be followed to protect forest resources. Site-specific information would also be available to make good decisions. It is important to understand that this is not the case. History has shown that fire suppression activities can cause substantial aquatic damage. They range in impact from direct mortality, from air tanker slurry drops, to loss of riparian vegetation as camps are constructed adjacent to streams.

All alternatives are essentially the same in regards to wildland fire use with the exception of Alternative 5, which does not allow wildland fire use in MPC 5.2. The increase of wildland fire use should decrease the potential threats from wild fire and therefore threats from wild fire suppression actions. All alternatives are essentially equal with the exception of Alternative 5 as identified above.

Effects on Aquatic and Semi-aquatic Species and Their Habitat from Management Prescription Categories

Management prescriptions can reflect the direction and emphasis across the landscape. Emphasis of and activities allowed within the prescription can directly affect aquatic resources. It is assumed that if an activity is not allowed in an area there is less threat to aquatic species. (In aquatic environments, this assumption is not true in cases where species diversity has been altered by the stocking of fish in areas outside their historic range. In this case lack of action may cause additional threats to a population of historically present fish.) The more activities allowed in a management prescription, the greater the threat. Prescription emphasis and the standards and guidelines associated with a prescription may reduce threats from land management activities.

The prescription providing the greatest reduction in threats is 2.4, research natural areas. No timber harvest, vegetation treatments, road building, grazing or new recreation development is allowed. Prescriptions 1.1-1.5, wilderness and proposed wilderness, along with prescription 2.6, undeveloped areas, also provide a high level of threat reduction in excluding timber harvest, vegetation treatments, road construction and new developed recreational facilities. Management prescription 3.1 also provides a high level of threat reduction. With the emphasis of the

prescription being on “protection, maintenance and or restoration of quality aquatic habitats, water shed conditions...” threats in this prescription should be significantly reduced.

To assess the affects of management prescriptions on aquatic species, the number of acres were summed for prescription categories 1.1-1.5, 2.4 and 3.1 and compared. Most of the acres gained in Alternative 1 are in proposed wilderness. Alternative 1 has the most acres in the combined prescriptions followed by Alternatives 2, 6, 7, 3, 4, and 5. Alternatives 2 and 7 also provide recognition for all populations of cutthroat trout.

Non-native Species and Other Threats

Additional threats also include non-native species, over utilization and accidents. Changes in fish stocking, treatment, and harvest limits are typically state actions. The Forest Service provides comments and may assist but leaves the general everyday fish management actions up to Wyoming Game and Fish and Utah Division of Wildlife Resources. Increased participation has come in these discussions and decisions through Regional Advisory Councils and conservation agreements and strategies for the Bonneville cutthroat trout, Colorado River cutthroat trout, and the spotted frog.

Nonnative species pose a threat to the aquatic species of the Wasatch-Cache National Forest. These include but are not limited to brook trout, rainbow trout, brown trout, *Myxosoma cerebralis* (whirling disease) and the New Zealand mud snail (*Potamopyrgus antipodarum*). These threats come in the form of competition for space and food, predation, interbreeding and crippling deformities.

Over utilization through scientific collections and harvest can also impact populations especially when combined with habitat lost and isolation of populations.

Accidents also have the potential to impact populations. These vary from vehicles going into stream channels along some of the major rivers, to flushing of water holding tanks with chemicals, to opening head gates on reservoirs and dropping water levels. All of these situations have occurred on or near the Forest. Little can be done about these threats through forest planning.

Fishery Enhancement

Fishery enhancement work ranges from altering channel configuration to fish interpretive signing. Other actions may include, but are not limited to, the installation of bank protection structures, pool formation structures, spawning gravel, fencing to exclude livestock, planting of riparian vegetation, installation of migration barriers to exclude exotic species and/or the chemical treatment of streams to remove non-native fish. It could also include the stocking of sterile fish versus reproductive fish. Some of these efforts are conducted by the states of Wyoming or Utah.

Construction and maintenance of barriers to prevent exotic species expansion and coordination with the State on aquatic species management could reduce potential impacts from exotic species. In an effort to reduce threats from non-native species, the State of Utah will now be

stocking with sterile rainbow or the appropriate subspecies of cutthroat trout (personal communication, Tom Pettengill, UDW sport fish coordinator, March 13, 2001.) The state of Utah is also working to develop sterile brook trout for stocking. In some of the identified potential sites for expanding cutthroat trout populations (Table AQ-6), which receive a high level of recreational fish pressure and where cross breeding has not occurred, an alternative may be to shift to stocking sterile fish to meet the recreational demand and alter fishing regulations to provide greater conservation of the native population.

The potential to reduce threats and expand populations of native species is being addressed. The Forest Service has identified a number of areas where opportunities exist to coordinate with the states of Utah and Wyoming to expand native fish populations (personal communication with Paul Thompson, March 15, 2001)(Table AQ-6). The areas are located in a number of drainages. Alternative 2 identifies the greatest number of expansion areas for aquatic species that are mapped as 3.1 in the selected drainages. Alternative 6 and 7 would not recommend expansion into the Smith-Morehouse Drainage. Alternative 1 would be the most restrictive with the largest amount of recommended wilderness. Alternatives 3-5 do not identify streams recommended for population restoration. These alternatives, however, do not preclude restoration from occurring in any drainage. Most of the treatment and removal streams were identified in an effort to expand existing meta-populations. The exception to this is the South Fork of the Weber River. Currently a natural barrier exists on this stream that would allow a population to be established above this area.

Table AQ-6. Potential restoration area for Bonneville cutthroat trout by alternative.

Drainage	Stream	Alt. 2	Alt. 6	Alt.7
Hayden Fork	Hayden Fork Drainage	Yes	Yes	Yes
West Fork Bear	Whitney Reservoir	Yes	Yes	Yes
Logan River Drainage	Temple Fork	Yes	Yes	Yes
	Beaver Creek ⁽¹⁾	Yes	Yes	Yes
Ogden River	Causey Reservoir Tributaries	Yes	Yes	Yes
Weber River Drainage	South Fork Weber	Yes	Yes	Yes
	Smith-Morehouse Reservoir and above	Yes	No	No

(1) The majority of this work would need to be conducted on the Caribou National Forest in Idaho.

Cumulative and Viability Effects Summary.

Alternative 2 provides the best balance of protection and restoration opportunities for aquatic and semi-aquatic species (Table AQ-7). The individual ratings for Table AQ-7 are explained in the above narratives. Alternative 1 ranks out high as an alternative that provides for aquatic and semi-aquatic species but there are some difficulties in restoration efforts. Alternative 1 would make it very difficult to actively restore aspen stands adjacent to streams or to install migration barriers to preclude non-native fish because it depends entirely on natural processes. Alternatives 6 and 3 allow for restoration work but they provide less emphasis on aquatic restoration and protection. Alternatives 4 and 5 provide the least emphasis on protection of native aquatic and semi-aquatic species.

Table AQ-7. Ranking of Wasatch-Cache National Forest's alternatives by threats with 1 being least threat for aquatic and semi-aquatic species and 7 being greatest threat. If two or more alternatives are equal the ranking were averaged.

Potential threats affected by Wasatch-Cache NF management	Ranking of effects, compared to current, from changes by alternative						
	Alt 1	Alt 2	Alt 3	Alt 4	Alt 5	Alt 6	Alt 7
Timber	1	2	5	6.5	6.5	3	4
Grazing	2	1	4.5	6.5	6.5	4.5	3
Travel Management	1	3	5	6	7	4	2
Recreation Management	1	2	5	6	7	3	4
Special Uses	4.5	4.5	4.5	1	4.5	4.5	4.5
Vegetation Treatment (excluding fish and timber action)	6	1	4	3	2	5	7
Oil and Gas	2.5	2.5	5	1	7	4	6
Fire Management Activities	3.5	3.5	3.5	3.5	7	3.5	3.5
Management Prescription	1	2	5	6	7	3	4
Fish Enhancement	5.5	1	5.5	5.5	5.5	2.5	2.5
Overall average	2.8	2.3	4.7	4.5	6.0	3.7	4.1

The viability assessment for native fish (Appendix B and summarized above), with emphasis on the Bonneville cutthroat trout and Colorado cutthroat trout, indicates that the native fish species are expected to persist on the WCNF for the next 100 years even under current risks and threats (Alternative 4). Comparison across alternatives is, therefore, based on the effects and cumulative effects analysis presented above, including the differences in the level of threats that would be addressed under each alternative, as presented in Table AQ-7. The overall average is used to provide a sense of difference between alternatives. No weighing of individual threats has been done because any one factor could be sufficient to cause the loss of a population. The difference in effects on viability would therefore be the same as identified above for cumulative effects. All of the Alternatives, except Alternative 5, would result in either a similar to or at reduced levels of threats and would therefore result in continued persistence of the species.

Of these, Alternative 2 would be expected to provide the most beneficial effect to the viability of the species, followed by Alternatives 1, 6, 7, 3, and 4, in that order. Alternative 5 would result in an increase over the current level in risks and threats to the populations. Persistence is possible under Alternative 5, but the potential for losses of species is greatest due to the greatest potential for threats to populations and their metapopulations.

It is important to recognize that the threats identified in Table AQ-7 are merely a ranking and not absolute numbers. A ranking of 6 in the grazing row is not equally equated to a ranking of 6 in the recreation row. It should also be recognized that the threat differences between rankings of 1 to 2 in grazing may be significantly different than the threat difference between a ranking of 2 to 3. The rankings are just that, a ranking.

The standards, guidelines, and monitoring and implementation measures that were developed for the Revised Plan to minimize risks and threats for species viability have been identified (Table AQ-8), as previously discussed in the effects discussions with the exception of general protection as identified below. These include standards pertaining to watershed health.

Table AQ-8. Standards and Guidelines in the Revised Plan Pertaining to Threats

Threat	Reference #
Timber Harvest	G3, G4, G65, G3.1A1,
Domestic Livestock Grazing	S23, S24, G67, G71, G72, G3.1A2
Travel Management	S2, S3, S4, S16, S19, G4, G28, G40, G41, G42, G43, G3.1A3
Recreation Management	S19, G4, G40, G42, G48, G50, S3.1A1, S3.1A2, G3.1A3, G3.1A4
Oil and Gas Activities	S1, S2, S4, S27, G6, G7
Fire Management	G35, G3.1A1, Wasatch-Cache Fire Management Plan.

