# Management Plan for Conservation of Bonneville Cutthroat Trout In Idaho

Prepared by

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## EXECUTIVE SUMMARY

The purpose of this document is to review relevant biology, describe current status, identify potential factors affecting status, and provide a prioritized list of strategies that when implemented will conserve native Bonneville cutthroat trout *Oncorhynchus clarkii utah* in Idaho. This management plan was jointly authored by the Idaho Department of Fish and Game and the U.S. Department of Agriculture, Forest Service.

The historical range of Bonneville cutthroat trout includes portions of Idaho, Wyoming, Utah, and Nevada. About 14% (899 miles) of the historical river and stream habitat occurs in Idaho. Within the Idaho portion, Bonneville cutthroat trout currently occupy an estimated 63% (565 miles) of the historically available river and stream habitat (Figure 1). Status for the remaining Idaho streams was classified as 30% unknown, 6% extirpated, and 1% non-fish bearing.

Status of Bonneville cutthroat trout in Idaho was assessed by compiling existing information from state, federal, and private entities. General conclusions from that review are: 1) Bonneville cutthroat trout occupy most of the available tributary habitat in the Bear River Drainage, 2) the most abundant and well distributed populations occur in the Logan, Cub, and Thomas Fork River tributaries, 3) many of the remaining tributaries support fish at relatively low densities, 4) extirpations appear to have occurred in five tributaries of the Bear River, 5) existing data and monitoring efforts describe primarily resident (or isolated) populations, 6) future monitoring should incorporate fluvial populations that occur in the mainstem Bear River and, 7) several conservation opportunities exist within the range of Bonneville cutthroat trout in Idaho to maintain and improve habitat and population conditions.

Conservation strategies focus on preserving genetic integrity, reducing impacts of non-native fish, improving degraded habitat, and enhancing self-sustaining populations. This document concludes with an action plan of prioritized conservation measures that will contribute to the long-term persistence and enhancement of Bonneville cutthroat trout populations in Idaho.

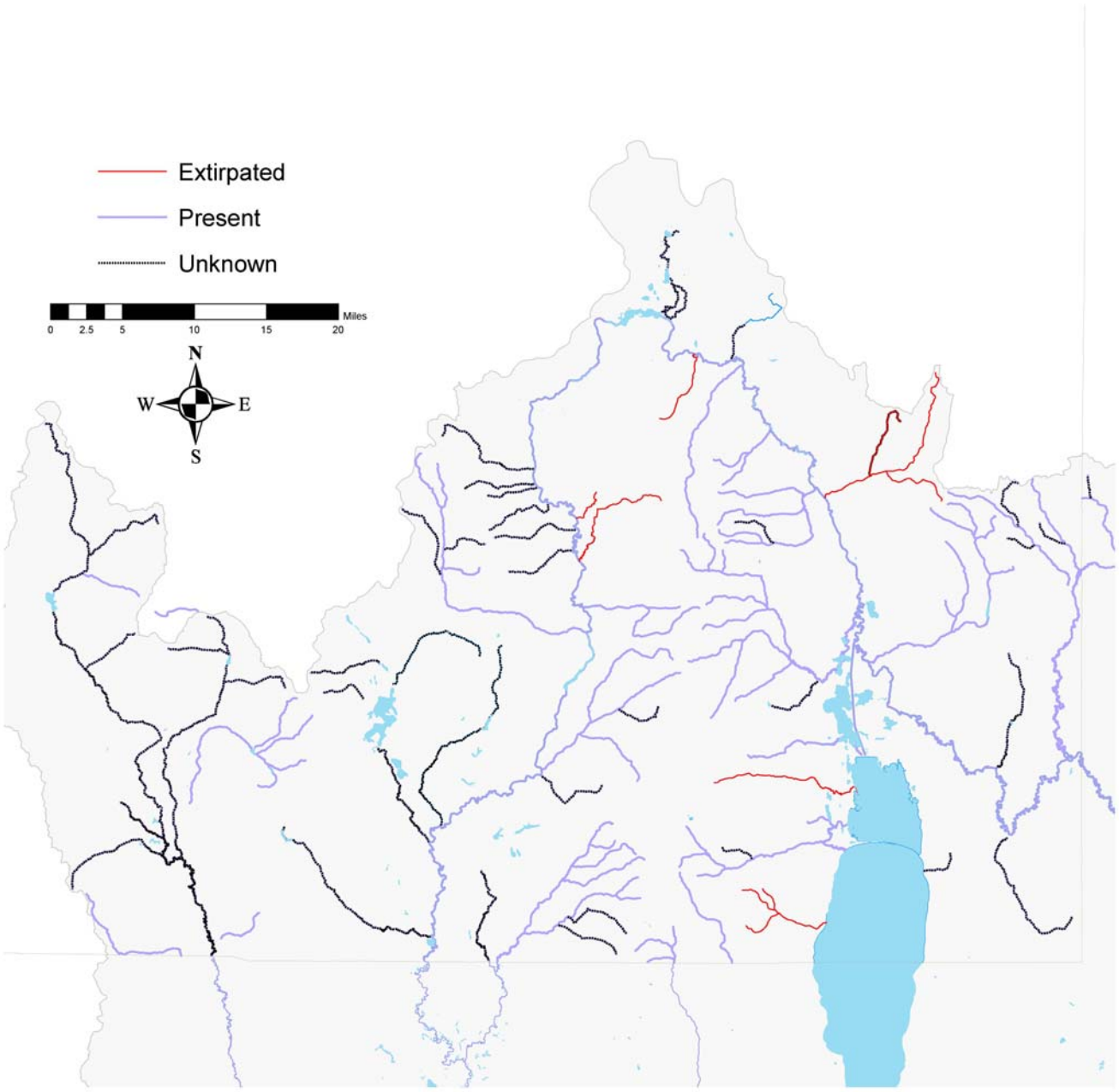



Figure 1. The historical range of Bonneville cutthroat trout in Idaho. About 14% (899 miles) of the historical range occurs in Idaho. Within Idaho, Bonneville cutthroat trout occupy an estimated 63% (565 miles) of the historical range.

# GOAL AND OBJECTIVES

## Goal

Ensure the long-term viability and persistence of Bonneville cutthroat trout within its historical range in Idaho at levels capable of providing angling opportunities.

## Objectives

Preserve genetic integrity of existing populations

Conserve genetic diversity and provide for genetic exchange

Improve degraded habitats

Reduce impacts of non-native fish species

Develop recreational fishing opportunities

Restore and maintain habitat for all life history stages and strategies

Maintain current distribution and restore distribution in previously occupied areas, if warranted.

## NATURAL HISTORY AND BIOLOGY

### Biogeography

Bonneville cutthroat trout (BCT) are native to the Bonneville basin of Idaho, Nevada, Utah, and Wyoming. The Bonneville basin covers approximately 51,216 square miles within the Great Basin and once contained the largest of the ancient pluvial lakes, Lake Bonneville. At its maximum size, Lake Bonneville extended over 20,015 square miles and had a maximum depth of almost 1,000 feet, comparable to the size of Lake Michigan (United States Fish and Wildlife Service 2001).

Up until the late Pleistocene Epoch, 25,000 to 35,000 years ago, the Bear River was a tributary to the Snake River. Lava movement in the late Pleistocene Epoch diverted the upper Bear River at Soda Springs, Idaho, south into the Bonneville basin (Hickman 1978). When the Bear River was a tributary to the Snake River, Yellowstone cutthroat trout *Oncorhynchus clarkii bouvieri* that were native to that system gained access to the Bonneville basin and colonized it. Taxonomists have noted the similarity of the two fish and the lack of strong differentiating characters (Hickman 1978; Behnke 1979; Loudenslager and Gall 1980).

The large, ancient Lake Bonneville provided a means for the distribution of the fish throughout the basin. However, even at its peak, Lake Bonneville did not inundate the Bear River Drainage. Some Bear River fish may have continued to be oriented to fluvial rather than lacustrine habitat. When climatic change dried Lake Bonneville about 8,000 years ago, many tributaries became isolated and their fish faunas began to evolve independently (Hickman 1978; May et al. 1978). Given the relatively short time of separation, the demonstrated close affinity of present-day Bear River Bonneville cutthroat trout and Snake River Yellowstone cutthroat trout is not surprising. Behnke (1992) suggested that the desiccation of ancient Lake Bonneville fragmented the Bonneville cutthroat trout into remaining streams and lakes throughout the basin, resulting in several slightly differentiated groups of Bonneville cutthroat trout: the Bear River basin, Bonneville basin proper (including the Wasatch Mountain and Sevier River drainages), and the Snake Valley (an arm of ancient Lake Bonneville which was isolated during an earlier desiccation event).

### Taxonomy

Behnke (1979, 1992) postulated that cutthroat trout may have gained access to the Bonneville basin at multiple times when Lake Bonneville water elevations fluctuated during past geologic events. Thus, some natural evolutionary differences may be evident among drainages in the Bonneville basin that became geographically isolated during different geologic time periods.

Loudenslager and Gall (1980) theorized that Colorado River cutthroat trout *O. c. pleuriticus* and Bonneville cutthroat trout are closely related and share a common ancestor but that Bear River Bonneville cutthroat trout represents a subsequent invasion of Yellowstone cutthroat trout into the Bonneville basin. Therefore, the Bear River

Bonneville cutthroat trout might be more closely associated with a subgroup of the Yellowstone cutthroat subspecies compared to other Bonneville cutthroat trout in the Bonneville basin. Limited mitochondrial DNA (mtDNA) analysis of Bonneville cutthroat trout by Williams and Shiozawa (1989) supported the idea of diverse origins or multiple, independent mtDNA mutations in the basin. Later, Shiozawa et al. (1993) categorized Bonneville cutthroat trout within Utah into three types different from Behnke (1992). The subgroups were: (1) the Bear River type, (2) the Southern Bonneville type (from the Virgin River drainage), and (3) the main Bonneville basin type. Shiozawa found that analysis of restriction fragment length polymorphisms (RFLPs) in mtDNA of Bear River Bonneville cutthroat trout indicates this group is more closely related to Yellowstone cutthroat trout than to other Bonneville cutthroat trout which further supports Loudenslager and Gall (1980). More recently, Campbell et al. (2007) assessed genetic population structure of Bear River Bonneville cutthroat trout and their results were consistent with previous studies that demonstrated that cutthroat trout in the Bear River drainage share a more recent common ancestor with Yellowstone cutthroat trout in Idaho than with populations of Bonneville cutthroat trout in the central and southern portions of their range in Utah.

Martin et al. (1985) used protein electrophoresis to determine Bear River cutthroat trout were distinct from all other Bonneville cutthroat trout. Their work further confirmed the similarities between the Bear River type Bonneville cutthroat trout and Yellowstone cutthroat trout. Yet experts continue to place Bear River cutthroat in the Bonneville cutthroat trout subspecies. Because of the diverse nature of the Bonneville cutthroat trout subspecies, more research is required before phylogeny and intraspecific relationships can be comprehensively interpreted (Schmidt et al. 1995). Behnke and Zarn (1976) advise that the various existing types should be considered unique and should not be genetically mixed because much of the evolutionary history of this subspecies remains unknown. Based on current knowledge all types of cutthroat within the Bonneville basin are considered Bonneville cutthroat trout; however, management agencies respect the divergence between drainages and as a general rule, do not transfer fish between these groups.

## Morphometrics

Bonneville cutthroat trout generally have large, evenly distributed spots, but there can be a high degree of intra-basin variation. Bonneville cutthroat trout tend to develop large pronounced spots that are more evenly distributed on the sides of the body rather than concentrated posterior as in the Yellowstone subspecies. Coloration in Bonneville cutthroat trout is generally dull compared to other cutthroat trout subspecies. But coloration can vary depending on environmental conditions and local genetic composition. Vertebrae typically number 62-63, slightly higher than in other subspecies. Scales in lateral series average 150-170. Pyloric caeca number between 25-55 with a mean of 35, except in the Bear River drainage, which typically average more than 40 caeca. Bonneville cutthroat trout average between 16-21 gill rakers, with a mean of 18-19, except the Snake Valley type which have 18-24 (mean, 20-22). Another important characteristic of all cutthroat subspecies is the presence of basibranchial teeth which are absent in rainbow trout *O. mykiss* (Behnke 1992). Numbers of basibranchial teeth provide information about subspecies derivation and relatedness. Yellowstone cutthroat trout have profuse basibranchial teeth, averaging 20-28, while most Bonneville cutthroat trout average 5-10 (Behnke 1992).

Morphological features expected for Bear River cutthroat trout of high genetic purity include:

- Large, sparse, pronounced spots evenly distributed on the body.
- Coloration is typically a dull, yellowish-brown with no bright colors (except for orange cutthroat mark). Mature males may develop a rosy tint along the body.
- Basibranchial teeth are expected in at least 90 percent of the specimens.
- Scale counts range from 160-170 in the lateral series and from 38-40 above the lateral line.
- Pyloric caeca typically number 40-50 and gill rakers 17 to 19 (Binns 1981).

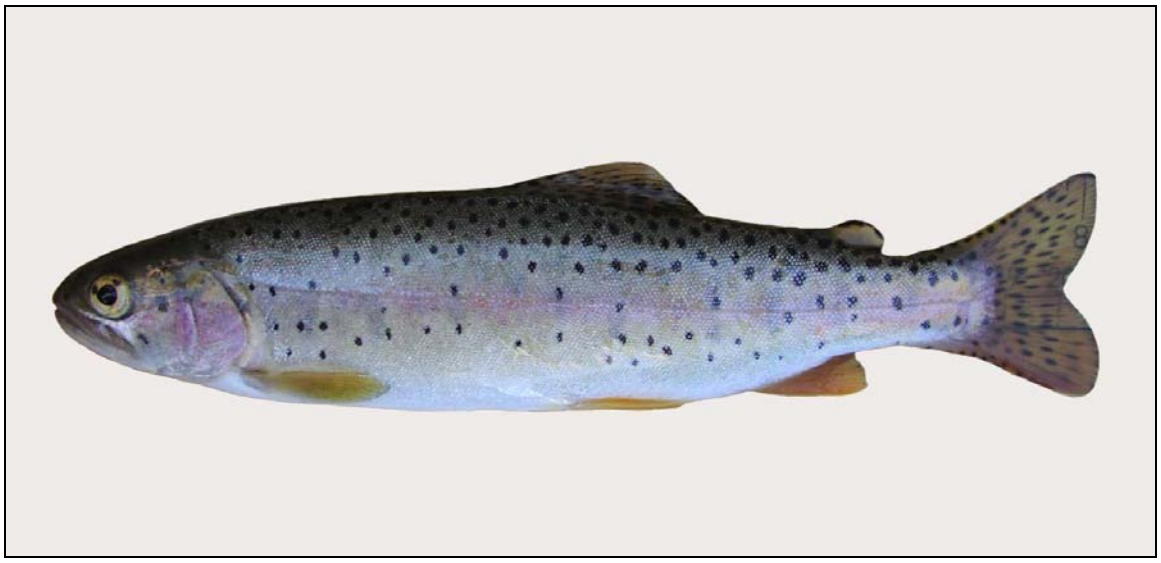


Figure 2. Bonneville cutthroat trout from Preuss Creek, Idaho 2004.

## Life History Characteristics

Bonneville cutthroat trout in Idaho exhibit three potential life history characteristics; resident, fluvial, and adfluvial. Resident life history pattern fish can spend their entire lives in tributary streams, while fluvial fish migrate from the river to spawn in smaller water and return to the river. Adfluvial fish spend most of their lives in lakes and spawn upstream primarily in tributaries. Multiple life history patterns within a population add to its biodiversity and resiliency (Lee et al. 1997). Throughout the range of Bonneville cutthroat trout in Idaho, there are barriers that make it difficult for the migrants to reach their spawning grounds. These barriers include road crossings, irrigation diversion structures, and dams.

## Habitat Relationships

Little information is available on specific habitat requirements of Bonneville cutthroat trout. However, there is a wealth of information on salmonid habitat conditions in general which appear to generally represent those of BCT (Binns and Eiserman 1979; Pennak and Van Gerpen 1947; Scarnecchia and Bergersen 1987). For example, well-oxygenated water, the presence of clean, well-sorted gravels with minimal fine sediments for successful spawning, cooler temperatures in general, and a complexity of in stream habitat structure such as large woody debris and overhanging banks are considered good trout habitat conditions. Bonneville cutthroat trout populations are found at high, moderate, and low elevations in small headwater streams, larger mainstem rivers, and lake systems (Caribou-Targhee National Forest 2001-2003; Colyer et al. 2005; Burnett 2003; Schrank and Rahel 2002).

An extensive body of published scientific literature exists on effects of human-caused disturbance to salmonid habitat (see for example Beschta et al. 1987; Chamberlin et al. 1991; Furniss et al. 1991; Meehan 1991; Sedell and Everest 1991; Frissell 1993; Henjum et al. 1994; McIntosh et al. 1994; Wissmar et al. 1994; U.S. Department of Agriculture and U.S. Department of the Interior 1996; Gresswell 1999; Trombulak and Frissell 2000). Declines in populations of native salmonids including Bonneville cutthroat trout can result from combined effects of habitat degradation and fragmentation, blocked migration corridors, degraded water quality or quantity, angler harvest and poaching, entrainment into diversion canals and dams, non-native species interactions, and other factors (U.S. Fish and Wildlife Service 2002). Examples of land and water management activities that could degrade habitat and depress salmonid populations include dams and other diversion structures, forestry management, livestock grazing, intensive agriculture, road construction and maintenance, mining, and urban/rural landscape development.

Bonneville cutthroat trout have also been found to survive in what is considered marginal salmonid habitat conditions (e.g. turbid water, fine sediments, warmer temperatures, poor structural habitat; Colyer et al. 2001; Colyer et al. 2005; Schrank et al. 2003). This may be because Bonneville cutthroat trout have evolved in a desert environment where climate can cause fluctuations in water, sediment regimes, and environmental condition (Behnke 1992). Schrank et al. (2003) reported that Bonneville cutthroat trout did not emigrate from warm stream reaches or experience mortality

despite maximum daily water temperatures as high as 80°F. Their study fish did not appear to be dependent upon localized coolwater refuges.

## Reproduction

Both the age at maturity and the annual timing of spawning vary geographically with elevation, temperature, and life history strategy (Behnke 1992; Kershner 1995). Spawning by Bonneville cutthroat trout usually occurs during the spring and early summer at higher elevations (Behnke 1992) at temperatures ranging from 4-10°C (May et al. 1978). May et al. (1978) reported Bonneville cutthroat trout spawning in Birch Creek, Utah beginning in May and continuing into June. The Bonneville cutthroat trout in Bear Lake began spawning in late April and completed spawning in June (Nielson and Lentsch 1988).

The Wyoming Game and Fish Department developed a broodstock of pure Bonneville cutthroat trout at its Daniel Fish Hatchery. The original source of these fish came from eggs spawned from Raymond Creek (tributary to Thomas Fork) Bonneville cutthroat trout in 1977. To add diversity to the gene pool, young-of-the-year Bonneville cutthroat trout were collected from Coantag Creek and upper Giraffe Creek and transplanted to the Daniel Fish Hatchery in 1979. In 1989, additional diversity for the Daniel Fish Hatchery broodstock came from Water Canyon Creek and Raymond Creek. Recent electrophoretic analysis of the hatchery broodstock indicated that there has been no hybridization with rainbow trout and that genetic variation is still good. These fish were used to stock waters with slightly hybridized cutthroat trout populations and reintroduce Bonneville cutthroat trout after removal of non-native fish or a catastrophic impact upon a previously existing population (Remmick et al. 1993).

The Utah Division of Wildlife Resources (UDWR) collects eggs from naturally migrating Bonneville cutthroat trout at a trap on Swan Creek. The annual egg take quota is 275,000. The Swan Creek trap has been in operation for about 30 years at the time this management plan was completed. The IDFG stocks about 200,000 Bonneville cutthroat trout back to Bear Lake from the Swan Creek egg take. IDFG and UDWR have an agreement that all of the fish produced from spawning tributaries of Bear Lake must be returned to Bear Lake.

## Biotic Interactions

In many parts of their range, Bonneville cutthroat trout evolved with June sucker *Chasmistes liorus mictus*, Utah sucker *Catostomus ardens*, mountain sucker *Catostomus platyrhynchus*, leatherside chub *Lepidomeda copei*, Utah chub *Gila atraria*, redside shiner *Richardsonius balteatus*, least chub *Lotichthys phlegethontis*, longnose dace *Rhinichthys cataractae*, speckled dace *Rhinichthys osculus*, mottled sculpin *Cottus bairdi*, Paiute sculpin *Cottus beldingi*, mountain whitefish *Prosopium williamsoni* (Sigler and Miller 1963), and Paiute sculpin *Cottus beldingi.* In Bear Lake, Bonneville cutthroat trout evolved with endemic Bear Lake whitefish *Prosopium abyssicola*, Bonneville whitefish *Prosopium spilonotus*, Bonneville cisco *Prosopium gemmifer*, and Bear Lake sculpin *Cottus extensus*.

Interactions between Bonneville cutthroat trout and these fish vary. Suckers, sculpins, and minnows probably provide forage after Bonneville cutthroat trout attain sufficient size to switch from invertebrates to larger prey. Occasionally, sculpins prey on Bonneville cutthroat trout eggs and fry (Sigler and Miller 1963), but sculpin appear to be a minor predator. Many of the fish species that coexist with Bonneville cutthroat trout feed on insects during part or all of their life history.

Non-native fish, particularly brook trout *Salvelinus fontinalis*, Yellowstone cutthroat trout (outside its native historical range), and rainbow trout have been introduced within the historical range of Bonneville cutthroat trout in Idaho. A primary concern is hybridization between rainbow trout and Bonneville cutthroat trout. To address that concern a recent genetics evaluation has been completed and is included in this report. Studies that investigate competition and predation interactions between Bonneville cutthroat trout and non-native species are limited. Buys (2002) and Hilderbrand (1998) completed competition studies between Bonneville cutthroat trout and brook trout in Beaver Creek, Idaho. Those authors suggested that competition with brook trout has contributed to declines in native cutthroat trout populations. McHugh and Budy (2005) showed that non-native brown trout *Salmon trutta* reduced Bonneville cutthroat trout body condition when the two species were sympatric. No predation studies were identified.

A variety of diseases and parasites are found in waters containing Bonneville cutthroat trout. Infectious pancreatic necrosis, infectious hematopoietic necrosis, and whirling disease may occur in the Bear River area. The parasites plestophera and epitheliocystis have been found in the Bear River system. The bacterial diseases furunculosis and bacterial kidney disease are also found within the system. There is no literature that directly assesses the effect of these diseases on Bonneville cutthroat trout.

## Bonneville Cutthroat Trout Viability

Much of the extensive work on viability of bull trout *Salvelinus confluentus* can also be applied to the Bonneville cutthroat trout conservation effort. Within each Bonneville cutthroat trout management unit, local populations and core population areas can be identified. Local populations generally spend their entire lives in tributaries, exhibit relatively small amounts of genetic diversity within a particular local population, and have higher levels of genetic diversity between stream populations, and high levels of genetic divergence between tributaries. Core populations are partially isolated but have some degree of gene flow among them, most noticeably in the form of larger migratory fish. Core populations meet the definition of (Meffe and Carrol 1994) and function as a metapopulation (Dunham and Rieman 1999). A primary intent of this management plan is to have core areas reflect the qualities of a metapopulation. Within a metapopulation, local populations are expected to function as one demographic unit (Hanski and Gilpin 1997).

The viability of Bonneville cutthroat trout metapopulations depends upon the number of local populations, adult abundance (number of spawning fish present), the reproductive rate of the population (measured by population trend and variability), and connectivity (presence of migratory life history form and functional habitat). The measures prescribed in this document are intended to benefit these elements.

## STATUS AND DISTRIBUTION

Bonneville cutthroat trout are considered a Game Fish by the State of Idaho and a Sensitive Species by the USDA Forest Service (USFS) and U.S. Bureau of Land Management (BLM). Several non-governmental organizations believe the species is eligible for Endangered Species Act (ESA) listing. A chronology of ESA-related activities is presented below.

| | |
|---|---|
| 1979 | The American Fisheries Society (AFS) and the Desert Fishes Council (DFC) petition the United States Fish and Wildlife Service (Service) to list BCT as a Threatened Species. |
| 1980 | 45 FR 19857 Notice of review of BCT status and solicitation for information. |
| 1982 | 47 FR 58454 Category II Candidate Species |
| 1984 | 49 FR 2485 'Warranted but Precluded' for petitioned action. |
| 1984 | Status Review completed by the Service's Utah Field Office. |
| 1985 | 50 FR 37958 Category I Candidate Species |
| 1987 | 52 FR 24312 'Warranted but Precluded' for petitioned action. |
| 1988 | 53 FR 25511 'Warranted but Precluded' for petitioned action. |
| 1991 | 56 FR 58804 Category II Candidate Species |
| 1992 | The DFC and the Utah Wilderness Association petition the Service to list BCT as Threatened. Service determines no new information provided in petition. |
| 1994 | 59 FR 58982 Category II Candidate Species |
| 1996 | 61 FR 7596 Removal from Candidate Status with policy change eliminating lists for Category II and III species. |
| 1996 | 61 FR 48500 Notice of availability of draft Conservation Agreement for the BCT |
| 1997 | Conservation Agreement and Strategy signed by the Service, the Utah Division of Wildlife Resources (UDWR), Bureau of Reclamation (BOR), USFS, BLM, Confederated Tribes of the Goshute, Utah Reclamation Mitigation and Conservation Commission. |
| 1998 | The Biodiversity Legal Foundation petitions the Service to list BCT as Threatened, with critical habitat in February. |
| 1998 | 63 FR 67640 Positive 90-day finding for February petition to List BCT as Threatened. |
| 1999 | 64 FR 2167 Reopening of comment period on the 90-day finding for a petition to list BCT as Threatened. |
| 2000 | The Service signs the Range-wide Conservation Agreement and Strategy for BCT. |
| 2001 | 66 FR 51362 Service publishes announcement that BCT is not warranted for listing. Final Status Review (available at website above) dated October 2001. |
| 2005 | Center for Biological Diversity, Pacific Rivers Council and Biodiversity Conservation Alliance filed suit in Federal District Court in Denver on the BCT 12-Month Finding. |
| 2007 | Service will revisit listing decision in late 2007 or early 2008. |

In the latest “not warranted” finding, the Service cited several restoration actions and protection measures currently underway to protect and restore Bonneville cutthroat trout populations throughout their range. Today, several plans, agreements, and strategies are in place at different management levels that help conserve Bonneville cutthroat trout: they include the range-wide conservation agreement and strategy, the multi-state position paper on genetic considerations concerning cutthroat trout management, the Forest Service Manual, the Revised Caribou-Targhee Forest Plan, the IDFG 2007-2012 Fisheries Management Plan, and others.

Range-wide Conservation Agreement and Strategy for Bonneville Cutthroat Trout (*Oncorhynchus clarkii utah*): The goal of this conservation agreement is to ensure the long-term persistence of Bonneville cutthroat trout within its historic range by coordinating conservation efforts among states, tribal governments, Federal management agencies, and other involved parties. Conservation actions include enhancing and maintaining habitat. Specifically, restoring altered channel/habitat features and natural hydraulic/sediment regimes.

Cutthroat Trout Management Position Paper Regarding Genetic Considerations: The purpose of this paper, prepared by inland state fisheries agencies within the range of cutthroat trout, is to provide a shared position pertaining to the management of inland cutthroat trout population genetics. Inland cutthroat trout population genetic management designations have Core, Conservation, and Sportfish management components (Utah Division of Wildlife Resources 2000).

Forest Service Manual: The Forest Service Manual provides agency policy direction to National Forests. There is specific direction pertaining to fish and wildlife management. Some are listed below.

2620.45 Each District Ranger has the authority and responsibility to implement management direction and ensure that standards and objectives for wildlife and fish, including endangered, threatened, and sensitive animal and plant species, are met.
1640.3 It is Forest Service policy to emphasize the protection, enhancement, and maintenance of habitats for production of wildlife and fish.
2670.22 Develop and implement management practices for Sensitive species to ensure that species do not become threatened or endangered because of Forest Service actions. Maintain viable populations of all native and desired non-native wildlife, fish, and plant species in habitats distributed throughout their geographic range on National Forest System lands.
2670.32 Avoid or minimize impacts to species whose viability has been identified as a concern.
2672.1 Sensitive Species Management: Sensitive species or native plant and animal species must receive special management emphasis to ensure their viability and to preclude trends toward endangerment that would result in the need for Federal listing. There must be no impacts to sensitive species without an analysis of the significance or adverse effects on the populations, their habitat, and on viability objectives when making decisions that would significantly reduce sensitive species numbers.

Caribou Revised Forest Plan: The Caribou Forest Plan is the overarching document that directs land management on the Caribou half of the Caribou-Targhee National Forest. The goal of the Revised Forest Plan (RFP) is to restore native ecosystems to a healthy, resilient state using a combination of active management

activities and natural processes. Management direction is improved to maintain or restore riparian vegetation, channel stability and function, and other aquatic resources. New standards and guidelines are established for riparian and aquatic areas, which provide for the protection of these resources and dependent species. Restoration of ecological systems is a key component of maintaining the viability of native and desired non-native species. One management emphasis is restoration of native cutthroat trout populations.

The status of Bonneville cutthroat trout in Idaho was summarized using information from state, federal, and academic programs. Major contributors included the USFS, Idaho Department of Environmental Quality (IDEQ), BLM and IDFG. A large percentage of the available survey data was collected during the past five years. However, an effort was made to locate all pertinent survey information. To begin the assessment process, comparable information was pooled into a common database.

Several steps were used to describe the current status. First, potential habit was defined as all perennial streams and rivers within the Malad and Bear River Drainages. Streams that are intermittent during the irrigation season due to water withdrawal were included as potential habitat. Secondly, all potential Bonneville cutthroat trout habitat locations were given a rating as occupied, extirpated, fishless, or unknown. To receive an occupied rating, Bonneville cutthroat trout must have been observed within the past five years. Extirpated was defined by systems with previous observation (pre-1999) but no collections of Bonneville cutthroat trout made during surveys completed in the past five years. The extirpated rating may be liberally applied given that sample crews don't survey the entire stream. It is possible that an extirpated rating is applied to a stream that contains a very low density of Bonneville cutthroat trout not detected during surveys. A fishless designation was given streams that were sampled but no fish of any species were found and the lack of fish was not linked to human disturbance. Streams designated as status unknown have not been sampled in past five years or more.

Habitat occupied by Bonneville cutthroat trout was further categorized using relative abundance and uniformity indices. The relative abundance index was used to rate Bonneville cutthroat trout streams as high, moderate, and low. If detailed sampling (multiple pass depletion or mark-recapture) was available, Bonneville cutthroat trout abundance was categorized using the following criteria: high > 20 fish/100 m, moderate 5 – 20 fish/100 m; and low < 5 fish/100 m. In the absence of detailed sampling, single pass electrofishing data and professional judgment were used to rate BCT abundance in each system. Therefore, the intent of this assessment is to provide a relative guide for population condition and should not be interpreted as rigorous statistical findings. In addition to the abundance index, many of the Bonneville cutthroat trout populations sampled were found to occupy some but not all sections of a given stream. To account for spatial variation within a stream, an index of spatial uniformity was provided. Waters were rated on how uniformly Bonneville cutthroat trout populated a stream (high = BCT found in most sample locations, moderate = fish sampled in at least half of the sample locations; and low = BCT observed in less than 50% of sample locations). The uniformity index utilized spot electrofishing data to better describe the spatial and temporal variations in a stream in the absence of detailed depletion estimates.

Recent sampling on Eightmile Creek is a good example of how the abundance and uniformity indices were used to describe the population. The Idaho Department of Environmental Quality, IDFG, and USFS sampled Eightmile Creek in the past several years. A total of 19 different sites were sampled with backpack electrofishing equipment. Bonneville cutthroat trout were observed in 4 of the 19 sites. If depletion only estimates (n=4) were used to describe the population, the stream would have been inaccurately classified as not supporting Bonneville cutthroat trout. By including all electrofishing sites, the population was classified as a low abundance population with low distribution uniformity.

To help describe populations on a scale relevant to management and conservation efforts, six management units were identified within Idaho (Figure 3). The management units reflect major drainage divides and are separated in the river corridor by major Bear River Dams. Because of the Bear River dams, the management units define population segments with limited or no population exchange. Using those criteria, the Bear River system was split into five management units (Pegram, Nounan Valley, Dam Complex, Gentile Valley, and Riverdale). The management units begin at the Wyoming Border (Pegram management unit) and follow the Bear River downstream to the Utah Border (Riverdale management unit). The Riverdale management unit includes the Cub and Logan rivers, which enter the Bear River in Utah. The Malad River drainage was defined as a single management unit and also enters the Bear River in Utah.

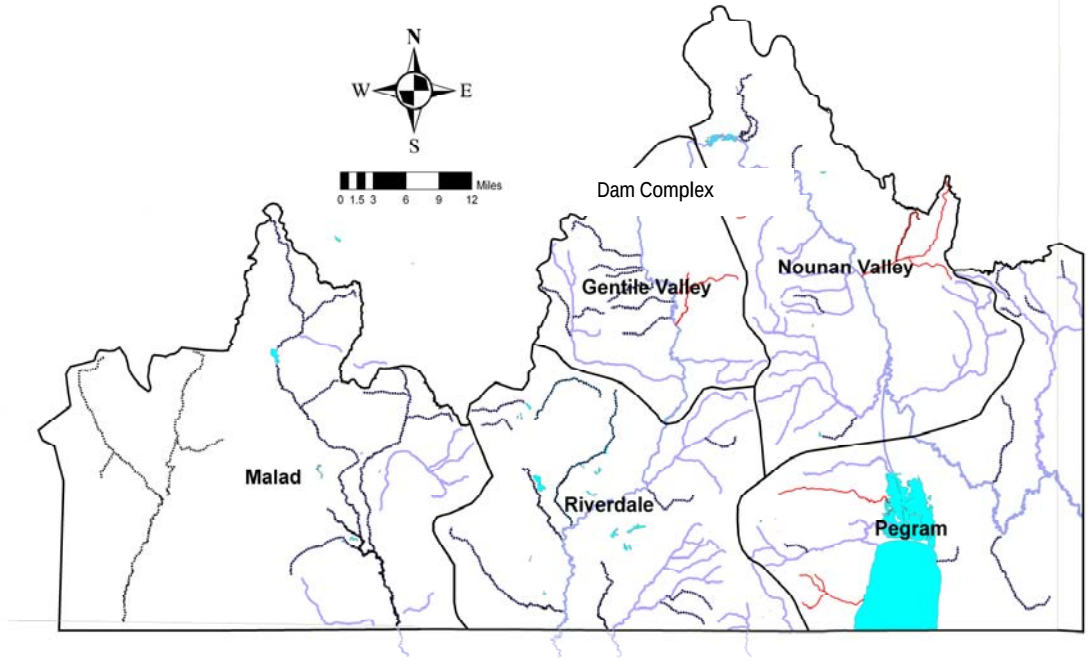



Figure 3. Management units identified within the range of Bonneville cutthroat trout in Idaho.

## Pegram Management Unit

The Pegram Management Unit covers the Bear River from the Wyoming border to Stewart Dam (44.9 miles). Bear and Mud lakes are also included in the Pegram Management Unit. Major tributaries include the Thomas Fork River, Bloomington, Paris, Saint Charles, and Fish Haven creeks (Figure 4). This management unit contains 18

tributaries of which 78% (150.6 miles) are occupied by Bonneville cutthroat trout. Bonneville cutthroat trout occupy Bear Lake, which is about 70,000 acres at full pool. Bear Lake is included in this management unit because Bonneville cutthroat trout from the Bear River near Pegram are connected to Bear Lake via the Stewart Dam diversion.

The Thomas Fork of the Bear River is considered a stronghold for Bonneville cutthroat trout. Three tributaries of the Thomas Fork (Preuss, Giraffe, and Dry Creeks) were established as long term monitoring streams for Bonneville cutthroat trout. To enhance those tributary populations, a conservation agreement was initiated in October 1994. The multi-agency agreement outlined cattle management requirements of the Caribou Cattlemen Association, enforcement of those actions by the USFS, and Bonneville cutthroat trout population monitoring by IDFG. This agreement has recently been discontinued, but construction of structural improvements such as fences to decreased cattle impacts to the streams have continued.

Population densities in Preuss, Giraffe, and Dry creeks have varied markedly since the initiation of the conservation agreement (Appendix A). Average Bonneville cutthroat trout densities over the past two decades were 8 BCT/100$m^2$ in Preuss Creek, 12 BCT/100$m^2$ in Giraffe Creek, and 12 BCT/100$m^2$ in Dry Creek. In all three tributaries, densities have ranged from average total values of 1 BCT/100$m^2$ to greater than 25 BCT/100$m^2$. Some of the variation appears to be influenced by precipitation. During the drought period in the early 1990s, populations declined markedly and then rebounded after abundant precipitation in 1997 to 1999. Populations declined again after a return to dry conditions in 2000 probably due to the interaction between precipitation and connectivity to the mainstem. Dry Creek and Preuss Creek have significant connectivity issues (Appendix A).

Preuss and Giraffe creeks are ranked high for population homogeneity and moderate for overall population abundance (Table 1). Conversely, Dry Creek declined to less than 1 BCT/100$m^2$ in 2000 and no Bonneville cutthroat trout were sampled in 2004. The Dry Creek population is rated low for abundance and poor for population homogeneity. The Dry Creek population appears to be close to extirpation.

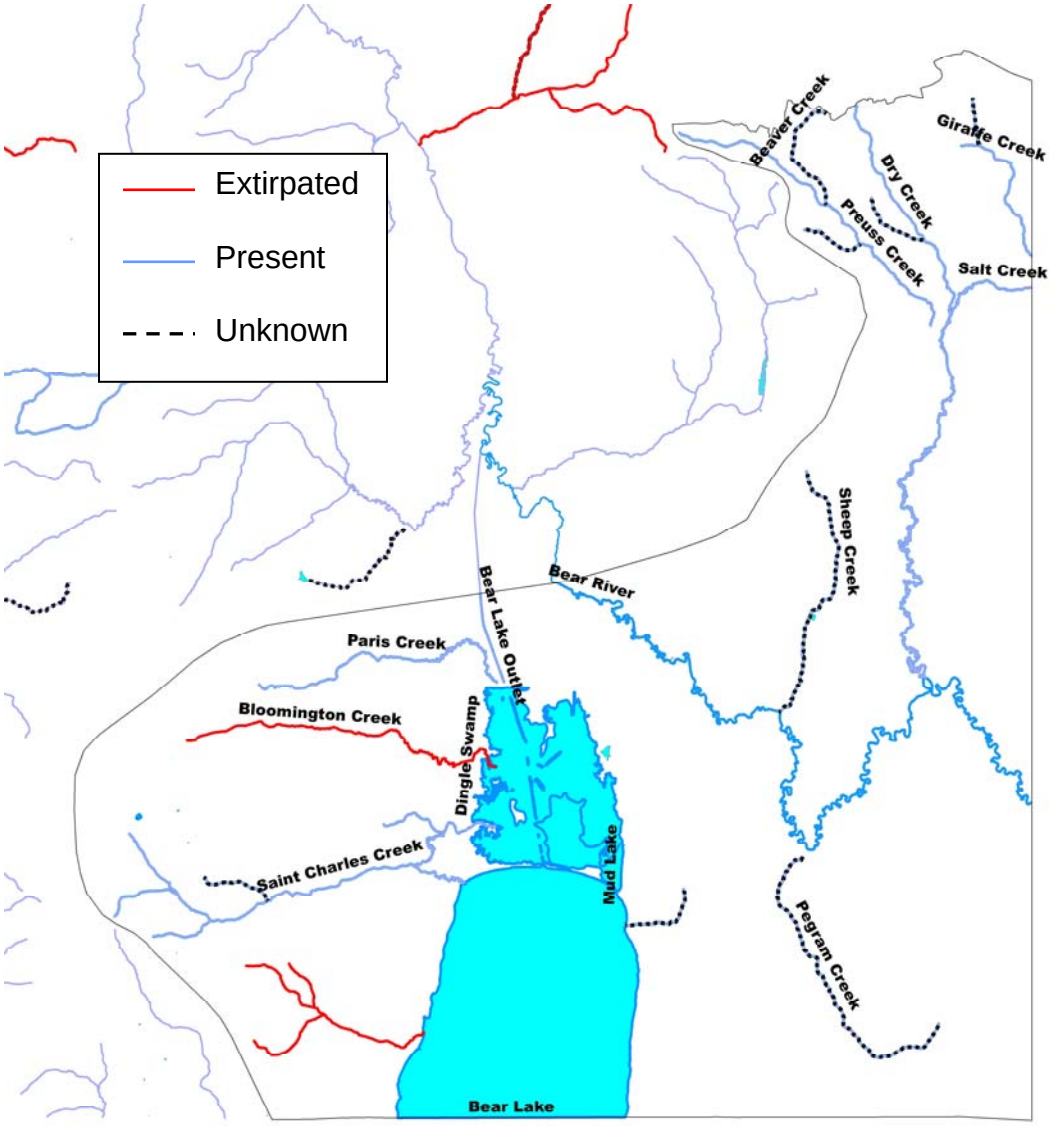



Figure 4 The Pegram Management Unit includes Bear Lake and the Bear River from the Wyoming Border downstream to Stewart Dam. There are a total of 18 tributary streams in this Management Unit.

Table 1 Population status, abundance, and uniformity index for Bonneville cutthroat trout in the Pegram Management Unit of the Bear River.

| | | Distance (miles) | | | Population | Status Indices | |
|---|---|---|---|---|---|---|---|
| Stream Name | Parent Stream | Public | Private | Total | Status | Abundance | Uniformity |
| Bear River (Pegram MU) | Great Salt Lake | 0.8 | 44.1 | 44.9 | present | low | low |
| Bear Lake Outlet | Bear River | 1.7 | 6.5 | 8.2 | present | low | low |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Sheep Creek | Bear River | 6.3 | 3.3 | 9.6 | unknown | | |
| Thomas Fork | Bear River | 0.0 | 36.7 | 36.7 | present | moderate | moderate |
| Preuss Creek | Thomas Fork | 10.0 | 5.8 | 15.7 | present | moderate | high |
| Fish Creek | Preuss Creek | 1.0 | 0.0 | 1.0 | unknown | | |
| Beaver Creek | Preuss Creek | 3.9 | 0.0 | 3.9 | unknown | | |
| Dry Creek_Thomas Fork | Thomas Fork | 5.1 | 3.0 | 8.1 | present | low | low |
| Dip Creek | Dry Creek | 2.1 | 0.0 | 2.1 | unknown | | |
| Giraffe Creek | Thomas Fork | 3.3 | 0.0 | 3.3 | present | moderate | high |
| Robinson Creek | Giraffe Creek | 0.1 | 0.0 | 0.1 | unknown | | |
| St. Charles Creek | Bear Lake | 8.1 | 3.1 | 11.2 | present | low | moderate |
| Davis Canyon | St. Charles Creek | 1.3 | 0.0 | 1.3 | unknown | | |
| Big Arm St. Charles | Saint Charles Creek | 0.0 | 3.5 | 3.5 | present | low | moderate |
| Spring Creek | Dingle Swamp | 0.0 | 1.6 | 1.6 | present | low | low |
| Little Arm St. Charles | Saint Charles Creek | 0.0 | 3.2 | 3.2 | present | moderate | high |
| Fish Haven Creek | Bear Lake | 3.9 | 2.1 | 6.0 | extirpated | | |
| Indian Creek | Bear Lake | 1.6 | 1.0 | 2.7 | unknown | | |
| Bloomington Creek | Bear River | 5.4 | 9.8 | 15.2 | extirpated | | |
| Paris Creek | Dingle Swamp | 1.0 | 13.2 | 14.2 | present | low | low |
| | Totals | 55.5 | 136.9 | 192.4 | | | |

Summary Statistics for the Pegram MU

| | | Miles | | |
|---|---|---|---|---|
| | | Public | Private | Total |
| Status Totals | Extirpated | 9.3 | 11.9 | 21.2 |
| | Present | 29.9 | 120.7 | 150.6 |
| | Unknown | 16.2 | 4.3 | 20.6 |
| Abundance Index | High | 0.0 | 0.0 | 0.0 |
| | Moderate | 13.3 | 45.7 | 59.0 |
| | Low | 16.6 | 71.4 | 88.0 |

The Thomas Fork River supports resident stream populations and a run of fluvial BCT from the Bear River. In 1994, IDFG completed mark-recapture estimates of BCT in two sections of the Thomas Fork River. Abundance of age-1 and older BCT ranged from 6 to 149 fish per km.

*Bear Lake and its Tributaries*

Bear Lake is significant because it supports the only natural lake dwelling population of Bonneville cutthroat trout in Idaho. The Bonneville cutthroat trout in Bear Lake can live 10 or more years, grow to 10 pounds or more, demonstrate an unusual capability to continue growing during the winter, and depend on endemic fishes of Bear Lake as forage (Wurtsbaugh and Hawkins 1990).

Saint Charles Creek is the largest Bear Lake tributary. This stream supports excellent spawning and rearing habitat. Despite excellent potential, production of adfluvial cutthroat trout from Saint Charles is limited due to unscreened irrigation diversions and migration barriers near the confluence with Bear Lake. Saint Charles Creek's confluence becomes impassible to adult cutthroat trout at lake elevations below 5,912 feet. During 2003 and 2004, peak lake elevations were below 5,907 feet. As a result, juvenile production in the stream was very poor. Fish survey work showed that Saint Charles Creek's fish community was dominated by resident rainbow trout, brook trout, and rainbow trout x cutthroat trout hybrids, with Bonneville cutthroat trout comprising less than 20% of the fish community.

Because of the limited production from Saint Charles Creek, persistence of the Bear Lake cutthroat trout populations is dependent on hatchery supplementation. The Utah Division of Wildlife Resources stocks 200,000 to 300,000 Bonneville cutthroat trout in Bear Lake annually. Managers increase trout stocking when the lake is at full storage capacity. Those fish are collected at the egg stage from spawners that migrate from Bear Lake into Swan Creek, Utah. In good years, the run of adult Bear Lake cutthroat trout into Swan Creek is 300 to 500 adults. Utah also maintains a broodstock in one of their hatcheries to supplement stocking if the egg take at Swan Creek is insufficient to meet the minimum stocking goal of 200,000. In 2004, Idaho and Utah agreed to develop an interagency management plan for Bear Lake's fishery management program.

Fish Haven Creek is another tributary of Bear Lake that has potential to support Bear Lake Bonneville cutthroat trout. However, in fishery surveys completed in 2000 and 2003, no resident BCT were collected. One Bonneville cutthroat trout was observed in a survey from 1997. Fish Haven Creek is a unique situation where no resident populations persist, but below all irrigation diversions, cutthroat trout from Bear Lake continue to attempt to populate the stream. In 2003, adult Bonneville cutthroat trout were observed in the lowest ¼ mile of stream near the confluence with Bear Lake. Due to low water conditions created by irrigation diversions, however, those fish became stranded in shallow pools and were salvaged by IDFG and transported to Saint Charles Creek.

The two remaining major tributaries in the Pegram management unit include Bloomington and Paris creeks. These two streams flow into the Bear River outlet canal (Figure 4). Bonneville cutthroat trout populations in those creeks appear to be very low or non-existent. No Bonneville cutthroat trout were sampled in Bloomington Creek

during fishery surveys completed in 1991, 1994, 1997, and 2003. One Bonneville cutthroat trout was collected in a 2000 survey and it was probably an out-migrant from Bloomington Lake. Bloomington Lake is periodically stocked with Bonneville cutthroat trout by IDFG. In Paris Creek, Bonneville cutthroat trout occupy a limited section of the stream downstream of the forest boundary, living sympatrically with brook trout. Table 1 shows a complete summary of abundance, distribution, and uniformity indices for the Pegram management unit.

**Nounan Valley Management Unit**

The Nounan Valley management unit covers the Bear River from Stewart Dam downriver to Soda Dam (57.7 miles). This management unit contains the largest free-flowing section of Bear River in Idaho and supports the greatest number of tributaries. There are a total of 27 perennial tributaries covering 173.5 miles of habitat (Figure 5). Those tributary miles are nearly evenly split between public (81.2 miles) and private (92.3 miles) ownership. Recent fishery surveys show that Bonneville cutthroat trout occupy 68% (118.3 miles) of the available tributary habitat. The remaining tributary miles are 11% extirpated, 18% unknown, and 3% fishless. Bonneville cutthroat trout also occupy the mainstem Bear River in the Nounan Valley management unit.

From 22 streams surveyed, 17 (77%) contained Bonneville cutthroat trout. The percent of streams occupied by Bonneville cutthroat trout in the Nounan Valley reach is greater than any other management unit. Additionally, several of the Nounan Valley management unit tributaries were inhabited by Bonneville cutthroat trout in most of the sample locations. The uniformity index was moderate or high for the majority of tributaries (Table 2). Unfortunately, observations of overall population densities were not as positive. Most of the streams (88%) fell in the low-density range. Surprisingly, none of the tributaries in the Nounan Valley management unit received a high-density rating. In short, the Nounan management unit is populated by Bonneville cutthroat trout but at relatively low densities.

Some of the potential factors contributing to low Bonneville cutthroat trout densities include low stream productivity, unscreened irrigation diversions, migration barriers, or displacement by non-native species. Fish surveys of Georgetown and Montpelier creeks show robust trout populations, but few Bonneville cutthroat trout present. It is likely that if fewer non-native fish were present, Bonneville cutthroat trout populations would increase. In other waters like Stauffer and Co-op creeks, only native fish are present. Therefore, other factors are contributing to low Bonneville cutthroat trout abundance in those streams. Irrigation diversions are present on all tributary streams and need to be evaluated for fish passage and entrainment.

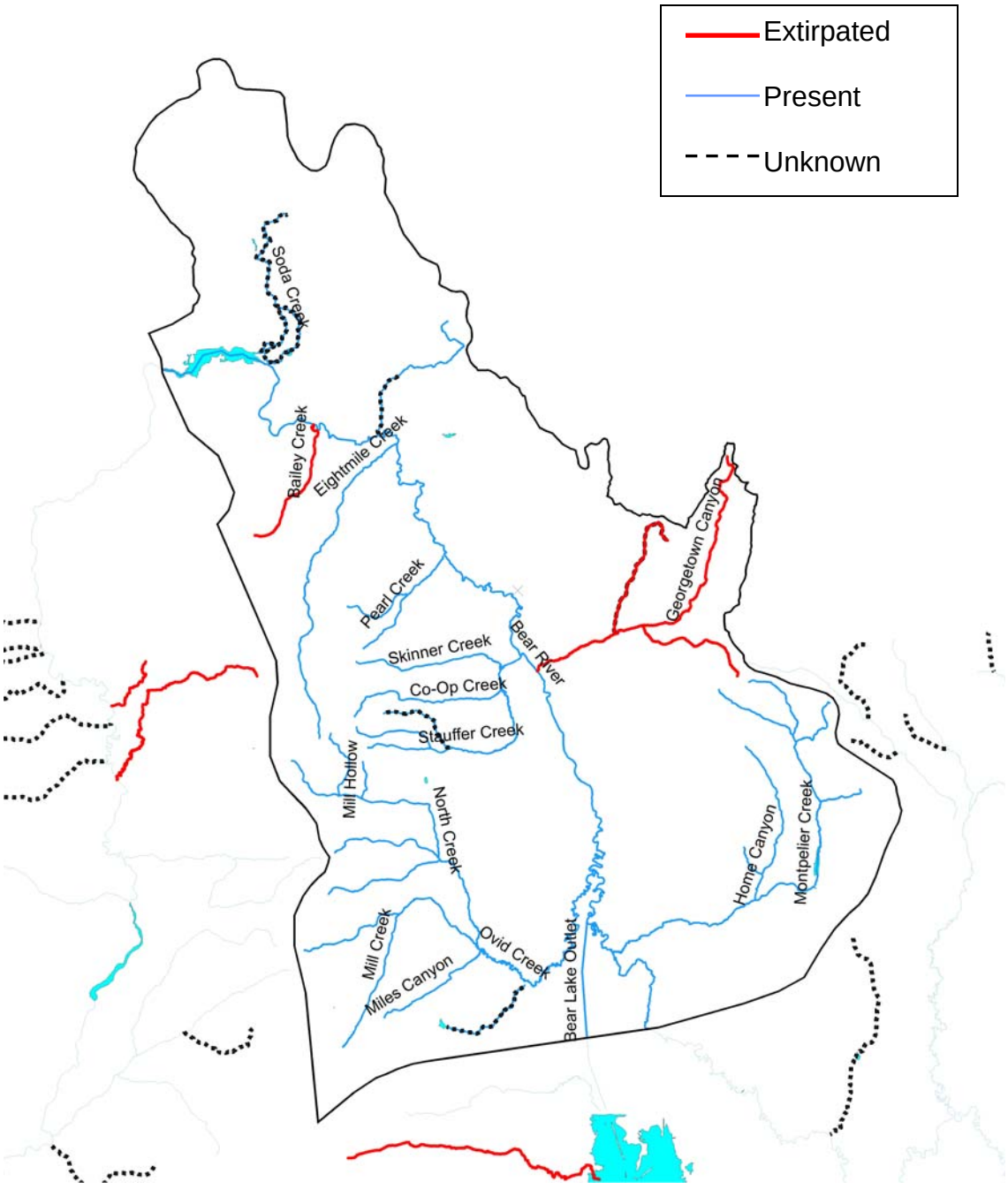



Figure 5 The Nounan Valley Management Unit includes the Bear River from Stewart Dam downstream to Soda Dam. There are a total of 27 perennial tributaries that drain into the Bear River.

In 1994, IDFG collected several Bonneville cutthroat trout in Georgetown Creek approximately 1 mile upstream of the national forest boundary. In 1997, several large (14 – 18 inch) Bonneville cutthroat trout were collected in Georgetown Creek near the confluence of the Bear River. However, extensive sampling by USFS in 2001 did not produce any Bonneville cutthroat trout observations. IDFG revisited the stream in 2003 and no BCT were observed. However, in the spring and summer of 2007, agencies documented fluvial Bonneville cutthroat trout in the lower reach of Georgetown Creek. A small privately owned hydropower project is situated on Georgetown Creek. The diversion structure is located on BLM land under a special use permit. It is a barrier to fish movement. As of 2007, the USFS and IDFG were working with irrigators on a proposal to install a fish ladder at the diversion site.

Table 2 Population status, abundance, and uniformity index for Bonneville cutthroat trout in the Nounan Valley Management Unit of the Bear River.

| | | Distance (miles) | | | Population | Status Indices | |
|---|---|---|---|---|---|---|---|
| Stream Name | Parent Stream | Public | Private | Total | Status | Abundance | Uniformity |
| Bear River (Nounan MU) | Great Salt Lake | 3.4 | 54.3 | 57.7 | present | low | low |
| Montpelier Creek | Bear River | 14.7 | 9.4 | 24.1 | present | low | moderate |
| Dry Creek_ | Bear River | 0.0 | 0.6 | 0.6 | unknown | | |
| Home Canyon Creek | Montpelier Creek | 1.6 | 0.0 | 1.6 | present | moderate | low |
| Snowslide Canyon Creek | Montpelier Creek | 0.9 | 0.0 | 0.9 | unknown | | |
| Whiskey_ | Montpelier Creek | 2.7 | 0.0 | 2.7 | present | low | moderate |
| Little Beaver Creek | Montpelier Creek | 3.8 | 0.0 | 3.8 | present | | |
| Ovid Creek | Bear River | 0.0 | 17.5 | 17.5 | unknown | | |
| Mill Creek | Ovid Creek | 3.0 | 0.0 | 3.0 | present | low | low |
| Liberty Creek | Mill Creek | 1.9 | 0.0 | 1.9 | unknown | | |
| North Canyon Creek | Ovid Creek | 5.9 | 6.9 | 12.8 | present | low | high |
| Emigration Creek | North Creek | 2.8 | 2.2 | 5.0 | present | low | low |
| Copenhagen Creek | Logan River | 3.4 | 0.5 | 3.9 | no fish | | |
| Georgetown Creek | Bear River | 8.3 | 5.7 | 14.0 | present | | |
| Georgetown Left | Georgetown Creek | 0.6 | 1.4 | 2.0 | extirpated | | |
| Stauffer Creek | Bear River | 0.0 | 10.5 | 10.5 | present | low | moderate |
| Beaver Creek | Stauffer Creek | 0.4 | 2.0 | 2.5 | present | moderate | high |
| South Fork Stauffer | Stauffer Creek | 2.7 | 0.3 | 3.0 | present | low | low |
| North Fork Stauffer | Stauffer Creek | 3.7 | 0.8 | 4.4 | present | low | low |
| Skinner Creek | Stauffer Creek | 1.1 | 7.1 | 8.2 | present | low | moderate |
| North Skinner Creek | Skinner Creek | 2.3 | 0.0 | 2.3 | present | low | moderate |
| Co-op Creek | Stauffer Creek | 3.7 | 3.6 | 7.3 | present | low | low |
| Pearl Creek | Bear River | 1.4 | 4.5 | 5.9 | present | low | moderate |
| North Pearl Creek | Pearl Creek | 3.3 | 0.3 | 3.6 | present | low | moderate |
| Eightmile Creek | Bear River | 7.3 | 7.7 | 15.0 | present | low | low |
| Sulphur Canyon | Bear River | 2.6 | 0.0 | 2.6 | unknown | | |
| Bailey Creek | Bear River | 3.2 | 3.4 | 6.6 | present | | |
| Soda Creek | Alexander Reservoir | 0.0 | 7.8 | 7.8 | unknown | | |
| | Totals | 84.6 | 146.6 | 231.2 | | | |

Summary Statistics for the Nounan Valley Management Unit

| | | Miles | | |
|---|---|---|---|---|
| | | Public | Private | Total |
| Status Totals | Extirpated | 12.1 | 10.5 | 22.6 |
| | Present | 63.6 | 109.6 | 173.2 |
| | Unknown | 5.5 | 26.0 | 31.4 |
| Abundance Index | High | 0.0 | 0.0 | 0.0 |
| | Moderate | 2.0 | 2.0 | 4.0 |
| | Low | 57.8 | 107.5 | 165.4 |

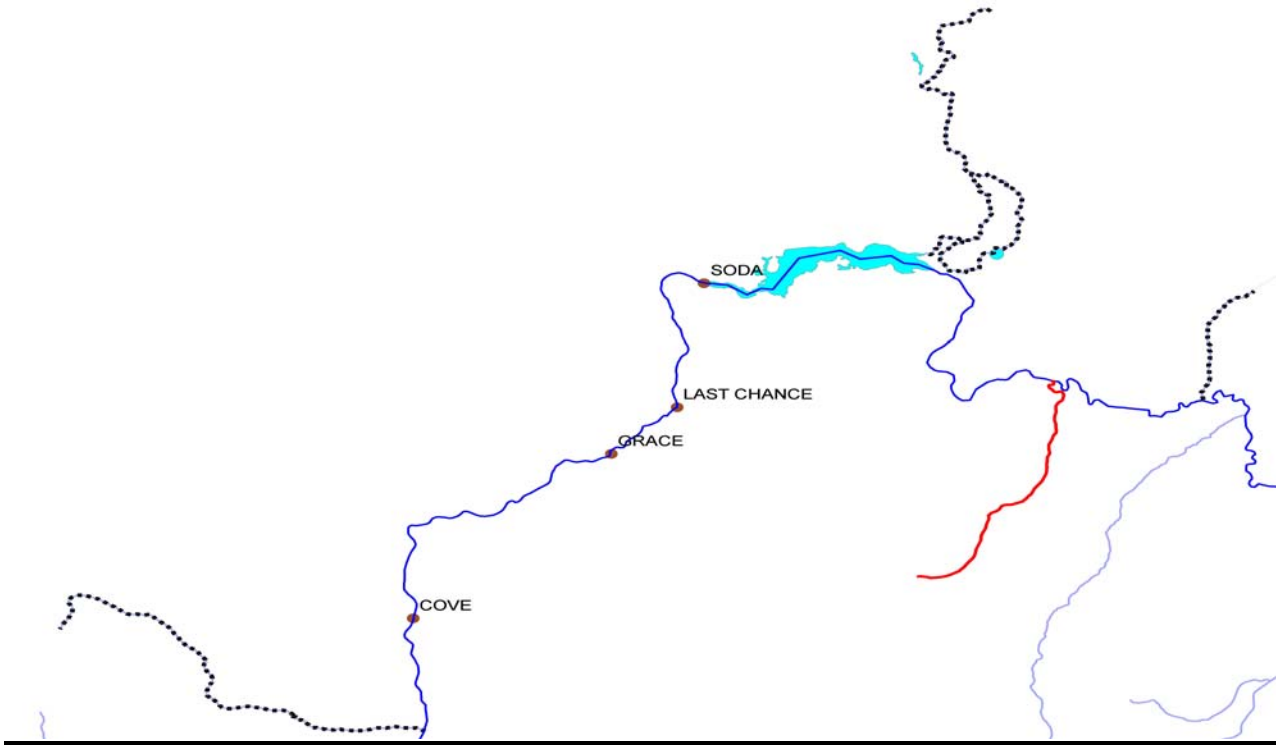



Figure 6 The Dam Complex management unit includes the Bear River from Soda Dam downstream to Grace Dam (6.1 miles). Cove Dam was removed in 2006. There are no tributary streams in this section of the Bear River.

**Dam Complex Management Unit**

This management unit covers the section of Bear River between Soda and Grace dams (Figure 6). Last Chance and Grace Dams are included in this management unit. There are no tributaries in this management unit. The river gradient is much higher than the other management units at 3.7%. This management unit includes a total river reach of 6.1 miles. Status of Bonneville cutthroat trout within the Dam Complex management unit was classified as unknown. If Bonneville cutthroat trout exist in the Dam Complex management unit, they are most likely downstream migrants from the Nounan Valley management unit. Therefore, Bonneville cutthroat trout in the Dam Complex management unit are essentially trapped without spawning habitat or the potential to migrate upstream. Although unlikely, it is possible that Bonneville cutthroat trout could follow water flow downstream out of the Dam Complex management unit and contribute to populations in the Gentile Valley or Riverdale management units. In 1993, one site in

the Dam Complex was surveyed below Soda Dam. No Bonneville cutthroat trout were documented.

**Gentile Valley Management Unit**

The Gentile Valley management unit covers the Bear River from the Grace Dam downriver to Oneida Dam (31.4 miles; Figure 7). In that reach there are 14 perennial tributaries covering 85 miles of habitat. Those tributary miles are primarily located on private land (80%). Five of the tributaries in the Gentile Valley management unit have not been sampled in the past five years and were given unknown population status. Of the remaining 9 tributaries, seven supported Bonneville cutthroat trout and two were classified as extirpated. The extirpated streams are Trout and Whiskey creeks. Table 3 summarizes all of the population indices data for the Gentile Valley management unit.

In the Gentile Valley management unit, tributaries occupied by Bonneville cutthroat trout include Cottonwood, Jacobson, Shingle, Smith, Williams, and North and South Hoops creeks. Cottonwood Creek is the largest tributary (19 miles) in the Gentile Valley management unit. Population status for Cottonwood Creek is rated low and Bonneville cutthroat trout are limited to relatively small sections of the stream. Shingle and Jacobson creeks are tributaries to Cottonwood Creek. Due to irrigation withdrawal and infiltration, Cottonwood Creek is intermittent during summer months near its confluence with the Bear River.

Smith Creek was classified as occupied habitat. In a spot electrofishing effort completed in 2001, one Bonneville cutthroat trout was sampled from Smith Creek. However, high water temperatures may limit the Smith Creek population. Smith Creek supports a warm water fish hatchery approximately 0.75 miles upstream of its confluence with the Bear River. The commercial hatchery produces cichlids *Tilapia sp*.

Williams Creek supports a robust trout population dominated by rainbow trout. The stream was designated as occupied based on preliminary genetic analysis showing some fish carrying genetic markers indicative of Bonneville cutthroat trout. However, fish carrying the Bonneville cutthroat trout markers were not pure Bonneville cutthroat trout. No pure Bonneville cutthroat trout were observed in the genetic sample (n = 41). The hybridization may be coming from fluvial Bonneville cutthroat trout from the Bear River or resident populations.

Recent angling reports document the presence of fluvial Bonneville cutthroat trout in the Gentile Valley management unit of the Bear River. Conclusive photographs of Bonneville cutthroat trout accompany the angling reports. Additional survey work for this section is necessary to determine the condition of the existing population and locate important spawning and rearing habitats.

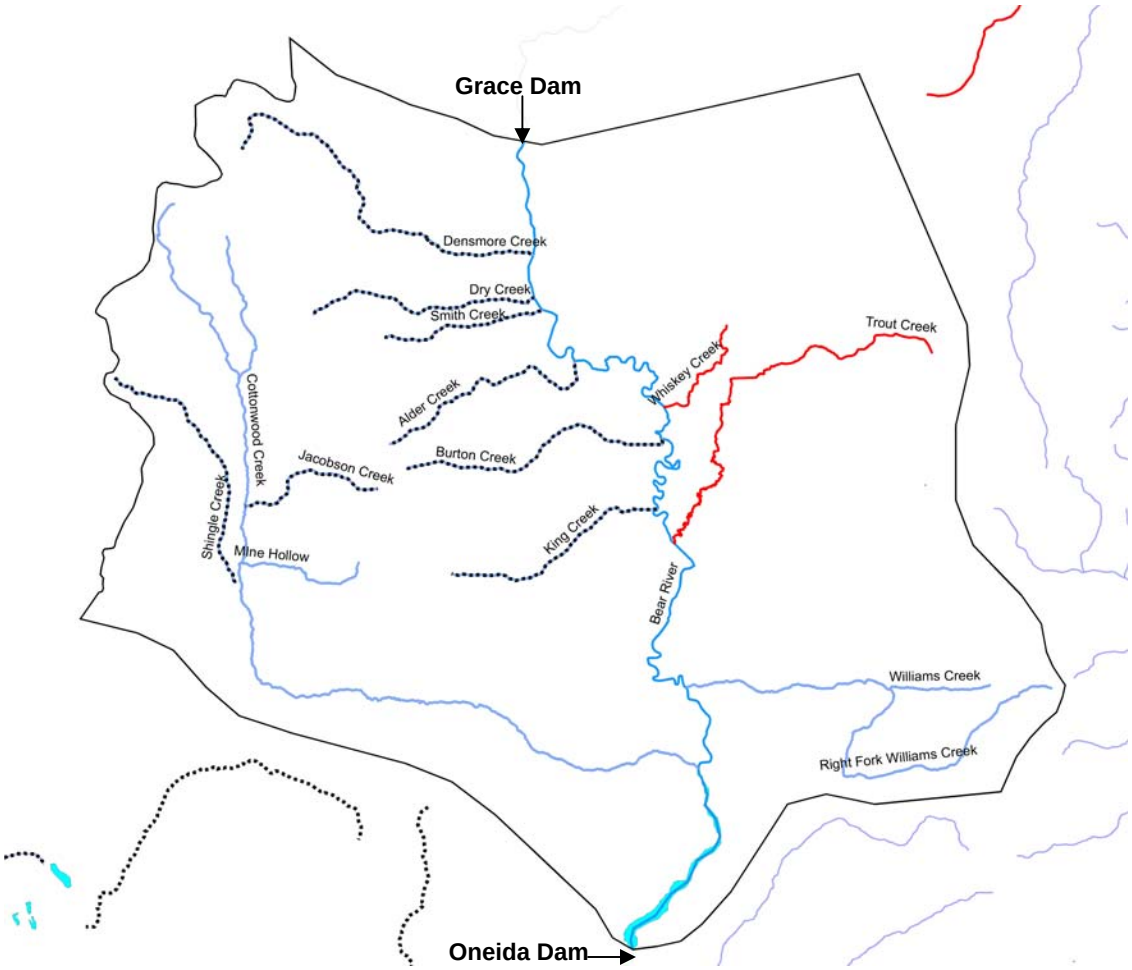



Figure 7 The Gentile Valley Management Unit includes the Bear River from Grace Dam downstream to Oneida Dam (31.4 miles). There are 14 perennial tributaries that drain into Bear River in this Management Unit.

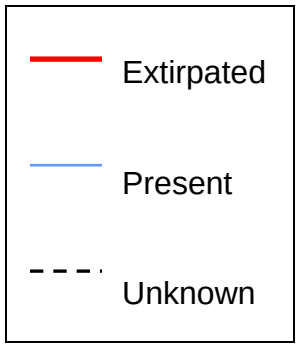


Table 3 Population status, abundance, and uniformity index for Bonneville cutthroat trout in the Gentile Valley Management Unit of the Bear River.

| | | Distance (miles) | | | Population | Status Indices | |
|---|---|---|---|---|---|---|---|
| Stream Name | Parent Stream | Public | Private | Total | Status | Abundance | Uniformity |
| Bear River | | 2.0 | 29.4 | 31.4 | present | low | low |
| Densmore Creek | Bear River | 1.1 | 5.2 | 6.3 | unknown | | |
| Dry Creek | Bear River | 1.1 | 3.6 | 4.7 | unknown | | |
| Smith Creek | Bear River | 0.0 | 5.0 | 5.0 | present | low | low |
| Alder Creek | Bear River | 0.6 | 4.6 | 5.2 | unknown | | |
| Burton Creek | Bear River | 0.0 | 6.6 | 6.6 | unknown | | |
| King Creek | Bear River | 0.0 | 5.7 | 5.7 | unknown | | |
| North Hoops Creek | Bear River | 1.6 | 3.1 | 4.7 | present | low | low |
| South Hoops Creek | Bear River | 0.0 | 2.5 | 2.5 | present | low | low |
| Cottonwood Creek | Bear River | 16.5 | 2.4 | 18.9 | present | low | low |
| Shingle Creek | Cottonwood Creek | 1.2 | 2.6 | 3.8 | present | low | low |
| Jacobson Creek | Cottonwood Creek | 0.8 | 1.3 | 2.1 | present | low | low |
| Trout Creek | Bear River | 0.0 | 12.0 | 12.0 | extirpated | | |
| Whiskey_BR | Bear River | 0.0 | 3.8 | 3.8 | extirpated | | |
| Williams Creek | Bear River | 0.0 | 4.3 | 4.3 | present | low | low |
| | Totals | 24.9 | 91.9 | 116.8 | | | |

Summary Statistics for the Gentile Valley Management Unit

| | | Miles | | |
|---|---|---|---|---|
| | | Public | Private | Total |
| Status Totals | Extirpated | | 15.8 | 15.8 |
| | Present | 22.1 | 50.5 | 72.6 |
| | Unknown | 2.8 | 25.7 | 28.5 |
| Abundance Index | High | 0.0 | 0.0 | 0.0 |
| | Moderate | 0.0 | 0.0 | 0.0 |
| | Low | 22.1 | 50.5 | 72.6 |

## Riverdale Management Unit

The Riverdale management unit covers the Bear River from Oneida Dam downriver to the Utah border (31 miles). This management unit contains a total of 23 perennial tributaries with 133 miles of potential stream habitat (Figure 8). Those tributary miles are located on 52 miles of public and 81 miles of privately owned lands. Recent fishery surveys show that Bonneville cutthroat trout occupy 60% (80 miles) of the available tributary habitat. The remaining tributary miles are 38% unknown and 2% fishless.

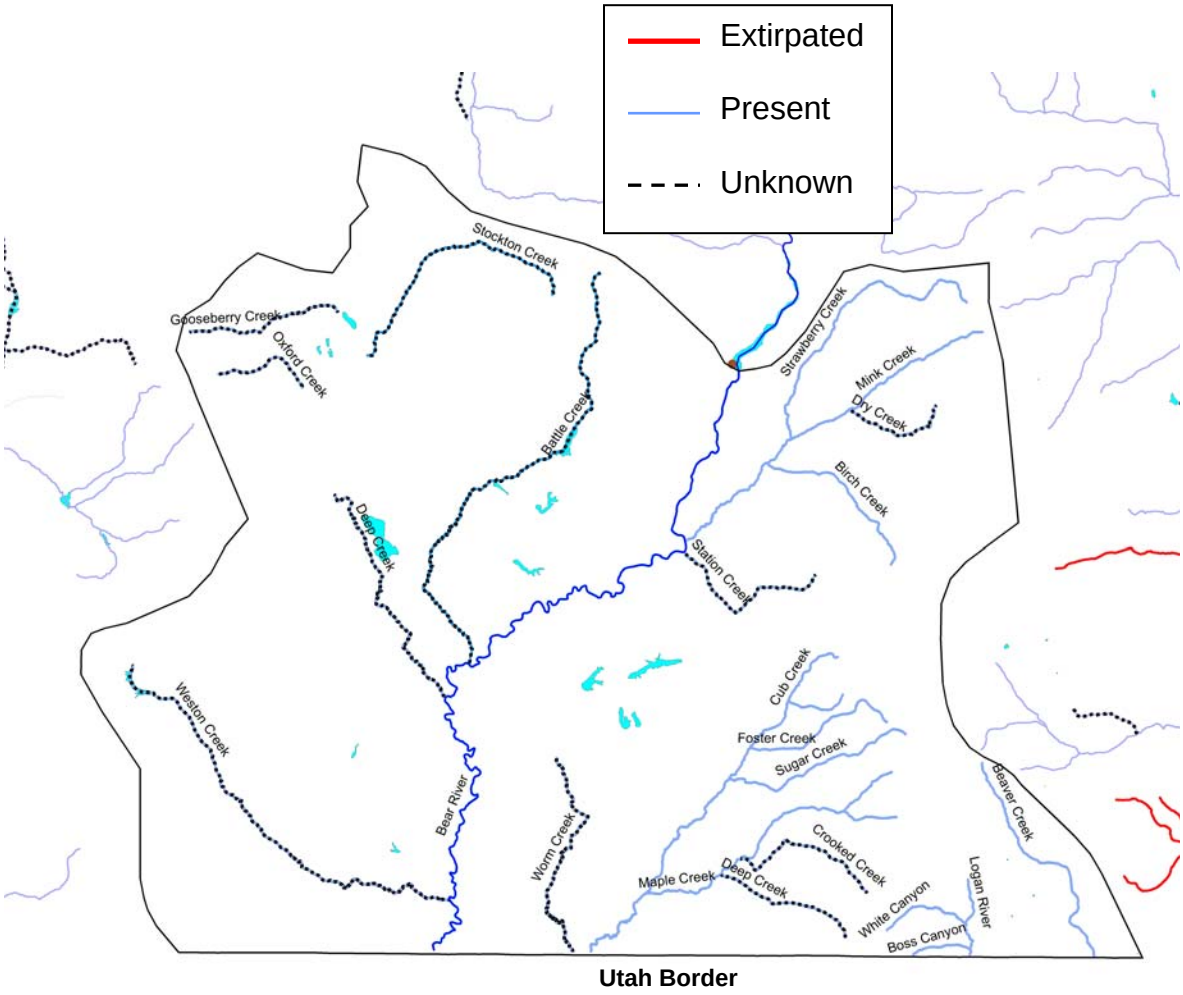



Figure 8. The Riverdale Management Unit includes the Bear River from Oneida Dam downstream to the Utah Border (31.1 miles). Approximately half the tributaries enter the Bear River system downstream of the Utah-Idaho Border.

The Riverdale management unit supports several of the most robust populations of the Bonneville cutthroat trout in Idaho. The Cub and Logan river systems and many of their supporting tributaries have high densities of Bonneville cutthroat trout. Juvenile production and densities appear strong in Maple, Foster, Sugar, Boss, White Canyon, and Hodge Nibley creeks. The strong tributary populations in the Riverdale management unit may benefit from connectivity with the Logan and Cub rivers.

In addition to tributary populations, a fluvial population of Bonneville cutthroat trout was observed in mainstem reaches in the Bear River within the Riverdale management unit during general population surveys completed in 1988 and 1993. The fluvial population appeared to decline between the 1988 and 1993 surveys. In a 2002 creel survey, anglers caught an estimated 27 BCT in a 6.7 mile section of the Bear River below Oneida Dam. Table 4 summarizes all abundance and population distribution data from the Riverdale management unit.

Table 4 Population status, abundance, and uniformity index for Bonneville cutthroat trout in the Riverdale Management Unit of the Bear River.

| | | Distance (miles) | | | Population | Status Indices | |
|---|---|---|---|---|---|---|---|
| Stream Name | Parent Stream | Public | Private | Total | Status | Abundance | Uniformity |
| Bear River (Riverdale) | Great Salt Lake | 2.3 | 28.9 | 31.1 | present | low | low |
| Mink Creek | Bear River | 2.5 | 11.1 | 13.6 | present | low | moderate |
| Birch Creek | Mink Creek | 3.9 | 2.7 | 6.5 | present | low | high |
| Dry Creek | Mink Creek | 1.1 | 3.7 | 4.8 | unknown | | |
| Strawberry Creek | Mink Creek | 3.0 | 0.0 | 3.0 | no fish | | |
| Battle Creek | Bear River | 0.0 | 8.3 | 8.3 | unknown | | |
| Fivemile Creek | Bear River | 3.0 | 6.0 | 9.0 | unknown | | |
| Weston Creek | Bear River | 1.6 | 3.2 | 4.7 | unknown | | |
| Deep Creek | Bear River | 0.0 | 10.8 | 10.8 | unknown | | |
| Stockton Creek | Oxford Slough | 1.8 | 6.5 | 8.3 | present | low | low |
| Oxford Creek | Oxford Slough | 0.6 | 0.0 | 0.6 | unknown | | |
| Gooseberry Creek | no connection | 1.4 | 3.8 | 5.2 | unknown | | |
| Cub River | Bear River | 5.3 | 14.6 | 19.9 | present | moderate | moderate |
| Worm Creek | Cub River | 3.5 | 0.0 | 3.5 | unknown | | |
| Maple Creek | Cub Creek | 2.4 | 9.6 | 12.0 | present | moderate | high |
| Deep Creek | Maple Creek | 0.8 | 2.1 | 2.8 | unknown | | |
| Sugar Creek | Cub River | 3.0 | 3.6 | 6.6 | present | high | high |
| Foster Creek | Cub River | 0.2 | 2.0 | 2.2 | present | moderate | moderate |
| Logan River | Bear River | 3.4 | 0.0 | 3.4 | present | moderate | high |
| Beaver Creek | Logan River | 6.6 | 0.0 | 6.6 | present | high | high |
| Boss Creek | Logan River | 3.3 | 0.0 | 3.3 | present | moderate | moderate |
| White Canyon Creek | Logan River | 2.7 | 0.0 | 2.7 | present | moderate | high |
| Hodge Nibley Creek | Logan River | 1.9 | 0.0 | 1.9 | present | moderate | moderate |
| Corral Hollow Creek | Logan River | 1.7 | 0.0 | 1.7 | present | moderate | moderate |
| | Totals | 55.9 | 116.6 | 172.5 | | | |

Summary Statistics for the Riverdale MU

| | | Public | Private | Total |
|---|---|---|---|---|
| Status Totals | Extirpated | | | |
| | Present | 40.9 | 78.9 | 119.7 |
| | Unknown | 12.0 | 37.7 | 49.7 |
| Abundance Index | High | 3.6 | 9.7 | 13.3 |
| | Moderate | 20.8 | 26.2 | 47.0 |
| | Low | 10.4 | 49.1 | 59.5 |

## Malad River Management Unit

The Malad River Management Unit encompasses all of the Malad River and its tributaries within Idaho (Figure 9). This management unit contains a total of 17 perennial tributaries with 116 miles of potential stream habitat. Those tributary miles are located on 33 miles of public and 83 miles of privately owned lands. Recent fishery surveys identified 28 miles of occupied tributary habitat. The occupied habitat includes First, Second, Third, and Mill creeks. The natural drainage of Mill Creek is within the historical range of Yellowstone cutthroat trout (connection to the Snake River Basin). However, Mill Creek was diverted for irrigation purposes into the range of Bonneville cutthroat trout. Population status for most of the potential tributary habitat (75%) as well as the mainstem Malad and Little Malad Rivers is unknown and much of the Malad River management unit still needs to be surveyed (Table 5).

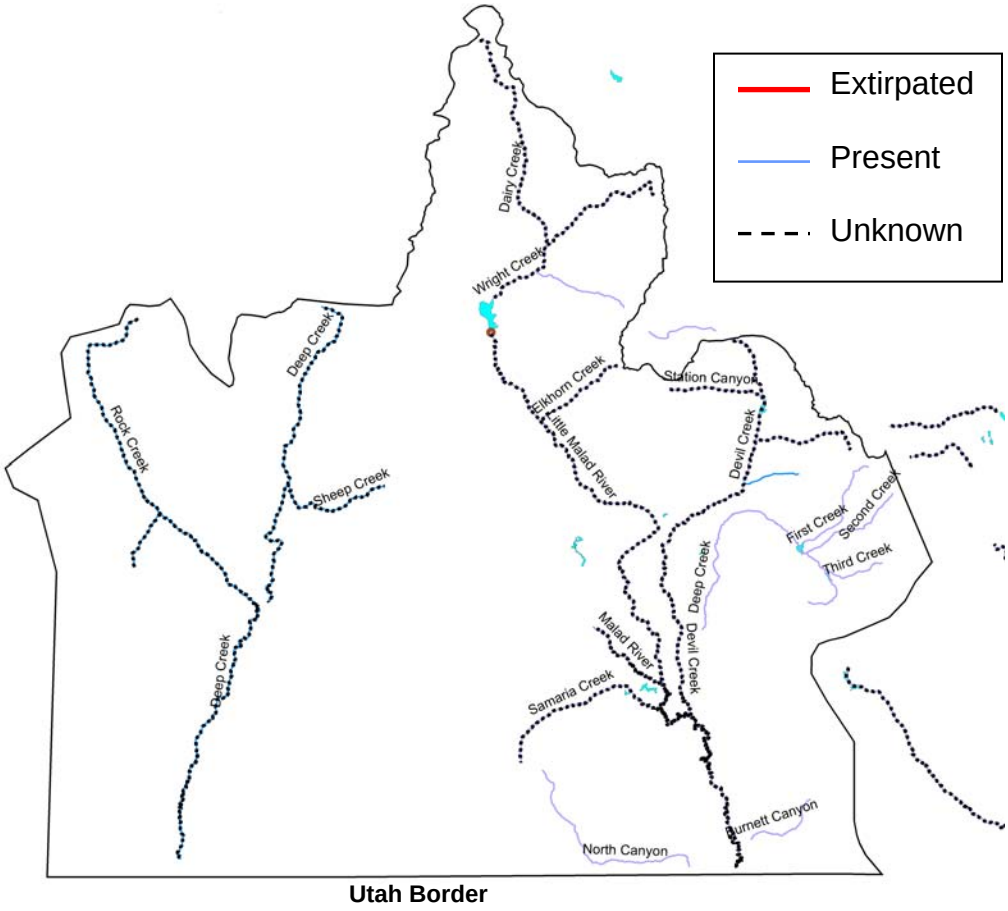



Figure 9 The Malad River Management Unit includes the Malad River Drainage and its tributaries. There are 12 perennial tributaries that drain into the Malad River in Idaho.

Table 5 Population status, abundance, and uniformity index for Bonneville cutthroat trout in the Malad River Management Unit.

| | | Distance (miles) | | | Population | Status Indices | |
|---|---|---|---|---|---|---|---|
| Stream Name | Parent Stream | Public | Private | Total | Status | Abundance | Uniformity |
| Malad River | Bear River | 0.0 | 31.7 | 31.7 | unknown | | |
| Little Malad River | Malad River | 0.0 | 31.0 | 31.0 | unknown | | |
| Wright Creek | Daniels Reservoir | 0.0 | 6.6 | 6.6 | unknown | | |
| Indian Mill Creek | Wright Creek | 1.3 | 3.0 | 4.3 | no fish | | |
| Dairy Creek | Little Malad River | 0.0 | 8.4 | 8.4 | present | low | low |
| Elkhorn Creek | Little Malad River | 1.7 | 1.1 | 2.8 | unknown | | |
| Samaria Creek | Malad River | 0.0 | 4.4 | 4.4 | unknown | | |
| Devil Creek | Malad River | 0.0 | 20.1 | 20.1 | unknown | | |
| New Canyon Creek | Devil Creek | 1.7 | 2.4 | 4.1 | unknown | | |
| Deep Creek | None | 0.0 | 11.9 | 11.9 | unknown | | |
| First Creek | Deep Creek Res | 1.1 | 1.6 | 2.7 | present | moderate | moderate |
| Second Creek | Deep Creek | 3.3 | 1.9 | 5.2 | present | moderate | moderate |
| Third Creek | Deep Creek | 4.8 | 1.9 | 6.7 | present | moderate | moderate |
| Burnett Creek | Malad River | 1.8 | 1.4 | 3.2 | unknown | | |
| Deep Creek_Curlew | Great Salt Lake | 6.3 | 6.1 | 12.4 | unknown | | |
| Rock Creek | Deep Creek_Curlew | 5.0 | 4.6 | 9.6 | unknown | | |
| Meadow Creek | Deep Creek_Curlew | 2.6 | 0.6 | 3.2 | unknown | | |
| Sheep Creek | Deep Creek_Curlew | 1.1 | 4.0 | 5.1 | unknown | | |
| | Totals | 33.6 | 138.7 | 168.3 | | | |

Summary Statistics for the Malad River MU

| | | Public | Private | Total |
|---|---|---|---|---|
| Status Totals | Extirpated | | | |
| | Present | 9.2 | 13.8 | 23.0 |
| | Unknown | 5.1 | 110.6 | 115.7 |
| Abundance Index | High | 0.0 | 0.0 | 0.0 |
| | Moderate | 9.2 | 5.4 | 14.6 |
| | Low | 0.0 | 8.4 | 8.4 |

## FACTORS AFFECTING STATUS

Four primary factors limit Bonneville cutthroat trout in Idaho. These factors include water management, livestock grazing, non-native fish species, and angler harvest. In an effort to determine the most significant limiting factor(s) for Bonneville cutthroat trout and help prioritize conservation efforts within a watershed, each tributary and major river reach received a potential threat rating based on each of the four major categories. A rating of 0 indicated no identifiable threat. A rating of 3 indicated that the potential threat was considered significant and conservation efforts should be focused in that area. Appendix C provides additional explanation of the potential threat rating system and summarizes potential threat scores for each management unit.

### Irrigation and Hydropower

Irrigation and hydropower historically and contemporaneously pose significant risks to Bonneville cutthroat trout in Idaho (Appendix C). The impacts of irrigation and hydropower operations on Bonneville cutthroat trout include: barriers to movement and migration, mortality of fish lost in unscreened irrigation or hydropower diversions/facilities, loss of stream productivity due to reduced stream flows, increased summer water temperatures, mortality of fish trapped in dewatered tributaries, and altered flow regimes.

There are three hydropower facilities on the mainstem Bear River owned and operated by PacifiCorp, a private electric utility (Soda, Grace, Oneida; Figure 6). As mentioned previously, the Cove Dam was removed by PacifiCorp in 2006. All of these facilities currently are barriers to upstream fish migration. Tributary streams have also been impounded for irrigation purposes. Dams on tributaries that block upstream fish movement include Daniels, Deep, Crowthers, Pleasantview, and Devil Creek reservoirs in the Malad River management unit. In the Riverdale management unit, Weston, Treasureton, Condie, Glendale, Lamont, and Johnson reservoirs block fish migrations. Montpelier and Little Valley reservoirs are barriers to fish migration in the Nounan Valley management unit, as is the Georgetown Creek hydropower diversion dam. It should be noted that that in regards to all of the irrigation project reservoirs and associated diversions, water rights for these projects have been legally obtained as per statutes and rules and regulations of the State of Idaho.

The dams have created isolated population segments, increased the risk of losing genetic diversity, and prevented Bonneville cutthroat trout from refounding populations that have been extirpated. In some cases, the dams may prevent or suppress the expansion of non-native fish populations and protect isolated populations from hybridization with rainbow trout or competition with other non-native fish species.

Virtually all the streams and rivers identified as potential Bonneville cutthroat trout habitat in Idaho are managed for irrigation purposes. Irrigation diversions form partial or complete barriers to fish migration and can kill fish caught in irrigation canals. For example, unscreened irrigation diversions reduced survival of juvenile Bonneville cutthroat trout in Saint Charles Creek by 90% (Kershner 1995), and a single irrigation canal on the Thomas Fork resulted in the mortality of 23% of radio-tagged Bonneville cutthroat trout as they attempted to move downstream after spawning (Schrank and

Rahel 2004). Since most streams have more than one irrigation diversion, there are possibly hundreds of unscreened irrigation diversions that reduce survival of Bonneville cutthroat trout via entrainment.

## Grazing

Adverse impacts of improper livestock grazing on fisheries habitat and fish populations are well documented in the scientific literature (Keller and Burnham 1982; Platts and Nelson 1985; Chaney et al. 1993; Fitch and Adams 1998). Protecting and improving riparian habitat will result in narrower stream channels, deeper pools, provide cooler water, stabilize stream banks, reduce sediment loading, increase insect production, and improve spawning success. Improving riparian habitat will increase carrying capacity for trout species and will enhance many of the existing Bonneville cutthroat trout populations (Duff 1988; Platts 1991a; Platts 1991b; Schrank and Rahel 2006).

A rating system was used to summarize livestock grazing impacts on riparian habitat. The rating system is described in Appendix C and provides a range of scores from no visible impact to severe habitat degradation. An interagency, interdisciplinary team of resource management professionals was assembled to rate grazing impacts on each tributary. The team used a consensus approach for rating each tributary. Participants in the process included representatives from the USFS (Forest Hydrologist Lee Leffert, Forest Fisheries Biologist Jim Capurso, Montpelier Range Conservationist Brad Transtrum, Westside Ranger District Wildlife Biologist Ken Timothy, Westside District Ranger Jerald Tower), BLM (Resource Area Range Conservationist Mike Jorgensen), IDEQ (Beneficial Use Reconnaissance Lead Dave Hull), and IDFG (Southeast Region Fisheries Biologist David Teuscher, Staff Biologist Jim Mende, Regional Fisheries Manager Richard Scully).

## Non-Native Fish

Non-native fish species may hybridize, compete for food or space, or prey upon Bonneville cutthroat trout. Table 6 identifies waters where Bonneville cutthroat trout coexist with non-native fish species. Most of the non-native fish species that occur in historical Bonneville cutthroat trout habitat were introduced by federal or state fish and wildlife management agencies (Appendix B). The most common non-native salmonid species found in the Bear River Drainage are: rainbow trout, brook trout, and brown trout. Walleye *Sander vitreus*, smallmouth bass *Micropterus dolomieui*, and common carp *Cyprinus carpio* are other non-native species that may negatively impact Bonneville cutthroat trout populations.

### *Rainbow Trout*

Rainbow trout can hybridize with native Bonneville cutthroat trout resulting in introgressive hybridization. Rainbow trout occupy about 38% (317 miles) of the river and stream habitat in the Bear and Malad River drainages (Table 6). Rainbow trout were introduced by IDFG to improve angling opportunity (Appendix B). Currently, most of the rainbow trout populations continue to be maintained by hatchery stocking using sterile

trout. However, there are some naturally reproducing and self sustaining populations of rainbow trout in the Bear River drainage including Saint Charles, Georgetown, and Williams creeks. In those systems, hybridization with native BCT has been documented.

To quantify the magnitude of introgression between rainbow trout and Bonneville cutthroat trout in Idaho, genetic samples were collected from most of the major tributaries in the Malad and Bear River drainages (Figure 10). Analysis of those samples shows that most of the Bonneville cutthroat trout in Idaho have not been impacted by rainbow trout introgression (Table 7).

Table 6 Fish population status in the Bear and Malad River drainages.

A symbol of any kind indicates current occupancy by that species. Allopatric Bonneville cutthroat trout indicates waters where Bonneville cutthroat trout are the only trout species found in that stream.
RBT=rainbow trout, BKT=brook trout, BN=brown trout, SMB=smallmouth bass, WE=walleye. For the non-native species, closed circles indicate past or present hatchery stocking. Open circles represent possible invasions (i.e., the species is present but was not introduced intentionally by hatchery stocking). Because not all stocking events are recorded, the open circle classification is likely an overestimate of fish invasions. Therefore, open circles describe either true invasions or populations initiated by undocumented hatchery stocking events.

| | | Native BCT | | | Non-native Game Fish Species | | | | |
|---|---|---|---|---|---|---|---|---|---|
| **Stream Name** | **Miles** | **Status** | **Sympatric** | **Allopatric** | **RBT** | **BKT** | **BN** | **SMB** | **WE** |
| **Pegram Management Unit** | | | | | | | | | |
| Bear River | 44.9 | present | ■ | | ● | | ● | | |
| Bear Lake Outlet | 8.2 | present | ■ | | | | ● | | |
| Sheep Creek | 9.6 | unknown | | | | | | | |
| Thomas Fork | 36.7 | present | ■ | | | | ○ | | |
| Preuss Creek | 15.7 | present | | ■ | | | | | |
| Fish Creek | 1.0 | unknown | | | | | | | |
| Beaver Creek | 3.9 | unknown | | | | | | | |
| Dry Creek | 8.1 | present | | ■ | | | | | |
| Dip Creek | 2.1 | unknown | | | | | | | |
| Giraffe Creek | 3.3 | present | | ■ | | | | | |
| Robinson Creek | 0.1 | unknown | | | | | | | |
| St. Charles Creek | 11.2 | present | ■ | | ● | ● | | | |
| Davis Canyon | 1.3 | unknown | | | | | | | |
| Big Arm St. Charles | 3.5 | present | ■ | | ● | ● | | | |
| Spring Creek | 1.6 | present | ■ | | ● | ● | | | |
| Little Arm St. Charles | 3.2 | present | ■ | | ● | ● | | | |
| Fish Haven Creek | 6.0 | extirpated | | | | ● | | | |
| Indian Creek | 2.7 | unknown | | | | | | | |
| Bloomington Creek | 15.2 | extirpated | | | ● | ● | | | |
| Paris Creek | 14.2 | present | ■ | | ● | ● | | | |
| **Nounan MU** | | | | | | | | | |
| Bear River | 57.7 | present | ■ | | ● | | ● | | |
| Montpelier Creek | 24.1 | present | ■ | | ● | ● | ○ | | |

| | | Native BCT | | | Non-native Game Fish Species | | | | |
|---|---|---|---|---|---|---|---|---|---|
| **Stream Name** | **Miles** | **Status** | **Sympatric** | **Allopatric** | **RBT** | **BKT** | **BN** | **SMB** | **WE** |
| Dry Creek | 0.6 | unknown | | | | | | | |
| Home Canyon Creek | 1.6 | present | ■ | | ○ | | ○ | | |
| Snowslide Canyon Creek | 0.9 | unknown | | | | | | | |
| Whiskey | 2.7 | present | ■ | | | ○ | | | |
| Little Beaver Creek | 3.8 | present | ■ | | | ○ | | | |
| Ovid Creek | 17.5 | unknown | | | | ● | | | |
| Mill Creek | 3.0 | present | ■ | | | ● | | | |
| Liberty Creek | 1.9 | unknown | | | | ○ | | | |
| North Canyon Creek | 12.8 | present | ■ | | | ○ | | | |
| Emigration Creek | 5.0 | present | | ■ | | | | | |
| Copenhagen Creek | 3.9 | no fish | | | | | | | |
| Georgetown Creek | 14.0 | extirpated | | | ● | ● | ○ | | |
| Georgetown Left | 2.0 | extirpated | | | ● | ● | | | |
| Stauffer Creek | 10.5 | present | | ■ | | | | | |
| Beaver Creek | 2.5 | present | | ■ | | | | | |
| South Fork Stauffer | 3.0 | present | | ■ | | | | | |
| North Fork Stauffer | 4.4 | present | | ■ | | | | | |
| Skinner Creek | 8.2 | present | ■ | | | ○ | | | |
| North Skinner Creek | 2.3 | present | | ■ | | | | | |
| Co-op Creek | 7.3 | present | | ■ | | | | | |
| Pearl Creek | 5.9 | present | ■ | | | ○ | | | |
| North Pearl Creek | 3.6 | present | ■ | | | | | | |
| Eightmile Creek | 15.0 | present | ■ | | ● | ● | | | |
| Sulphur Canyon | 2.6 | unknown | | | | | | | |
| Bailey Creek | 6.6 | present | ■ | | | ○ | | | |
| Soda Creek | 7.8 | unknown | | | | | | | |
| **Dam Complex MU** | | | | | | | | | |
| Bear River | 6.1 | unknown | | | ● | | | | |
| **Gentile Valley MU** | | | | | | | | | |
| Bear River | 31.4 | present | ■ | | ● | | ● | ● | ● |
| Densmore Creek | 6.3 | unknown | | | | | | | |
| Dry Creek | 4.7 | unknown | | | | | | | |
| Smith Creek | 5.0 | present | | ■ | | | | | |
| Alder Creek | 5.2 | unknown | | | | | | | |
| Burton Creek | 6.6 | unknown | | | | | | | |
| King Creek | 5.7 | unknown | | | | | | | |
| Cottonwood Creek | 18.9 | present | | ■ | | | | | |
| Shingle Creek | 3.8 | present | | ■ | | | | | |
| Jacobson Creek | 2.1 | present | | ■ | | | | | |
| Trout Creek | 12.0 | extirpated | | | ● | ● | | | |
| Whiskey | 3.8 | extirpated | | | ● | | | | |
| Williams Creek | 4.3 | present | ■ | | ● | ● | | | |
| **Riverdale MU** | | | | | | | | | |
| Bear River | 31.1 | present | ■ | | ● | | ● | ○ | ○ |
| Mink Creek | 13.6 | present | ■ | | ● | ● | ○ | | |
| Birch Creek | 6.5 | present | | ■ | | | | | |
| Dry Creek | 4.8 | unknown | | | | | | | |
| Strawberry Creek | 3.0 | no fish | | | | | | | |

| | | Native BCT | | | Non-native Game Fish Species | | | | |
|---|---|---|---|---|---|---|---|---|---|
| **Stream Name** | **Miles** | **Status** | **Sympatric** | **Allopatric** | **RBT** | **BKT** | **BN** | **SMB** | **WE** |
| Battle Creek | 8.3 | unknown | | | | | | | |
| Deep Creek | 10.8 | unknown | | | | | | | |
| Fivemile Creek | 9.0 | unknown | | | | | | | |
| Weston Creek | 4.7 | unknown | | | | | | | |
| Cub River | 19.9 | present | ■ | | ● | ● | | | |
| Worm Creek | 3.5 | unknown | | | | | | | |
| Maple Creek | 12.0 | present | | ■ | | | | | |
| Deep Creek | 2.8 | unknown | | | | | | | |
| Sugar Creek | 6.6 | present | | ■ | | | | | |
| Foster Creek | 2.2 | present | | ■ | | | | | |
| Logan River | 3.4 | present | | ■ | | | | | |
| Beaver Creek | 6.6 | present | ■ | | | ● | | | |
| Boss Creek | 3.3 | present | | ■ | | | | | |
| White Canyon Creek | 2.7 | present | | ■ | | | | | |
| Hodge Nibley Creek | 1.9 | present | | ■ | | | | | |
| Corral Hollow Creek | 1.7 | present | | ■ | | | | | |
| Stockton Creek | 8.3 | present | | ■ | | | | | |
| Gooseberry Creek | 5.2 | unknown | | | | | | | |
| Oxford Creek | 0.6 | unknown | | | | | | | |
| **Malad MU** | | | | | | | | | |
| Malad River | 31.0 | unknown | | | | | | | |
| Little Malad River | 31.7 | unknown | | | | | | | |
| Wright Creek | 6.6 | unknown | | | | | | | |
| Indian Mill Creek | 4.3 | no fish | | | | | | | |
| Dairy Creek | 8.4 | present | | ■ | | | | | |
| Elkhorn Creek | 2.8 | unknown | | | | | | | |
| Samaria Creek | 4.4 | unknown | | | | | | | |
| Devil Creek | 20.1 | present | ■ | | ● | | | | |
| New Canyon Creek | 4.1 | unknown | | | | | | | |
| Deep Creek | 11.9 | unknown | | | | | | | |
| First Creek | 2.7 | present | ■ | | | ● | | | |
| Second Creek | 5.2 | present | | ■ | | | | | |
| Third Creek | 6.7 | present | | ■ | | | | | |
| Burnett Creek | 3.2 | unknown | | | | | | | |
| Deep Creek_Curlew | 12.4 | unknown | | | | | | | |
| Rock Creek | 9.6 | unknown | | | | | | | |
| Meadow Creek | 3.2 | unknown | | | | | | | |
| Sheep Creek | 5.1 | unknown | | | | | | | |

| | | BCT | | | Non-native Game Fish Species | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | present | Sympatric | Allopatric | RBT | BKT | BN | SMB | WE |
| Total Miles | 899 | 565 | 397 | 168 | 323 | 232 | 248 | 69 | 69 |
| % of available miles | 100% | 63% | 44% | 19% | 36% | 26% | 28% | 8% | 8% |

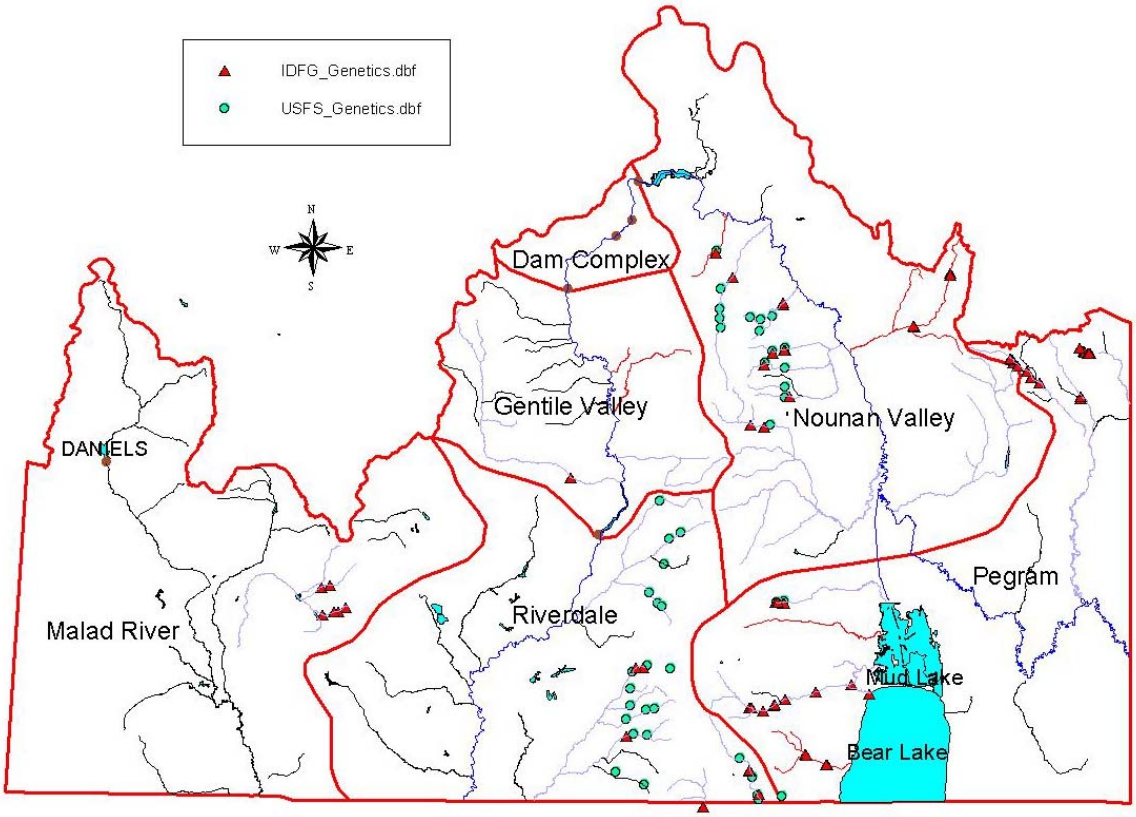



Figure 10 Locations of genetic samples collected in each of the Management Units. A total of 565 samples have been collected.

The IDFG's Fisheries Management Plan 2007-2012 states, "hatchery-reared fish will be stocked as appropriate to preserve, establish, or reestablish depleted fish populations and to provide angling opportunity to the general public" (Idaho Department of Fish and Game 2007). The Fisheries Management Plan also indicates that emphasis will be placed on protection and enhancement of native trout, especially through habitat maintenance or improvement and regulation to control harvest. At the same time, IDFG will continue to emphasize catchable programs on streams with good angler access, where return to the creel is good, and where stocked fish do not affect persistence of native fish. Hatchery fish are also used extensively to maintain reservoir fisheries.

In order to maintain catchable trout programs where they are appropriate, introgression risk is being minimized by stocking few waters containing BCT, and in the few that are stocked to provide angler harvest opportunities, catchable rainbow trout are

treated via either heat or pressure shock to induce triploidy with resultant high rates of sterility, typically >96% (Dillon et al. 2000). To minimize the potential for hatchery trout mating with native trout stocks, the IDFG implemented a program to produce and stock only sterile rainbow trout from the hatchery system. This statewide policy was initiated by the IDFG in 2000. Induction rates achieved by the IDFG to produce triploid hatchery rainbow trout are now 99% or higher. To be consistent and to further reduce hybridization risks, we will require stocking fish that have been treated for sterility to be used in private ponds located within drainages where Bonneville cutthroat trout exist.

During the 20th century, Yellowstone cutthroat trout were aggressively stocked in the Bear River and Malad River drainages (Appendix B). Additionally, a historical Yellowstone cutthroat trout stream (Mill Creek) was diverted into a Bonneville cutthroat trout drainage. Those introductions created the potential for contemporary subspecies introgression. Attempts are being made by the IDFG to develop genetic markers to distinguish the Yellowstone from the Bonneville subspecies. Once those markers become available, fisheries managers can use them to assess the relative impact of stocking Yellowstone cutthroat trout within the historical Bonneville cutthroat trout range.

Table 7 Genetic samples collected from Bear and Malad river tributaries. The numbers of rainbow trout (RBT) hybrids and percent introgression values are provided.

| Population | N | # of hybrids detected | %RBT introgression | Notes |
|---|---|---|---|---|
| Pegram management unit | | | | |
| Bear Lake-1998 | 35 | 0 | 0 | |
| Bear Lake-2003 | 30 | 2 | 0 | |
| Saint Charles -03 | 19 | 13 | 63.30% | |
| Saint Charles -04 | 31 | | | processing |
| Thomas Fork | 16 | 0 | 0 | |
| Pruess-03 | 5 | 0 | 0 | |
| Pruess-04 | 17 | | | processing |
| Giraffe-03 | 9 | 0 | 0 | |
| Giraffe-04 | 20 | | | processing |
| Nounan Valley management unit | | | | |
| Eightmile-01 | 22 | 0 | 0 | 19 RBT, 3 cutthroat |
| Eightmile-03 | 5 | 0 | 0 | 5 cutthroat |
| Pearl-01 | 5 | 0 | 0 | |
| North Pearl-01 | 6 | 0 | 0 | |
| Pearl-03 | 7 | 0 | 0 | |
| Skinner-01 | 11 | 0 | 0 | |
| N. Skinner | 2 | 0 | 0 | |
| Skinner-03 | 5 | 0 | 0 | |
| S. Skinner-03 | 5 | 0 | 0 | |
| N. Stauffer-01 | 1 | 0 | 0 | |
| N. Canyon | 9 | 0 | 0 | |
| N. Canyon -04 | 24 | | | processing |
| Geotown-03 | 11 | 0 | 0 | All RBT |
| Co-op-01 | 10 | 0 | 0 | |
| Gentile Valley management unit | | | | |

| Population | N | # of hybrids detected | %RBT introgression | Notes |
|---|---|---|---|---|
| Cottonwood | 22 | 2 | 1.50% | |
| Williams-01 | 13 | 1 | N/A | 12 RBT |
| Williams-03 | 28 | 5 | N/A | 23 RBT |
| Riverdale management unit | | | | |
| Cub-03 | 35 | 0 | 0 | |
| Foster Cr.-01 | 2 | 0 | 0 | |
| Maple-01 | 26 | 1 | <1% | |
| Maple-03 | 30 | 2 | 1% | |
| Sugar | 26 | 4 | 2.50% | |
| Logan-03 | 23 | 0 | 0 | |
| Beaver Cr. -03 | 13 | 0 | 0 | |
| Mink Cr. | | | | No samples |
| Birch Cr.-01 | 3 | 0 | 0 | |
| Birch Cr.-03 | 6 | 0 | 0 | |
| Dry Cr. -01? | 20 | 0 | 0 | |
| Malad management unit | | | | |
| Second Cr. -04 | 3 | | | processing |
| Third Cr. -04 | 10 | | | processing |
| **Grand Total** | **565** | | | |

*Brook trout*

Brook trout are fall spawners of a different genus and do not threaten the genetic integrity of Bonneville cutthroat trout. However, brook trout are potential competitors and predators of Bonneville cutthroat trout (Griffith 1988). Brook trout occupy 26 tributaries (232 miles) in the Bear and Malad River drainages (Table 6). That occupancy represents 27% of the potential habitat available to Bonneville cutthroat trout in Idaho. Similar to rainbow trout, brook trout were introduced in the Bear and Malad drainages in the early 1900s. Interestingly, brook trout expansion from those initial stocking events appears to be relatively limited in the Bear River Drainage.

The current distribution of brook trout is best described by past stocking records (Appendix B; Table 6). Possible invasions by brook trout have occurred in only three waters in the Bear River Drainage in Idaho (Bailey, Pearl and Skinner creeks). All of those tributaries are found in the Nounan Valley management unit. In addition to invasions, upstream expansion of brook trout has occurred in tributary streams to Ovid and Montpelier creeks. Of the 26 tributaries with brook trout, 19 (73%) of the populations appear to have been initiated by hatchery stocking, three (12%) appear to be invasions, and four (15%) were upstream expansions.

*Brown trout*

Like brook trout, brown trout are fall spawners and of a different genus than Bonneville cutthroat trout. Brown trout may negatively effect Bonneville cutthroat trout through competition and or predation but do not threaten Bonneville cutthroat trout genetically (McHugh and Budy 2005). Brown trout occupy every reach of the mainstem Bear River in Idaho and three major tributaries (Thomas Fork River, Montpelier Creek, and Mink Creek). Similar to brook trout, brown trout distribution can be explained primarily by past stocking records (Appendix B). Due to their limited occupancy in tributaries, brown trout are not considered a significant threat to most of the tributary Bonneville cutthroat trout populations.

*Walleye*

Walleye occupy the Bear River in the Gentile Valley and Riverdale management units. Walleye were initially introduced in Oneida Reservoir in 1976. Approximately 500,000 walleye fry are stocked in Oneida Reservoir annually. Since being introduced, walleye migrated downstream through Oneida Dam and occupy all of the Bear River within the Riverdale management unit. Walleye are top predators in fish communities and will opportunistically feed on fish in Oneida Reservoir and the Bear River. Once Bonneville cutthroat trout habitat restoration is complete in the Gentile Valley and Riverdale management units, walleye stocking should be reduced or eliminated to aid in Bonneville cutthroat trout restoration.

*Smallmouth Bass*

Smallmouth bass were introduced in the Dam Complex MU of the Bear River in 1990-1991. Since introduction, smallmouth bass have expanded to occupy all available downriver habitats. Their current distribution begins at Soda Dam and continues downriver to the Utah border (55 miles). Smallmouth bass appear to have successfully populated the river and Oneida Reservoir. In standard reservoir surveys, smallmouth bass increased from not present in 1992 to 9% of the relative species composition in a 2001 survey. Despite no current stocking, anglers now catch more smallmouth bass than walleye in Oneida Reservoir. In the river fishery below Oneida Reservoir, smallmouth bass are targeted by anglers. Smallmouth bass may pose a significant threat to fluvial Bonneville cutthroat trout populations from the former Cove Dam site to the Utah Border. Interactions between fluvial Bonneville cutthroat trout and the burgeoning smallmouth bass population should be investigated.

## Angler Harvest

Harvest of Bonneville cutthroat trout by recreational angling received the lowest overall threat rating of the four categories (Appendix C). Non-native species, water management, and grazing impacts were rated as being more deleterious to the overall status of Bonneville cutthroat trout in Idaho. However, there are some systems where

harvest may be a significant source of mortality and should be considered in conservation planning.

All of the native cutthroat trout subspecies in Idaho provide important recreational fisheries. The IDFG maintains dual management goals for native species that include preservation and maintaining recreational fishing opportunities. To meet those goals, IDFG offers recreational angling for native cutthroat trout species but under conservative harvest regulations. In small rivers and streams, the daily limit is two Bonneville cutthroat trout of any size. In the Cub River the daily limit is two with none under 16 inches in length. For the mainstem Bear and Thomas Fork rivers, Bonneville cutthroat trout are protected with a no-harvest regulation (catch and release). The general fishing season on Bear River tributaries begins on Memorial Day Weekend and closes November 30.

High profile fisheries that could potentially have significant Bonneville cutthroat trout harvest are the Cub River and the Bear River fishery below Oneida Dam. The reach below Oneida Dam is the most heavily fished portion of the Bear River in Idaho, with an estimated 7,000 anglers having fished 13,000 hours there in 2003.

The Cub River is heavily fished and supports a strong population of Bonneville cutthroat trout. While no quantitative creel data are available for the Cub River, observations made during the past several years (frequent angler observations and contacts) indicate high angling pressure. Anglers have good access to Cub River from a county road that runs parallel to the river. Despite high use, current fishing regulations appear to be protecting the population from excessive harvest. To be legally harvested, Bonneville cutthroat trout must be 16 inches in length. The 16 inch minimum size regulation was implemented in 1996.

The Black Canyon Reach of the Bear River, within the Dam Complex management unit, is another high profile fishery primarily supported by hatchery rainbow trout. The number of Bonneville cutthroat trout in this reach of the Bear River is dependent on downstream straying from the Nounan Valley management unit. Because Bonneville cutthroat trout have no known spawning habitat in the Black Canyon Reach and they are unable to return to their population of origin, angler harvest impacts are considered negligible.

In addition to the high profile fisheries, there are a number of streams that support regular angling pressure and possible harvest of Bonneville cutthroat trout. Some of those waters include: Saint Charles, Montpelier, and Georgetown creeks; and the Bear River (Nounan Valley Reach near Pegram, Gentile Valley near Thatcher, and the confluence with the Thomas Fork River). Harvest of fluvial Bonneville cutthroat trout in the Bear River is a concern due to relatively low fluvial population abundance and local angling pressure targeting spawning fish as the enter tributary streams to spawn (Blake Phillips, IDFG, personal communication).

## Restoration and Angling Opportunity

The primary fish management objectives of the IDFG are to conserve native fish populations and provide recreational fishing opportunities for a diverse angling

constituency. In some waters where habitat remains in good condition, native fish populations meet both these needs and IDFG conserves and protects those native populations with appropriate fishing seasons and harvest regulations. The IDFG 2007-2012 Fisheries Management Plan states that "wild native populations of resident and anadromous fish species will receive priority consideration in management decisions" (Idaho Fish and Game 2007). However, in areas where habitat is no longer capable of supporting abundant native fish populations and rehabilitating the habitat to support native species is not feasible, IDFG attempts to provide sport fisheries with non-native fish. Management of small irrigation impoundments is a common example where IDFG provides angling opportunity through non-native game fish management. Irrigation reservoirs in southeast Idaho provide ideal habitat for put-and-grow rainbow trout and for self sustaining populations of bass and other pan fish. Maintaining recreational fisheries in reservoirs and conserving Bonneville cutthroat trout populations in the Bear River and tributary streams can be accomplished. While some of the reservoirs inundate sections of streams and may block upstream migration, many Bonneville cutthroat trout populations continue to thrive upstream of the reservoirs. Most of the non-native fish (e.g., perch, bass, bluegill, and crappie) that occupy reservoirs do not use streams and will not impact upstream populations.

Currently, due to low densities of Bonneville cutthroat trout in the Bear River, angling demands cannot be met without IDFG stocking sterile rainbow trout or via other non-native game fish management. Therefore, during the Bonneville cutthroat trout restoration process, angling opportunities will continue to be met with the judicious use of non-native game fish species (i.e., supplementation with sterile rainbow trout) in reaches where there is high demand for harvest and minimal impacts to Bonneville cutthroat trout. Management of other non-native game fish species like walleye, brown trout, and smallmouth bass will depend on existing conditions, angler demands, and the IDFG objective to balance recreation needs with restoration of native fish populations. Management direction will vary in each section of the river and will likely change over time as enhancement projects provide increased angling opportunity for growing Bonneville cutthroat trout populations.

There are several other factors affecting the well-being of Bonneville cutthroat trout within the State of Idaho. Although the management agencies did not rate these factors as important as the four discussed above during the preparation of this document, they are still factors affecting populations. Some of these are discussed below.

**Other Land Uses**

In addition to grazing, other land uses can impact Bonneville cutthroat trout and their habitat. These include road building/maintenance/use, logging, recreation, and agricultural practices other than grazing (e.g., farming practices). Agricultural practices such as crop production may impact habitat if appropriate buffers zones are not provided. Vegetation buffers filter sediment flow and provide riparian habitat along the stream. Roads that have encroached upon Bonneville cutthroat trout habitat have the potential to deliver fine sediment. This can affect the quality of Bonneville cutthroat trout spawning and rearing habitat as well as water quality. Improperly placed road culverts at road crossings in Bonneville cutthroat trout streams have the potential to block fish

movement. Logging, if not done with the appropriate best management practices, can increase sediment delivery to streams and decrease large wood availability in riparian areas and streams. However, the State of Idaho's Forest Practices Act has resulted in overall exceptional compliance with rules and regulations for logging practices based on audits done by the IDEQ. Unrestricted motorized vehicle use, primarily off-highway vehicles, can also affect stream habitat quality through road crossings and resultant sedimentation, and impacts riparian vegetation. With proper education outreach to landowners and added awareness and sensitivity, impacts from these activities can be decreased.

**Water Quality**

In June 2006, the Environmental Protection Agency (EPA) approved 127 Total Maximum Daily Loads (TMDLs) for 63 different waterbodies for the Bear River/Malad River Basin. The TMDLs were submitted by the IDEQ for EPA approval in a document entitled, *Bear River/Malad River Subbasin Assessment and Total Maximum Daily Load Plan.* EPA believed that the TMDLs met the regulatory and statutory requirements for approval under the Clean Water Act.

The TMDL submittal of the IDEQ also included an implementation strategy for the TMDLs, pursuant to the TMDL Settlement Agreement of July 2002. Implementation is critical to realizing improvements in water quality for each of the TMDLs. The IDFG and USFS will work with the IDEQ and other appropriate agencies and partners to ensure that necessary actions are taken to achieve the TMDL reductions. Improvements in water quality throughout the Bear River/Malad River Basin will benefit BCT populations.

**Climate Change**

During the past decade, southeast Idaho has been in prolonged drought conditions having an impact on Bonneville cutthroat trout populations by decreasing available habitat and connectivity between habitats. The effect of this drought may be exacerbated with forecasted climate change. Due to global climate change, winter and spring temperatures have generally increased in western North America during the twentieth century and there is evidence that this warming has produced changes to stream hydrology and may be reflected in biota. The timing of spring snowmelt has generally shifted to earlier in the year. Those studying global warming predict snowpack will continue to decline and the rate of decrease may accelerate (Leung et al. 2004; Mote et al. 2005; Stewart et al. 2005; Regonda et al. 2005). In addition, Regonda et al. (2005) used models to predict a tend towards a decrease in snow water equivalent and a general increase in winter precipitation (in the form of rain) in the western United States, particularly at lower elevations. Warming temperatures may geographically isolate cold water stream fish in increasingly confined headwaters (Hauer et al. 1997). These predicted climatic changes may have an impact upon Bonneville cutthroat trout populations throughout their range, particularly those that persist in streams with already limited water resources by further limiting available habitat and decreasing connectivity (Fausch et al. 2002). Irrigators will likely install their irrigation diversion boards earlier and keep them in later in reaction to lower water availability during the summer growing

season, further affecting Bonneville cutthroat trout migrations. There will likely be decreased available habitat for Bonneville cutthroat trout due to a growing trend toward less available water in the summer. Conservation actions focusing on the protection of connected habitats and diversity in life history strategies, restoring connectivity, and reintroducing populations has the potential to prepare populations for climate change (Colyer 2006). This management plan incorporates important conservation approaches to decrease the expected effects of climate change.

## Management Action Plan

Along with a long-term assessment, the agencies must develop and implement necessary management actions. Although there are many potential management actions, they should focus on achieving the goal of Bonneville cutthroat trout conservation management, i.e., providing for the "long-term persistence of the subspecies, at levels capable of providing angling opportunities" and restoring populations into their historical range where feasible and practical.

The following sections describe some of the suggested actions to achieve the goal of Bonneville cutthroat trout management in Idaho.

### Fishing Regulations

In most streams with the potential to grow larger fish, current fishing regulations for Bonneville cutthroat trout are a bag limit of two cutthroat trout with none under 16 inches. The general stream limit of two cutthroat trout applies on many of the smaller streams where fish rarely exceed 12 inches in length, with most fish being less than 8 inches in length, and these streams often have limited angling pressure. In general, fishing rules are protecting the populations with good access and the ability to produce larger cutthroat.

Protective fishing rules that effectively eliminate most harvest will remain on small, depressed Bonneville cutthroat trout populations where angling could limit spawning adults to less than 500 fish. In general, fishing rules will be designed to allow Bonneville cutthroat trout to maintain healthy productive populations within the confines of their habitat limitations.

### Fish Stocking

As indicated earlier, stocking has been and is an integral part of the Idaho fisheries management program in Bonneville cutthroat trout habitat. It is difficult to provide a sport fishery for self-sustaining Bonneville cutthroat trout in reservoirs. Many of these reservoirs are dewatered during droughts, and most fish are lost. In reservoirs, 81% of stocked fish are rainbow trout. IDFG policy states that, "fish will be stocked as appropriate to preserve, establish, or reestablish depleted fish populations and to provide angling opportunity to the general public." In addition, IDFG's Fisheries Management Plan states that "non-native species of fish will be introduced only in waters where they are not expected to adversely impact stocks of native fish"(Idaho Department of Fish and Game).

Perhaps the most pervasive threat to Bonneville cutthroat trout is introgression with non-native rainbow trout. In addition, the level of competition for food or space between stocked rainbow trout and native Bonneville cutthroat trout will need continuing analysis. Idaho will continue to stock triploid (sterile) rainbow trout into areas where angler benefits justify the minimal risk to native salmonids. The IDFG, USFS, and partners will monitor introgression levels in adjoining Bonneville cutthroat trout populations and adjust stocking if needed to maintain or reduce introgression levels.

Bonneville cutthroat trout have largely evolved in stream habitats. Furthermore, it is more likely that habitat restoration or changes in land use practices in streams and watersheds will effect positive changes in Bonneville cutthroat trout fluvial populations than in reservoirs. There is no reason to introduce fertile hatchery-origin Bonneville cutthroat trout or fertile rainbow trout into those areas. Idaho will also explore the opportunities to use triploid Bonneville cutthroat trout to promote the uniqueness of cutthroat fishing in selected waters while maintaining the genetic status of connected populations.

One further application of stocking Bonneville cutthroat trout would be to restore populations in streams within the native range by translocation or transferring Bonneville cutthroat trout from another adjacent stream. Translocations will only be done after assessing the level of risk for both the donor population and the receiving population. Where non-native fish can be eliminated and habitat has been restored to the point where it has a high likelihood of being able to support a healthy population of Bonneville cutthroat trout, translocation can be an effective means of restoring cutthroat. Examples would include elimination of non-native trout populations in isolated streams where chemical renovation can be done with low risk and at reasonable cost. Evaluation of restoration efforts should become a part of the long-term monitoring and assessment strategies for Bonneville cutthroat trout management.

### Restoring Connectivity

It is likely that prior to intensive land and water management in Idaho, Bonneville cutthroat trout had fairly unconstrained access to much of their historical range. Connectivity cannot feasibly be restored to conditions that existed historically. Many dams and irrigation diversions will remain in place and many stream and river systems are degraded to the point where habitat and water temperatures will likely prevent fish from utilizing these areas. At best, agencies and others can restore connectivity between several populations within a specific drainage and perhaps connect a few major drainages in the future. It is not realistic to believe all historical Bonneville cutthroat trout habitat can be restored.

Idaho is a participant in a multistate position paper on genetic considerations concerning cutthroat trout management (Utah Division of Wildlife Resources 2000). The position paper indicates that cutthroat trout management includes two distinct but equally important components that must be addressed. These components include the conservation element and the sport fishery or recreational fishery element of cutthroat trout management. Further, this position paper indicates that there are two components of cutthroat trout conservation: preservation and management of genetically pure

populations (known as core conservation populations) and conservation of populations that may be slightly introgressed but which maintain the appropriate phenotypic characteristics for the subspecies with unique ecological, behavioral, or genetic traits as well (known as conservation populations).

The primary management goal for core populations is to facilitate the long-term persistence of each subspecies in a genetically pure condition. Core populations will serve as the primary sources of gametes for introductions and reintroductions through transplants and broodstock development, and are comprised of individuals that have been determined to be >99% pure from a genetic standpoint, and phenotypically true. For range expansion purposes, care should be taken to utilize only those populations that exhibit desirable population characteristics such as large population size, full representation of age classes, and successful annual reproduction. Potential management options related to the conservation and preservation of core populations may include 1) prevention of all non-native fish stocking or alternately the stocking of only sterile hatchery fish; 2) managing sport fishing and harvest; 3) removal or suppression of non-native competitors; 4) habitat restoration and enhancement; 5) removal of gametes and individuals for genetic founders in range expansion efforts; and 6) collection of gametes for brood stock development.

In order to ensure long-term persistence of core populations, the management agencies will strive to maintain or create metapopulations. High quality habitat is an essential component contributing towards the survival of metapopulations, and optimization of habitat is imperative.

For conservation populations, the primary management goal is to preserve and conserve unique ecological and behavioral characteristics of the subspecies that exist on a population by population basis. Conservation populations retain all of the phenotypic attributes associated with the subspecies, although they exist in a slightly introgressed condition. In general, these populations have less than 10% introgression, but introgression may extend to a greater level depending upon circumstances and the values and attributes to be preserved (Utah Division of Wildlife Resources 2000). The unique ecological, behavioral, and genetic attributes may include 1) the presence of fluvial or adfluvial life histories; 2) genetic predisposition for large size; and 3) ecological adaptations to extreme environmental conditions. There is a high probability that certain of these attributes are genetically linked to some degree.

Potential management options for conservation populations are the same for core populations. Conservation populations may be considered as sources for introductions or reintroductions if the objective is to duplicate the unique genetic, ecological, or behavioral attributes. As with core populations, long-term persistence of conservation populations will be enhanced by the development of metapopulations and optimizing habitat conditions. Conservation populations may be targeted for conversion to core populations by eradication of existing fish and reintroduction or genetic replacement.

A third group of fish constitutes the “sportfish” populations. The focus of this group of fish is recreational benefit to the public. Genetic requirements of this group are much less stringent than for core or conservation populations. These populations generally meet the species phenotypic expression defined by morphological and meristic characters of cutthroat trout. Furthermore, either wild or hatchery-enhanced

populations can maintain this group. Maintenance of genetic diversity for sportfish populations is secondary to providing a recreational fishery either through natural production or hatchery enhancement where needed.

The agencies need more specific information on the genetic status of Bonneville cutthroat trout populations before designating them as core, conservation, or sportfish populations. Once this information is secured across the range of Bonneville cutthroat trout in Idaho, the agencies will make determinations for designating conservation populations.

In order to gauge the effectiveness of conservation actions, the IDFG and USFS will assess two performance measures over the long-term: 1) the number of miles of habitat occupied by core and conservation populations, and 2) the number of respective core and conservation populations. Undoubtedly, other measures will be considered over time.

General range-wide management actions to meet the goals and objectives for this management plan are described below. These will be specifically prescribed per management unit.

1. ***Reestablish Bonneville Cutthroat Trout in historical habitats that no longer support populations.*** Explore the feasibility of reestablishing BCT in areas within their historical range where they have been extirpated. Some of the factors that need to be considered during reintroduction planning include: 1) amount of survey work completed to ensure Bonneville cutthroat trout status, 2) existing habitat condition and suitability, 3) presence/absence of non-native fish, 4) feasibility of suppressing/removing non-native fish, 5) suitable donor stocks for reintroduction, 6) project cost effectiveness and likelihood of success, and 7) priority of the restoration project relative to other projects to ensure persistence of Bonneville cutthroat trout.

*2.* ***Reduce negative impacts of non-native fish on Bonneville Cutthroat Trout populations.*** Assess the feasibility of suppressing or removing non-native fish species in watersheds where doing so would benefit Bonneville cutthroat trout. Strategies that can reduce non-native fish impacts include chemical renovations, liberalized angler harvest, changes in fish stocking practices, mechanical removal (e.g., electrofishing), and improvement of degraded habitat conditions that may be favoring non-native fish. Idaho agencies will work closely with neighboring states to prevent the spread of piscivorous game fish species (e.g., walleye) that may prey upon Bonneville cutthroat trout. Management agencies will need to consider the desires of anglers in decisions about whether or not to remove non-native fish species such as brook, brown, or rainbow trout since these are desired species in many circumstances. Also, it is simply not feasible to remove undesired non-native fish species in all instances.

3. ***Identify fish passage barriers.*** Complete fish passage surveys at all road crossings and irrigation diversions within the range of Bonneville cutthroat trout in Idaho. Coordinate with land management agencies and private landowners to provide fish passage at irrigation diversion dams and road culverts. Connecting populations is a priority, but in some circumstances barriers

prevent non-native fish expansion and will be considered in decision making (See Fausch et al. 2006).

4. ***Screen irrigation diversions.*** Complete an irrigation diversion assessment that identifies sites that adversely impact Bonneville cutthroat trout populations. Identify and cooperate with willing landowners and irrigation companies in screening projects. Seek cooperative partnerships with other agencies and parties to secure funding to accomplish projects.

5. ***Improve watershed habitat.*** Conduct watershed analyses in important habitat areas currently not yet surveyed to provide a local data clearinghouse, and to derive restoration opportunities through the comparison of past and current conditions. Coordinate with land management agencies and private landowners to identify streams that will benefit from riparian and stream channel restoration activities and/or modified land management activities. Work with agencies, water users, and other parties to restore adequate stream flows in those reaches partially or completely dewatered.

6. ***Identify waters where Bonneville Cutthroat Trout populations can be enhanced to levels that will provide recreational fishing.*** Prioritize angling opportunity for native Bonneville cutthroat trout populations. Providing fishing opportunities for the public will keep them engaged in long-term habitat and population restoration efforts.

7***. Continue Genetic Analysis.*** Complete genetic analyses for all Bonneville cutthroat trout populations in Idaho. Genetic analyses have been completed for many of the Bonneville cutthroat trout populations. Preliminary results identified fewer than 10 tributary populations with significant rainbow trout introgression. However, many of the genetic conclusions were based on small sample sizes. Additional work is needed to increase sample size, characterize genetic diversity, and complete population relatedness analysis.

*8.* ***Develop a Bonneville Cutthroat Trout monitoring program.*** The IDFG will lead an effort to develop a long-term population monitoring program for Bonneville cutthroat trout in the Bear River drainage. A long-term monitoring program is needed to evaluate population trends. The monitoring program should include streams currently classified with low, medium, and high populations as well as all life history strategies.

*9.* ***Maintain and expand the existing Bonneville cutthroat trout database.*** A comprehensive database will be developed and maintained for Bonneville cutthroat trout. An attempt has been made to compile existing fish survey information for all historic Bonneville cutthroat trout range in Idaho. Regular updating of the database will help identify population trends and assess conservation actions. The database will include fish population, genetic, and habitat information. This information will be shared annually with partners in Bonneville cutthroat trout restoration efforts especially the Utah Division of Wildlife Resources, the lead agency in developing the range-wide status review and assessment for Bonneville cutthroat trout and database updating.

***10. Public Outreach.*** Develop a public outreach and education program for Bonneville cutthroat trout. Ultimately, to be successful in our efforts to conserve Bonneville cutthroat trout in Idaho, we must develop public understanding and support. Outreach efforts should be focused at the broad program scale and at the project level scale and should include private landowners, agricultural interests, politicians, media, and others.

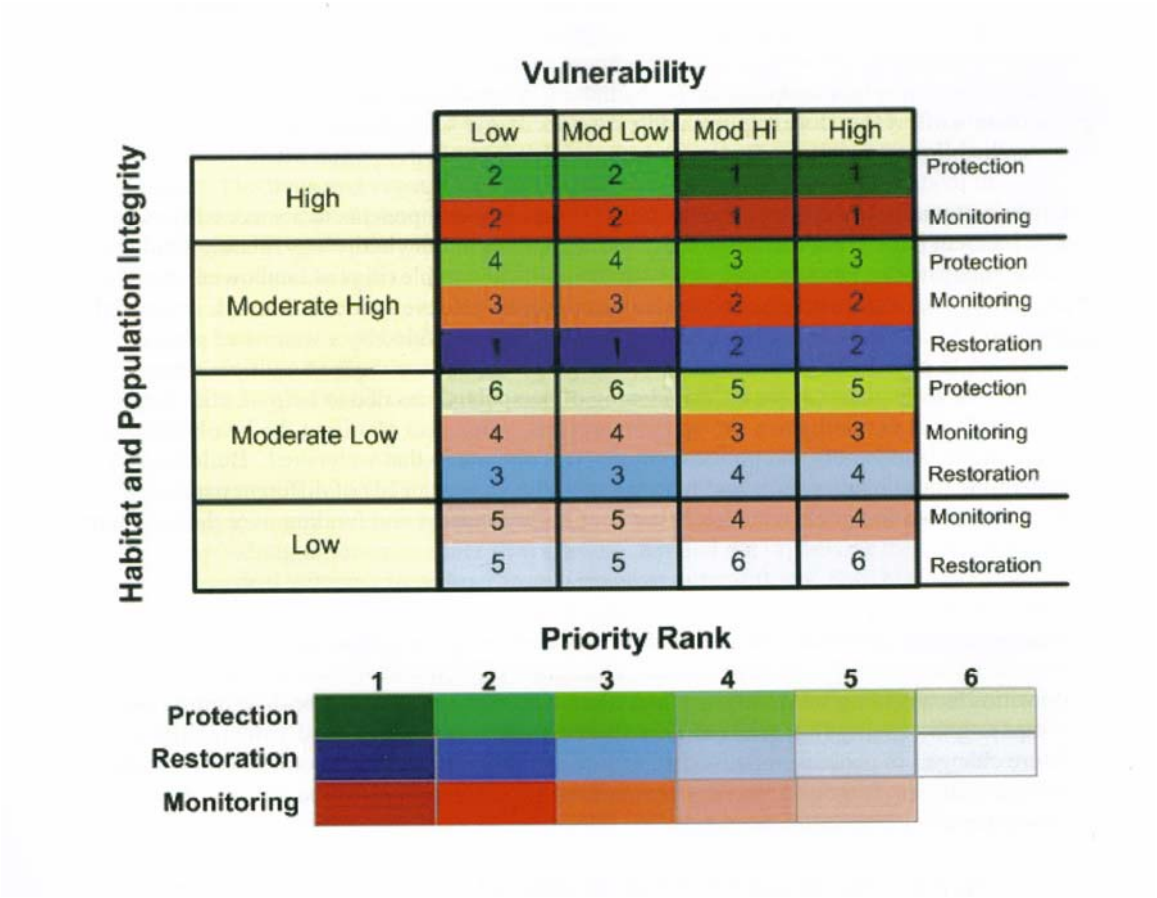
In this plan, five management units in the Bear River Drainage and one management unit in the Malad River Drainage were identified. The agencies emphasized three factors when prioritizing restoration projects in each management; (1) patch size, (2) "protect the best and restore the rest", and (3) "be opportunistic."

The boundaries of these management units roughly define potential metapopulations where connectivity between those populations is rare. In fact, connectivity between populations within each management unit has seldom been documented and is assumed to be rare. Population connectivity is expected to increase the viability of each population, if facilitated where it is appropriate. Increasing patch size (available connected habitat) should factor into the prioritization of Bonneville cutthroat trout enhancement and restoration opportunities in each management unit, particularly when considering the metapopulation concept.

The following is a matrix for determining priorities for protection, restoration, and monitoring. It was developed by Williams et al. (2006) and is a sensible and somewhat simple strategy for prioritizing restoration activities. One way to prioritize restoration work is by comparing the quality of habitats and populations to their vulnerability to future change. A general slogan for such an approach is to "protect the best and restore the rest." High quality habitat and strong populations should be protected. Priority protection should occur where high quality habitat and populations are most vulnerable to degradation.

The highest restoration priorities should be the best quality habitat that is somewhat degraded and is at a risk of further degradation in the future. Once the best has been restored, efforts are invested in the next priority populations and habitat (next best populations and habitat). Investments in restoration are most likely to be retained in areas that are less vulnerable to additional impacts. The highest priorities for monitoring are those populations and habitats that have the best quality, to ensure their quality is maintained (Williams et al. 2006).

***Matrix for determining priorities for protection, restoration, and monitoring (Williams et al. 2006)***




Finally, those involved in Bonneville cutthroat trout restoration and monitoring should be opportunistic. When funding opportunities and partnerships present themselves in the form of a project that does not necessarily fit into priorities derived by the methods above, but would eventually be implemented and comes with funding, implementation should be pursued. In other words, flexibility should be maintained to capitalize upon opportunities as they occur.

Utilizing the three strategies listed above, we have identified the following strategies and priorities for enhancing overall Bonneville cutthroat trout populations in Idaho.

To help maximize the efficiency of conservation activities, priorities were assigned to each of the conservation actions identified within each management unit.

For example, in the Nounan Valley management unit, conservation actions on Eightmile and Georgetown creeks received the highest priority rating. Both tributaries are relatively large systems with currently high fish production. For Georgetown Creek, chemical renovation followed by Bonneville cutthroat trout reintroduction received a high priority rating. The rational for the high priority rating for this Bonneville cutthroat trout re-introduction opportunity included: 1) high fish production potential as indicated by existing non-native trout population, 2) relatively large tributary (14 miles) that could support BCT, 3) a current status rating of likely extirpated, and 4) because angling effort in the stream is low, replacement of non-native species with native BCT should not have a large negative impact to fishing opportunities. Eightmile Creek received a high conservation priority for fencing riparian habitat and screening irrigation diversions. Rationale for the high priority rating for fencing and screening irrigation diversions on Eightmile Creek included: 1) the stream has been identified as the most utilized spawning tributary in the Nounan Valley management unit for fluvial Bonneville cutthroat trout, 2) it is a relatively long tributary that can support a large population Bonneville cutthroat trout, and 3) riparian improvements and screening irrigation diversions should increase Bonneville cutthroat trout abundance. In addition to priority ratings, we identified a relative timetable for completing the conservation action. Conservation actions are denoted as short-term (5 year goal) or long-term (5-20 years). Ideally, many of the high priority actions can be completed within a ten year period. However, completion of conservation actions will depend on project priority, funding, landowner and public support, etc.

**Pegram Management Unit**

Bear Lake and the Thomas Fork River support arguably two of the most important Bonneville cutthroat trout populations in Idaho. Until recently, most of the conservation and restoration work for Bonneville cutthroat trout has been focused on the Bear Lake and Thomas Fork watersheds. Bonneville cutthroat trout enhancement programs have been in place for Bear Lake since the 1970s. Population monitoring and habitat projects began for the Thomas Fork tributaries in the 1980s.

The Bear Lake population is the only natural adfluvial stock of Bonneville cutthroat trout in Idaho. The majority of tributary spawning habitat occurs in Fish Haven and Saint Charles creeks. Unfortunately, due primarily to unscreened irrigation diversions and migration barriers at the mouth of the spawning tributaries, natural reproduction of Bonneville cutthroat trout is extremely low. As a result, the Bear Lake Bonneville cutthroat trout population has become increasingly dependent on hatchery supplementation. Reestablishing natural reproduction in Saint Charles and Fish Haven creeks is one of the highest restoration priorities for Bonneville cutthroat trout in Idaho.

In 2002, a local working group was established to develop a restoration plan for Bonneville cutthroat trout in Saint Charles and Fish Haven creeks. The working group includes irrigation company representatives, local elected officials, private landowners, and government agency biologists. Screening irrigation diversions and improving upstream migration were identified as priorities and are being addressed. The working group is developing restoration plans for Fish Haven Creek. Additionally, The IDFG plans to modify angling regulations to promote harvest of brook trout, rainbow trout and hybrids. IDFG plans to continue monitoring efforts and will consider chemical renovation to remove non-native trout.

The Thomas Fork River and its tributaries provide nearly 70 miles of habitat for BCT. A recent Bonneville cutthroat trout telemetry study in the Thomas Fork identified barriers that impacted migrating fluvial fish. The barriers have been modified to accommodate fish passage. Conservation priorities for this area include continuing the 20-year monitoring program of resident Bonneville cutthroat trout populations in Preuss, Giraffe, and Dry creeks, monitoring livestock grazing impacts on riparian habitat, monitoring the effectiveness of the Thomas Fork fish passage projects, and reconnecting tributaries to the Thomas Fork such as Dry and Preuss creeks.

Bloomington Creek may be a good candidate for BCT restoration. This stream is a large tributary (15.2 miles) that drains into Mud Lake and has intermittent connection to Bear Lake. About 6 miles of the stream occurs on public lands. Brook trout and hatchery rainbow trout dominate the fish community. The stream may be a good candidate for chemical renovation because it has few tributary streams and a base flow of less than 20 cubic feet per second. Fishing pressure is limited primarily to the upper most reach near USFS campgrounds.

Habitat improvements are needed to enhance the Bonneville cutthroat trout in Paris Creek. Loss of riparian habitat, irrigation withdrawal, and brook trout are potential limiting factors for the Paris Creek population.

Table 8 summarizes conservation strategies and priorities for the Pegram management unit. There is a need throughout the management unit to improve fish passage at irrigation diversions and road crossings. Problem areas will be identified using an appropriate survey protocol. Passage opportunities will be prioritized and addressed.

The overall goal of this management unit is to increase the resiliency of Bonneville cutthroat trout populations in Bear River and its tributaries and Bear Lake and its tributaries by restoring existing populations and their habitat, where possible, by suppressing or removing non-native fish populations, and by reconnecting populations, where appropriate.

Table 8. Conservation actions for Bonneville cutthroat trout in the Pegram Management Unit.

| Stream Name | Miles | BCT Status | Priority | Required Actions | Timetable |
|---|---|---|---|---|---|
| Bear River | 44.9 | Present | 1 | Population survey and identify spawning and rearing habitats | 5 years |
| Bear Lake Outlet | 8.2 | Present | 3 | | |
| Sheep Creek | 9.6 | Unknown | 3 | Population survey | 5 years |
| Thomas Fork | 36.7 | Present | 1 | Passage at irrigation diversions, decrease sediment sources, improve riparian habitat | 5 – 20 years |
| Preuss Creek<br>Fish Creek<br>Beaver Creek | 15.7<br>1.0<br>3.9 | present<br>unknown<br>unknown | 2 | Improve riparian habitat through livestock management/enforcement, long-term monitoring program, fencing where opportunities exist | 5 – 20 years |
| Dry Creek<br>Dip Creek | 8.1<br>2.1 | present<br>unknown | 2 | Improve riparian habitat through livestock management/enforcement, long-term monitoring program | 5 – 20 years |
| Giraffe Creek<br>Robinson Creek | 3.3<br>0.1 | present<br>unknown | 2 | Improve riparian habitat through livestock grazing agreements, long-term monitoring program, fencing where opportunities exist | 5 – 20 years |
| St. Charles Creek<br>Davis Canyon<br>Big Arm<br>Spring Creek<br>Little Arm | 11.2<br>1.3<br>3.5<br>1.6<br>3.2 | present<br>unknown<br>present<br>present<br>present | 1 | Improve migration conditions at confluence with Bear Lake<br>screen irrigation diversions<br>brook and rainbow trout removal | 5 years |
| Fish Haven Creek | 6.0 | Extirpated | 1 | Screen irrigation diversions and provide for safe fish passage | 5 – 20 years |
| Indian Creek | 2.7 | Unknown | 3 | Population survey | 5 years |
| Bloomington Creek | 15.2 | Extirpated | 2 | Brook trout removal identify potential donor stock and reintroduce BCT | 5 – 20 years |
| Paris Creek | 14.2 | Present | 2 | Brook trout removal reduce grazing impacts on public and private lands and improve water use practices | 5 – 20 years |

## Nounan Valley Management Unit

To date, there have been limited efforts to enhance or restore Bonneville cutthroat trout in the Nounan Valley management unit. Most work has focused on Skinner Creek, where a cattle feedlot was removed from the riparian area and there are plans to improve road crossings and irrigation diversions. In Stauffer Creek, there is an opportunity to work with a private landowner that blocks upstream access periodically with a full-spanning dam. There is no irrigation canals associated with this structure. If the head gate is closed during upstream spawning migration, the Stauffer Creek Bonneville cutthroat trout population can be negatively affected.

The Nounan Valley management unit contains more resident populations than any other management unit. Nounan Valley has one tributary that is classified as extirpated (Georgetown Creek) and another system that appears to have a failing BCT population (Bailey Creek). Bonneville cutthroat trout were observed in Georgetown Creek in the 1990s, but have not been observed in recent surveys. Only one Bonneville cutthroat trout was observed in a recent survey from Bailey Creek. Restoring populations to those waters is a top priority for the Nounan Valley Management Unit. Successful reintroductions in Bailey and Georgetown Creeks would increase the total occupied habitat in the Nounan Valley Management Unit by approximately 10%. Additionally, anecdotal fishing reports and observation made during a 1993 fish survey

suggest that the Nounan Valley reach of the Bear River supports a viable fluvial population. A current survey of the population should be completed. Documenting spawning locations and possible barriers would help direct future conservation activities for the fluvial population (Table 9).

Table 9. Conservation actions for Bonneville cutthroat trout in the Nounan Valley Management Unit.

| Stream Name | Miles | BCT Status | Priority | Required Actions | Time-table Goal |
|---|---|---|---|---|---|
| Bear River (Nounan) | 57.7 | present | 1 | Population survey and identify spawning and rearing habitats.. Work with private landowners where there are opportunities to exclude livestock access to the river and its riparian area. | 5 years |
| Montpelier Cr | 24.1 | Present | 2 | Collect genetic samples Montpelier Creek and its tributaries. Reduce potential deleterious interactions from naturally reproducing brook, rainbow, and brown trout. Complete removal of brook trout unlikely. Improve riparian habitat | 5 – 20 years |
| Dry Creek | 0.6 | unknown | | | |
| Home Canyon Cr | 1.6 | present | | | |
| Snowslide Canyon Cr | 0.9 | unknown | | | |
| Whiskey | 2.7 | present | | | |
| Little Beaver Creek | 3.8 | present | | | |
| Ovid Creek | 17.5 | unknown | 3 | Reduce potential deleterious interactions from naturally reproducing brook trout. Improve riparian habitat Investigate connectivity with Bear River, address impacts from irrigation diversions. | 5 – 20 years |
| Mill Creek | 3.0 | present | | | |
| Liberty Creek | 1.9 | unknown | | | |
| North Canyon Creek | 12.8 | present | | | |
| Emigration Creek | 5.0 | present | | | |
| Copenhagen Creek | 3.9 | no fish | | | |
| Georgetown Creek | 14.0 | extirpated | 1 | Brook and rainbow trout removal Identify a potential donor stock and reintroduce BCT. Install fish passage facilities and screen diversions | 10 years |
| Georgetown Left | 2.0 | extirpated | | | |
| Stauffer Creek | 10.5 | present | 1 | Improve riparian habitat Investigate connectivity with Bear River, address impacts from irrigation diversions, exclude livestock from riparian areas where opportunities exist, provide permanent upstream passage at irrigation dam near the mouth of the stream. | 5 – 20 years |
| Beaver Creek | 2.5 | present | | | |
| South Fork Stauffer | 3.0 | present | | | |
| North Fork Stauffer | 4.4 | present | | | |
| Skinner Creek | 8.2 | present | | | |
| North Skinner Cr | 2.3 | present | | | |
| Co-op Creek | 7.3 | present | 2 | Improve riparian habitat Investigate connectivity with Bear River | 5 – 20 years |
| Pearl Creek | 5.9 | present | 2 | Improve riparian habitat Investigate connectivity with Bear River | 5 – 20 years |
| North Pearl Creek | 3.6 | present | 2 | Improve riparian habitat, exclude livestock from riparian area where opportunities exist. | 5 – 20 years |
| Eightmile Creek | 15.0 | present | 1 | Improve riparian habitat Investigate connectivity with Bear River | 10 years |
| Sulphur Canyon | 2.6 | unknown | 3 | Population survey | 5 years |
| Bailey Creek | 6.6 | present | 2 | Brook trout removal Investigate connectivity with Bear River | 5 – 20 years |
| Soda Creek | 7.8 | unknown | 3 | Population survey | 5 years |

## Dam Complex Management Unit

PacifiCorp is not required under their current federal license to provide fish passage at any of the large hydroelectric facilities on the Bear River until 2033. Given that there are no tributary streams in the Dam Complex management unit, establishing a self-sustaining Bonneville cutthroat trout population is unlikely. In 2006, PacifiCorp decommissioned and removed Cove Dam, increasing the size of connected river segments. This added the Cove to Grace Dam river reach to the Gentile Valley management unit and about 7.2 miles of Bear River with downstream tributaries. Passage at the other facilities should be investigated during the next federal licensing period.

## Gentile Valley Management Unit

Enhancing the fluvial Bonneville cutthroat trout population is a top priority for the Gentile Valley management unit. Most of the tributaries in the Gentile Valley management unit are relatively small and may not provide continuous natural flow necessary to support long-term persistence of resident Bonneville cutthroat trout. The smaller tributaries need to be sampled to assess current populations. Conservations efforts on those waters are deferred until status is better understood (Table 10).

Cottonwood, Williams, and Trout creeks offer significant Bonneville cutthroat trout restoration opportunities. Cottonwood Creek is the largest system within this management unit and currently supports a viable Bonneville cutthroat trout population. Because Bonneville cutthroat trout are the only trout that occupy Cottonwood Creek, conservation efforts should focus on improving habitat and identifying/treating migration barriers. Williams Creek is a productive stream that supports robust wild rainbow and brook trout populations. Access to Williams Creek is very limited and angling pressure is considered negligible. Chemical renovation should be considered to reduce non-native fish populations. Williams Creek may also be an important spawning tributary for fluvial Bonneville cutthroat trout in the Gentile Valley management unit. Similar to all other Bear River management units, there is a paucity of information regarding population abundance and important habitats used by fluvial Bonneville cutthroat trout. Survey information is a necessary prerequisite to identifying conservation measures. Table 10 summarizes the conservation actions intended for the Gentile Valley management unit.

Table 10. Conservation actions for Bonneville cutthroat trout in the Gentile Valley Management Unit.

| Stream Name | Miles | BCT Status | Priority | Required Actions | Time-table Goal |
|---|---|---|---|---|---|
| Bear River (Gentile) | 31.4 | present | 1 | Population survey and identify spawning and rearing habitats | 5 years |
| Densmore Creek | 6.3 | unknown | 3 | Population survey | 5 years |
| Dry Creek | 4.7 | unknown | 3 | Population survey | 5 years |
| Smith Creek | 5.0 | present | 3 | Population survey | 5 years |
| Alder Creek | 5.2 | unknown | 3 | Population survey | 5 years |
| Burton Creek | 6.6 | unknown | 3 | Population survey | 5 years |
| King Creek | 5.7 | unknown | 3 | Population survey | 5 years |
| Cottonwood Creek<br>Shingle Creek<br>Jacobson Creek | 18.9<br>3.8<br>2.1 | present<br>present<br>present | 1 | Improve riparian habitat<br>Investigate connectivity with Bear River, address fish safety at irrigation diversions | 5 – 20 years |
| Trout Creek | 12.0 | extirpated | 2 | Population survey, evaluate potential for reintroducing BCT. | 5 – 20 years |
| Whiskey_BR | 3.8 | extirpated | 3 | Improve riparian habitat, evaluate potential for reintroducing BCT. | > 20 years |
| Williams Creek | 4.3 | present | 1 | Brook and rainbow trout removal<br>Investigate connectivity with Bear River, exclude livestock from riparian areas where opportunities exist, address safe fish passage at irrigation diversions. | 5 years |

## Riverdale Management Unit

In general, the tributaries in the Riverdale management unit support the highest densities of Bonneville cutthroat trout in Idaho. There are no systems where Bonneville cutthroat trout populations were described as extirpated. However, the fluvial population component in the Riverdale management unit appears to be declining precipitously based on recent surveys. The tributary resident populations provide sources of outmigrants to refound or expand fluvial populations, but without return access to tributary spawning habitats the fluvial population will continue to decline. Therefore, the primary focus of conservation in the Riverdale management unit should be on protecting existing populations from habitat degradation and reconnecting tributary spawning habitats for mainstem fluvial populations. Fortunately, brook and rainbow trout are not widespread in tributary habitats. Conversely, fluvial populations of Bonneville cutthroat trout may interact with rainbow trout, brown trout, smallmouth bass, and walleye. A study of the fish community in this section of river is warranted. If non-native species interactions are found to be limiting the Bonneville cutthroat trout populations, removal or reduction of non-native species from the mainstem Bear River should be investigated. Fishing regulations provide a tool to minimize non-native species interactions. Table 11 summarizes conservation actions for the Riverdale Management Unit.

Table 11. Conservation actions for Bonneville cutthroat trout in the Riverdale Management Unit.

| Stream Name | Miles | BCT Status | Priority | Required Actions | Time-table Goal |
|---|---|---|---|---|---|
| Bear River (Riverdale) | 31.1 | present | 1 | Estimate the abundance of fluvial BCT and Investigate the impact of non-native fish species. Determine if angling regulations are consistent with BCT conservation goals. Exclude livestock from riparian areas where opportunities exist. | 5 years |
| Mink Creek | 13.6 | present | 3 | Brook trout removal, investigate barriers to fish migration, Mink Creek is likely the best spawning tributary in this MU for fluvial population | 5 – 20 years |
| Birch Creek | 6.5 | present | | | |
| Dry Creek | 4.8 | unknown | | | |
| Strawberry Creek | 3.0 | no fish | | | |
| Battle Creek | 8.3 | unknown | 3 | Population survey | 5 years |
| Deep Creek | 10.8 | unknown | 3 | Population survey | 5 years |
| Fivemile Creek | 9.0 | unknown | 3 | Population survey | 5 years |
| Weston Creek | 4.7 | unknown | 3 | Population survey | 5 years |
| Cub River | 19.9 | present | 1 | Monitor non-native trout populations | 10 years |
| Worm Creek | 3.5 | unknown | | Protect and improve riparian habitat | |
| Maple Creek | 12.0 | present | | Investigate connectivity with the | |
| Deep Creek | 2.8 | unknown | | Bear River, address trail impacts | |
| Sugar Creek | 6.6 | present | | upon riparian habitat, address | |
| Foster Creek | 2.2 | present | | dispersed campsite impacts upon riparian areas, stabilize eroding streambanks in Cub River, reduce brook trout in Cub River, | |
| Logan River | 3.4 | present | 2 | Protect and improve riparian habitat | 5 – 20 years |
| Beaver Creek | 6.6 | present | | Investigate connectivity with Bear | |
| Boss Creek | 3.3 | present | | River, decrease impacts from | |
| White Canyon Creek | 2.7 | present | | dispersed campsites, reduce | |
| Hodge Nibley Creek | 1.9 | present | | livestock impacts to riparian areas. | |
| Corral Hollow Creek | 1.7 | present | | . | |
| Stockton Creek | 8.3 | present | 3 | | |
| Gooseberry Creek | 5.2 | unknown | 3 | Population survey | 5 years |
| Oxford Creek | 0.6 | unknown | 3 | Population survey | 5 years |

## Malad River Management Unit

The Malad management unit contains about 10% of the potential Bonneville cutthroat trout habitat in Idaho. However, existing data suggest few remaining populations and low population densities. This management unit is the most arid region of historical Bonneville cutthroat trout range in Idaho. Because of the paucity of water resources, irrigation and grazing impacts appear to be more pronounced. The highest priority for this management unit is protection and enhancement of the three populations in the Deep Creek Drainage (First, Second, and Third creeks). Those populations are possibly the only three viable populations in this management unit. Monitoring of these populations is a high priority and opportunities to enhance existing habitat need to be identified (Table 12).

Genetic analyses of Bonneville cutthroat trout in this management unit have indicated they are more closely related to the ancient Lake Bonneville stock of Bonneville cutthroat trout than the Bear River stock. This suggests they were not affected by the Lake Bonneville flood like the other Bonneville cutthroat trout populations

in Idaho. These fish are more genetically similar to Bonneville cutthroat trout collected in southern Utah, making them unique in Idaho.

The Malad and Little Malad rivers need to be investigated for fish passage to determine if a fluvial component of the Bonneville cutthroat trout population remains and identify opportunities to improve it by addressing passage issues. More tributaries require Bonneville cutthroat trout population surveys.

Table 12. Conservation actions for Bonneville cutthroat trout in the Malad River Management Unit.

| Stream Name | Miles | BCT Status | Priority | Required Actions | Time-table Goal |
|---|---|---|---|---|---|
| Malad River | 31.0 | unknown | 3 | Population survey, address livestock impacts, identify water diversion impacts to migrating BCT, | 5 years |
| Little Malad River | 31.7 | unknown | 3 | Population survey, address livestock impacts, identify water diversion impacts to migrating BCT, | 5 years |
| Wright Creek | 6.6 | unknown | 3 | Population survey, address livestock impacts, identify water diversion impacts to migrating BCT, | 5 years |
| Indian Mill Creek | 4.3 | no fish | 3 | Population survey, address livestock impacts, identify water diversion impacts to migrating BCT, | 5 years |
| Dairy Creek | 8.4 | present | 3 | Population survey, address livestock impacts, identify water diversion impacts to migrating BCT, | 5 years |
| Elkhorn Creek | 2.8 | unknown | 3 | Population survey, address livestock impacts, identify water diversion impacts to migrating BCT, | 5 years |
| Samaria Creek | 4.4 | unknown | 3 | Population survey, address livestock impacts, identify water diversion impacts to migrating BCT, | 5 years |
| Devil Creek | 20.1 | present | 3 | Population survey, address livestock impacts, identify water diversion impacts to migrating BCT, | 5 years |
| New Canyon Creek | 4.1 | unknown | 3 | Population survey, address livestock impacts, identify water diversion impacts to migrating BCT, | 5 years |
| Deep Creek Malad<br>First Creek<br>Second Creek<br>Third Creek | 11.9<br>2.7<br>5.2<br>6.7 | Unknown<br>present<br>present<br>present | 1 | Brook trout removal, protect and improve riparian habitat Investigate connectivity with Deep Creek. Investigate the potential to establish an adfluvial population of BCT in Deep Creek Reservoir. , address livestock impacts, identify water diversion impacts to migrating BCT, Investigate culvert migration barrier reported on Deep Creek | 10 years |
| Burnett Creek | 3.2 | unknown | 3 | Population survey, address livestock impacts, identify water diversion impacts to migrating BCT, | 5 years |
| Deep Creek Curlew | 12.4 | unknown | 3 | Population survey, address livestock impacts, identify water diversion impacts to migrating BCT, | 5 years |
| Rock Creek | 9.6 | unknown | 3 | Population survey, address livestock impacts, identify water diversion impacts to migrating BCT, | 5 years |
| Meadow Brook | 3.2 | unknown | 3 | Population survey, address livestock impacts, identify water diversion impacts to migrating BCT, | 5 years |

## FUNDING MECHANISMS

The IDFG, IDEQ, BLM, FWS, and USFS have dedicated sampling time and funding to build the current database on Bonneville cutthroat trout distribution in Idaho. The agencies continue to recognize the importance of conserving Bonneville cutthroat trout. For example, during the 2003-2004 fiscal years, the IDFG allocated approximately 50% of their Southeast Region fisheries budget to native cutthroat trout monitoring and restoration efforts. The majority of those restoration efforts focused on improving natural reproduction of BCT in the Bear Lake system. The agencies will continue to dedicate

significant time to native Bonneville cutthroat trout conservation and continuing efforts will be directed in part by the priorities listed in this plan.

The federal relicensing process for the Bear River hydroelectric projects emphasized Bonneville cutthroat trout conservation. In the relicensing settlement agreement, several research and management projects were identified for funding. The research focus was to identify migration barriers and existing spawning locations. To answer those questions, Bonneville cutthroat trout radio telemetry and migration barriers studies were initiated in 2005. PacifiCorp is also funding genetics work. The PacifiCorp settlement agreement funding includes habitat, water, and land purchases and possibly Bonneville cutthroat trout broodstock development. Annual funding for Bonneville cutthroat trout restoration by PacifiCorp is approximately $467,000. The PacifiCorp funding is prioritized for use in the Nounan Valley, Dam Complex, Gentile Valley, and Riverdale management units.

Ongoing projects are being funded by other grants secured by agencies and non-governmental organizations. For example, Fisheries Restoration and Irrigation Mitigation Act (FRIMA) grants were obtained to install fish screens on irrigation diversions on Saint Charles Creek. Efforts will continue to secure funding to address passage barriers and improve habitat through various avenues. These may include the National Fish Habitat Action Plan, National Fish Passage Program, Bring Back the Natives, Partners for Fish and Wildlife, and others.

## CONCLUSION

Idaho is in a good position to ensure that Bonneville cutthroat trout are adequately protected with most populations capable of providing angling opportunity. Because of past and current work done on Bonneville cutthroat trout related to documenting changes that have occurred in Bonneville cutthroat trout populations, the agencies know a good deal about the status of Bonneville cutthroat trout in Idaho. This work confirmed that there are problem areas and that management actions are required over the long-term to ensure the viability and persistence of populations. Habitat protection and restoration will be the highest priority. This will require the support and assistance of many parties. As much as possible, the agencies will work with land managers, private landowners, and non-governmental organizations to collaborate on habitat restoration projects. There is much that needs to occur across the range of Bonneville cutthroat trout and no one party has enough staff or funding to accomplish the required workload. Priorities need to be established for this work; but, opportunistic projects will also be entertained on a case-by-case basis. Some individual watersheds are so altered by anthropogenic factors that it is very unlikely that restoration attempts will be successful. The agencies will focus their efforts in management units and in watersheds where the likelihood of success is moderate to high.

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# APPENDICES

Appendix A. Trout population data (fish per mile and fish per 100m$^2$). Multiple records in a single year represent data from different sample locations.

| | | Fish Per Mile | | | | | Fish per 100 m$^2$ | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Stream | Year | BCT | BK | BRN | HYB | RBT | BCT | BK | BRN | HYB | RBT |
| BAILEY CREEK | 2001 | 0.0 | 1,005.8 | 0.0 | 0.0 | 0.0 | 0.0 | 26.2 | 0.0 | 0.0 | 0.0 |
| BIRCH CREEK | 2001 | 16.1 | 0.0 | 0.0 | 0.0 | 0.0 | 0.3 | 0.0 | 0.0 | 0.0 | 0.0 |
| BIRCH CREEK | 2001 | 16.1 | 0.0 | 0.0 | 0.0 | 0.0 | 0.3 | 0.0 | 0.0 | 0.0 | 0.0 |
| BLOOMINGTON CREEK | 1994 | 0.0 | 95.6 | 0.0 | 0.0 | 111.5 | 0.0 | 1.0 | 0.0 | 0.0 | 1.2 |
| BLOOMINGTON CREEK | 1994 | 0.0 | 455.1 | 0.0 | 0.0 | 111.0 | 0.0 | 4.8 | 0.0 | 0.0 | 1.2 |
| BLOOMINGTON CREEK | 1994 | 0.0 | 118.3 | 0.0 | 0.0 | 118.3 | 0.0 | 1.4 | 0.0 | 0.0 | 1.4 |
| BLOOMINGTON CREEK | 1994 | 0.0 | 578.2 | 0.0 | 0.0 | 597.5 | 0.0 | 6.5 | 0.0 | 0.0 | 6.8 |
| BLOOMINGTON CREEK | 2000 | 0.0 | 0.0 | 0.0 | 0.0 | 257.5 | 0.0 | 0.0 | 0.0 | 0.0 | 3.6 |
| BLOOMINGTON CREEK | 2000 | 0.0 | 160.9 | 0.0 | 0.0 | 0.0 | | | | | |
| BOSS CREEK | 2003 | 354.1 | 0.0 | 0.0 | 0.0 | 0.0 | 14.7 | 0.0 | 0.0 | 0.0 | 0.0 |
| CUB RIVER | 1994 | 35.1 | 515.0 | 0.0 | 0.0 | 11.7 | 0.4 | 5.2 | 0.0 | 0.0 | 0.1 |
| CUB RIVER | 2001 | 418.4 | 0.0 | 0.0 | 0.0 | 16.1 | 1.7 | 0.0 | 0.0 | 0.0 | 0.1 |
| CUB RIVER | 2001 | 209.2 | 0.0 | 0.0 | 0.0 | 0.0 | 1.4 | 0.0 | 0.0 | 0.0 | 0.0 |
| CUB RIVER | 2001 | 0.0 | 498.9 | 0.0 | 0.0 | 16.1 | 0.0 | 4.6 | 0.0 | 0.0 | 0.1 |
| DAIRY CREEK | 2000 | 31.2 | 0.0 | 0.0 | 0.0 | 0.0 | 1.4 | 0.0 | 0.0 | 0.0 | 0.0 |
| DRY CREEK | 1987 | 493.0 | 0.0 | 0.0 | 0.0 | 0.0 | 13.3 | 0.0 | 0.0 | 0.0 | 0.0 |
| DRY CREEK | 1998 | 946.7 | 0.0 | 0.0 | 0.0 | 0.0 | 24.2 | 0.0 | 0.0 | 0.0 | 0.0 |
| DRY CREEK | 1998 | 661.8 | 0.0 | 0.0 | 0.0 | 0.0 | 14.3 | 0.0 | 0.0 | 0.0 | 0.0 |
| DRY CREEK | 1998 | 536.4 | 0.0 | 0.0 | 0.0 | 0.0 | 14.4 | 0.0 | 0.0 | 0.0 | 0.0 |
| DRY CREEK | 1998 | 815.1 | 0.0 | 0.0 | 0.0 | 0.0 | 18.6 | 0.0 | 0.0 | 0.0 | 0.0 |
| DRY CREEK | 1998 | 1,370.9 | 0.0 | 0.0 | 0.0 | 0.0 | 37.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| DRY CREEK | 2004 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| DRY CREEK_Mink | 2000 | 439.7 | 0.0 | 0.0 | 0.0 | 0.0 | 11.9 | 0.0 | 0.0 | 0.0 | 0.0 |
| DRY CREEK_Mink | 2001 | 531.1 | 0.0 | 0.0 | 0.0 | 0.0 | 12.2 | 0.0 | 0.0 | 0.0 | 0.0 |
| EIGHTMILE CREEK | 1994 | 94.2 | 737.9 | 0.0 | 0.0 | 0.0 | 1.3 | 10.4 | 0.0 | 0.0 | 0.0 |
| EIGHTMILE CREEK | 1994 | 35.0 | 262.4 | 0.0 | 0.0 | 367.4 | 0.6 | 4.4 | 0.0 | 0.0 | 6.2 |
| EIGHTMILE CREEK | 1994 | 73.3 | 586.3 | 0.0 | 0.0 | 307.8 | 1.2 | 9.3 | 0.0 | 0.0 | 4.9 |
| EIGHTMILE CREEK | 1994 | 0.0 | 867.2 | 0.0 | 0.0 | 50.0 | 0.0 | 12.5 | 0.0 | 0.0 | 0.7 |
| EIGHTMILE CREEK | 2001 | 16.1 | 386.2 | 0.0 | 0.0 | 16.1 | 0.2 | 3.8 | 0.0 | 0.0 | 0.2 |
| EIGHTMILE CREEK | 2001 | 0.0 | 305.8 | 0.0 | 0.0 | 0.0 | 0.0 | 5.4 | 0.0 | 0.0 | 0.0 |
| EIGHTMILE CREEK | 2001 | 0.0 | 225.3 | 0.0 | 0.0 | 0.0 | 0.0 | 5.8 | 0.0 | 0.0 | 0.0 |
| EIGHTMILE CREEK | 2001 | 0.0 | 16.1 | 0.0 | 0.0 | 0.0 | 0.0 | 0.3 | 0.0 | 0.0 | 0.0 |
| EMIGRATION CREEK | 2000 | 321.9 | 0.0 | 0.0 | 0.0 | 0.0 | 12.9 | 0.0 | 0.0 | 0.0 | 0.0 |
| FIRST CREEK | 2000 | 333.0 | 188.7 | 0.0 | 0.0 | 0.0 | 3.1 | 1.8 | 0.0 | 0.0 | 0.0 |
| FIRST CREEK | 2000 | 318.8 | 212.6 | 0.0 | 0.0 | 0.0 | 5.5 | 3.7 | 0.0 | 0.0 | 0.0 |
| FIRST CREEK | 2000 | 424.1 | 293.6 | 0.0 | 0.0 | 0.0 | 4.8 | 3.3 | 0.0 | 0.0 | 0.0 |
| FIRST CREEK | 2000 | 276.6 | 276.6 | 0.0 | 0.0 | 0.0 | 14.3 | 14.3 | 0.0 | 0.0 | 0.0 |
| FISH HAVEN CREEK | 2000 | 0.0 | 450.6 | 0.0 | 0.0 | 0.0 | 0.0 | 13.3 | 0.0 | 0.0 | 0.0 |
| GEORGETOWN CREEK | 1994 | 0.0 | 2,030.2 | 0.0 | 0.0 | 16.5 | 0.0 | 30.8 | 0.0 | 0.0 | 0.3 |
| GEORGETOWN CREEK | 1994 | 0.0 | 48.0 | 0.0 | 0.0 | 156.1 | 0.0 | 0.7 | 0.0 | 0.0 | 2.4 |
| GEORGETOWN CREEK | 1994 | 0.0 | 109.4 | 0.0 | 0.0 | 171.9 | 0.0 | 5.7 | 0.0 | 0.0 | 8.9 |
| GEORGETOWN CREEK | 2000 | 0.0 | 0.0 | 0.0 | 0.0 | 40.2 | | | | | |
| GEORGETOWN CREEK | 2000 | 0.0 | 201.2 | 0.0 | 0.0 | 0.0 | 0.0 | 8.3 | 0.0 | 0.0 | 0.0 |
| GEORGETOWN CREEK | 2000 | 0.0 | 80.5 | 0.0 | 0.0 | 0.0 | 0.0 | 2.5 | 0.0 | 0.0 | 0.0 |
| GEORGETOWN, LEFT FK | 2000 | 0.0 | 120.7 | 0.0 | 0.0 | 0.0 | 0.0 | 2.0 | 0.0 | 0.0 | 0.0 |

| Stream | Year | Fish Per Mile | | | | | Fish per 100 $m^2$ | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | BCT | BK | BRN | HYB | RBT | BCT | BK | BRN | HYB | RBT |
| GIRAFFE CREEK | 1986 | 1,024.1 | 0.0 | 0.0 | 0.0 | 0.0 | 33.5 | 0.0 | 0.0 | 0.0 | 0.0 |
| GIRAFFE CREEK | 1986 | 830.6 | 0.0 | 0.0 | 0.0 | 0.0 | 27.2 | 0.0 | 0.0 | 0.0 | 0.0 |
| GIRAFFE CREEK | 1987 | 987.6 | 0.0 | 0.0 | 0.0 | 0.0 | 29.1 | 0.0 | 0.0 | 0.0 | 0.0 |
| GIRAFFE CREEK | 1987 | 799.5 | 0.0 | 0.0 | 0.0 | 0.0 | 30.9 | 0.0 | 0.0 | 0.0 | 0.0 |
| GIRAFFE CREEK | 1990 | 72.7 | 0.0 | 0.0 | 0.0 | 0.0 | 2.8 | 0.0 | 0.0 | 0.0 | 0.0 |
| GIRAFFE CREEK | 1993 | 13.9 | 0.0 | 0.0 | 0.0 | 0.0 | 0.5 | 0.0 | 0.0 | 0.0 | 0.0 |
| GIRAFFE CREEK | 1995 | 77.1 | 0.0 | 0.0 | 0.0 | 0.0 | 2.5 | 0.0 | 0.0 | 0.0 | 0.0 |
| GIRAFFE CREEK | 1995 | 169.4 | 0.0 | 0.0 | 0.0 | 0.0 | 4.7 | 0.0 | 0.0 | 0.0 | 0.0 |
| GIRAFFE CREEK | 1995 | 74.9 | 0.0 | 0.0 | 0.0 | 0.0 | 4.5 | 0.0 | 0.0 | 0.0 | 0.0 |
| GIRAFFE CREEK | 1998 | 879.5 | 0.0 | 0.0 | 0.0 | 0.0 | 26.8 | 0.0 | 0.0 | 0.0 | 0.0 |
| GIRAFFE CREEK | 1998 | 689.7 | 0.0 | 0.0 | 0.0 | 0.0 | 26.8 | 0.0 | 0.0 | 0.0 | 0.0 |
| GIRAFFE CREEK | 1998 | 348.7 | 0.0 | 0.0 | 0.0 | 0.0 | 12.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| GIRAFFE CREEK | 1998 | 105.2 | 0.0 | 0.0 | 0.0 | 0.0 | 4.4 | 0.0 | 0.0 | 0.0 | 0.0 |
| GIRAFFE CREEK | 2002 | 173.7 | 0.0 | 0.0 | 0.0 | 0.0 | 6.7 | 0.0 | 0.0 | 0.0 | 0.0 |
| HOME CANYON CREEK | 1999 | 88.6 | 0.0 | 206.7 | 29.5 | 14.8 | 2.8 | 0.0 | 6.6 | 0.9 | 0.5 |
| LITTLE BEAVER CREEK | 2000 | 0.0 | 442.6 | 0.0 | 0.0 | 0.0 | 0.0 | 25.0 | 0.0 | 0.0 | 0.0 |
| LOGAN RIVER | 2001 | 675.9 | 0.0 | 0.0 | 0.0 | 0.0 | 16.8 | 0.0 | 0.0 | 0.0 | 0.0 |
| MAPLE CREEK | 2001 | 209.2 | 0.0 | 0.0 | 0.0 | 0.0 | 4.1 | 0.0 | 0.0 | 0.0 | 0.0 |
| MAPLE CREEK | 2001 | 128.7 | 0.0 | 0.0 | 0.0 | 0.0 | 1.9 | 0.0 | 0.0 | 0.0 | 0.0 |
| MINK CREEK | 2001 | 16.1 | 853.0 | 0.0 | 0.0 | 0.0 | 0.2 | 11.0 | 0.0 | 0.0 | 0.0 |
| MONTPELIER CREEK | 2000 | 40.2 | 120.7 | 0.0 | 0.0 | 0.0 | 0.8 | 2.3 | 0.0 | 0.0 | 0.0 |
| MONTPELIER CREEK | 2000 | 40.2 | 241.4 | 0.0 | 0.0 | 0.0 | 1.4 | 8.1 | 0.0 | 0.0 | 0.0 |
| NORTH CREEK | 1999 | 0.0 | 32.8 | 0.0 | 0.0 | 0.0 | 0.0 | 0.7 | 0.0 | 0.0 | 0.0 |
| NORTH CREEK | 1999 | 225.0 | 276.9 | 0.0 | 0.0 | 0.0 | 5.1 | 6.3 | 0.0 | 0.0 | 0.0 |
| NORTH CREEK | 2000 | 160.9 | 281.6 | 0.0 | 0.0 | 0.0 | 2.8 | 4.9 | 0.0 | 0.0 | 0.0 |
| NORTH CREEK | 2000 | 48.3 | 64.4 | 0.0 | 0.0 | 0.0 | 1.3 | 1.7 | 0.0 | 0.0 | 0.0 |
| NORTH CREEK | 2001 | 96.6 | 273.6 | 0.0 | 0.0 | 0.0 | 2.6 | 7.4 | 0.0 | 0.0 | 0.0 |
| PARIS CREEK | 2001 | 0.0 | 32.2 | 0.0 | 0.0 | 0.0 | 0.0 | 0.8 | 0.0 | 0.0 | 0.0 |
| PEARL CREEK | 2001 | 16.1 | 0.0 | 0.0 | 0.0 | 0.0 | 0.6 | 0.0 | 0.0 | 0.0 | 0.0 |
| PREUSS CREEK | 1981 | 643.7 | 0.0 | 0.0 | 0.0 | 0.0 | 19.9 | 0.0 | 0.0 | 0.0 | 0.0 |
| PREUSS CREEK | 1985 | 979.0 | 0.0 | 0.0 | 0.0 | 0.0 | 30.3 | 0.0 | 0.0 | 0.0 | 0.0 |
| PREUSS CREEK | 1985 | 712.5 | 0.0 | 0.0 | 0.0 | 0.0 | 21.4 | 0.0 | 0.0 | 0.0 | 0.0 |
| PREUSS CREEK | 1986 | 613.1 | 0.0 | 0.0 | 0.0 | 0.0 | 14.7 | 0.0 | 0.0 | 0.0 | 0.0 |
| PREUSS CREEK | 1986 | 503.7 | 0.0 | 0.0 | 0.0 | 0.0 | 12.8 | 0.0 | 0.0 | 0.0 | 0.0 |
| PREUSS CREEK | 1987 | 282.1 | 0.0 | 0.0 | 0.0 | 0.0 | 6.5 | 0.0 | 0.0 | 0.0 | 0.0 |
| PREUSS CREEK | 1987 | 482.8 | 0.0 | 0.0 | 0.0 | 0.0 | 14.9 | 0.0 | 0.0 | 0.0 | 0.0 |
| PREUSS CREEK | 1987 | 340.0 | 0.0 | 0.0 | 0.0 | 0.0 | 10.2 | 0.0 | 0.0 | 0.0 | 0.0 |
| PREUSS CREEK | 1989 | 29.7 | 0.0 | 0.0 | 0.0 | 0.0 | 0.7 | 0.0 | 0.0 | 0.0 | 0.0 |
| PREUSS CREEK | 1989 | 86.7 | 0.0 | 0.0 | 0.0 | 0.0 | 2.6 | 0.0 | 0.0 | 0.0 | 0.0 |
| PREUSS CREEK | 1989 | 67.6 | 0.0 | 0.0 | 0.0 | 0.0 | 2.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| PREUSS CREEK | 1990 | 99.0 | 0.0 | 0.0 | 0.0 | 0.0 | 3.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| PREUSS CREEK | 1990 | 68.0 | 0.0 | 0.0 | 0.0 | 0.0 | 2.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| PREUSS CREEK | 1990 | 166.2 | 0.0 | 0.0 | 0.0 | 0.0 | 3.1 | 0.0 | 0.0 | 0.0 | 0.0 |
| PREUSS CREEK | 1991 | 39.7 | 0.0 | 0.0 | 0.0 | 0.0 | 1.7 | 0.0 | 0.0 | 0.0 | 0.0 |
| PREUSS CREEK | 1991 | 89.0 | 0.0 | 0.0 | 0.0 | 0.0 | 4.2 | 0.0 | 0.0 | 0.0 | 0.0 |
| PREUSS CREEK | 1991 | 299.3 | 0.0 | 0.0 | 0.0 | 0.0 | 5.7 | 0.0 | 0.0 | 0.0 | 0.0 |
| PREUSS CREEK | 1991 | 17.9 | 0.0 | 0.0 | 0.0 | 0.0 | 0.6 | 0.0 | 0.0 | 0.0 | 0.0 |

| | | Fish Per Mile | | | | | Fish per 100 $m^2$ | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Stream | Year | BCT | BK | BRN | HYB | RBT | BCT | BK | BRN | HYB | RBT |
| PREUSS CREEK | 1993 | 64.4 | 0.0 | 0.0 | 0.0 | 0.0 | 1.5 | 0.0 | 0.0 | 0.0 | 0.0 |
| PREUSS CREEK | 1993 | 42.5 | 0.0 | 0.0 | 0.0 | 0.0 | 1.1 | 0.0 | 0.0 | 0.0 | 0.0 |
| PREUSS CREEK | 1993 | 410.9 | 0.0 | 0.0 | 0.0 | 0.0 | 20.8 | 0.0 | 0.0 | 0.0 | 0.0 |
| PREUSS CREEK | 1993 | 16.3 | 0.0 | 0.0 | 0.0 | 0.0 | 0.5 | 0.0 | 0.0 | 0.0 | 0.0 |
| PREUSS CREEK | 1995 | 82.1 | 0.0 | 0.0 | 0.0 | 0.0 | 2.5 | 0.0 | 0.0 | 0.0 | 0.0 |
| PREUSS CREEK | 1995 | 136.4 | 0.0 | 0.0 | 0.0 | 0.0 | 4.5 | 0.0 | 0.0 | 0.0 | 0.0 |
| PREUSS CREEK | 1995 | 117.8 | 0.0 | 0.0 | 0.0 | 0.0 | 2.4 | 0.0 | 0.0 | 0.0 | 0.0 |
| PREUSS CREEK | 1995 | 26.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.7 | 0.0 | 0.0 | 0.0 | 0.0 |
| PREUSS CREEK | 1995 | 80.5 | 0.0 | 0.0 | 0.0 | 0.0 | 2.7 | 0.0 | 0.0 | 0.0 | 0.0 |
| PREUSS CREEK | 1995 | 131.5 | 0.0 | 0.0 | 0.0 | 0.0 | 5.2 | 0.0 | 0.0 | 0.0 | 0.0 |
| PREUSS CREEK | 2002 | 119.2 | 0.0 | 0.0 | 0.0 | 0.0 | 4.9 | 0.0 | 0.0 | 0.0 | 0.0 |
| PREUSS CREEK | 2002 | 115.0 | 0.0 | 0.0 | 0.0 | 0.0 | 4.1 | 0.0 | 0.0 | 0.0 | 0.0 |
| SECOND CREEK | 2000 | 154.5 | 0.0 | 0.0 | 0.0 | 0.0 | 2.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| SECOND CREEK | 2000 | 79.3 | 0.0 | 0.0 | 0.0 | 0.0 | 1.3 | 0.0 | 0.0 | 0.0 | 0.0 |
| SECOND CREEK | 2000 | 175.2 | 0.0 | 0.0 | 0.0 | 0.0 | 1.6 | 0.0 | 0.0 | 0.0 | 0.0 |
| SKINNER CREEK | 2001 | 386.2 | 0.0 | 0.0 | 0.0 | 0.0 | 11.7 | 0.0 | 0.0 | 0.0 | 0.0 |
| ST CHARLES CREEK | 1987 | 357.6 | 1,233.8 | 0.0 | 89.4 | 232.5 | 3.5 | 12.1 | 0.0 | 0.9 | 2.3 |
| ST CHARLES CREEK | 1987 | 219.7 | 9.2 | 0.0 | 0.0 | 0.0 | 4.6 | 0.2 | 0.0 | 0.0 | 0.0 |
| ST CHARLES CREEK | 1987 | 303.6 | 1,518.2 | 0.0 | 0.0 | 1,062.8 | 3.3 | 16.6 | 0.0 | 0.0 | 11.6 |
| ST CHARLES CREEK | 1987 | 132.5 | 507.7 | 0.0 | 0.0 | 287.0 | 1.4 | 5.3 | 0.0 | 0.0 | 3.0 |
| ST CHARLES CREEK | 1987 | 63.7 | 106.2 | 0.0 | 106.2 | 84.9 | 0.9 | 1.4 | 0.0 | 1.4 | 1.1 |
| ST CHARLES CREEK | 1987 | 58.9 | 1,256.1 | 0.0 | 19.6 | 58.9 | 1.2 | 25.2 | 0.0 | 0.4 | 1.2 |
| ST CHARLES CREEK | 2000 | 668.8 | 668.8 | 0.0 | 41.8 | 20.9 | 11.6 | 11.6 | 0.0 | 0.7 | 0.4 |
| ST CHARLES CREEK | 2000 | 0.0 | 553.6 | 0.0 | 0.0 | 0.0 | 0.0 | 5.6 | 0.0 | 0.0 | 0.0 |
| ST CHARLES CREEK | 2000 | 146.6 | 410.4 | 0.0 | 29.3 | 0.0 | 1.6 | 4.5 | 0.0 | 0.3 | 0.0 |
| ST CHARLES CREEK | 2000 | 162.0 | 0.0 | 0.0 | 0.0 | 0.0 | 1.2 | 0.0 | 0.0 | 0.0 | 0.0 |
| ST CHARLES CREEK | 2000 | 973.0 | 1,577.8 | 0.0 | 26.3 | 263.0 | 16.1 | 26.1 | 0.0 | 0.4 | 4.3 |
| ST CHARLES CREEK | 2000 | 657.4 | 1,217.4 | 0.0 | 511.3 | 584.3 | 3.8 | 7.1 | 0.0 | 3.0 | 3.4 |
| ST CHARLES CREEK | 2000 | 240.2 | 312.3 | 0.0 | 0.0 | 24.0 | 3.5 | 4.5 | 0.0 | 0.0 | 0.3 |
| ST CHARLES CREEK | 2000 | 989.0 | 971.0 | 0.0 | 161.8 | 89.9 | 16.4 | 16.1 | 0.0 | 2.7 | 1.5 |
| ST CHARLES CREEK | 2001 | 64.4 | 273.6 | 0.0 | 0.0 | 64.4 | 1.9 | 8.1 | 0.0 | 0.0 | 1.9 |
| ST CHARLES CREEK | 2001 | | | | | | 5.4 | 7.6 | 0.0 | 0.5 | 2.2 |
| ST CHARLES CREEK | 2001 | | | | | | 0.1 | 2.3 | 0.0 | 0.0 | 4.1 |
| ST CHARLES CREEK | 2001 | 405.0 | 810.1 | 0.0 | 27.0 | 0.0 | 7.1 | 14.3 | 0.0 | 0.5 | 0.0 |
| ST CHARLES CREEK | 2001 | 534.5 | 831.4 | 0.0 | 0.0 | 296.9 | 24.6 | 38.3 | 0.0 | 0.0 | 13.7 |
| ST CHARLES CREEK | 2001 | 124.8 | 548.9 | 0.0 | 0.0 | 174.7 | 2.0 | 8.9 | 0.0 | 0.0 | 2.8 |
| ST CHARLES CREEK | 2001 | 713.1 | 2,236.6 | 0.0 | 48.6 | 129.7 | 10.3 | 32.3 | 0.0 | 0.7 | 1.9 |
| ST CHARLES CREEK | 2002 | 1,959.9 | 301.5 | 0.0 | 37.7 | 75.4 | 42.7 | 6.6 | 0.0 | 0.8 | 1.6 |
| ST CHARLES CREEK | 2002 | 0.0 | 456.0 | 0.0 | 0.0 | 0.0 | 0.0 | 15.3 | 0.0 | 0.0 | 0.0 |
| ST CHARLES CREEK | 2002 | 836.4 | 785.7 | 0.0 | 0.0 | 50.7 | 13.0 | 12.2 | 0.0 | 0.0 | 0.8 |
| ST CHARLES CREEK | 2002 | 310.4 | 167.1 | 0.0 | 238.8 | 334.3 | 1.9 | 1.0 | 0.0 | 1.5 | 2.0 |
| ST CHARLES CREEK | 2002 | 430.0 | 245.7 | 0.0 | 245.7 | 368.6 | 5.3 | 3.0 | 0.0 | 3.0 | 4.6 |
| SUGAR CREEK | 2001 | 80.5 | 0.0 | 0.0 | 0.0 | 0.0 | 1.9 | 0.0 | 0.0 | 0.0 | 0.0 |
| SUGAR CREEK | 2001 | 675.9 | 0.0 | 0.0 | 0.0 | 0.0 | 15.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| THIRD CREEK | 2000 | 217.5 | 0.0 | 0.0 | 0.0 | 0.0 | 3.8 | 0.0 | 0.0 | 0.0 | 0.0 |
| THIRD CREEK | 2000 | 91.4 | 0.0 | 0.0 | 0.0 | 0.0 | 2.2 | 0.0 | 0.0 | 0.0 | 0.0 |
| WHISKEY CREEK_Mntp | 2000 | 40.2 | 40.2 | 0.0 | 0.0 | 0.0 | | | | | |

| | | Fish Per Mile | | | | | | Fish per 100 $m^2$ | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Stream | Year | BCT | BK | BRN | HYB | RBT | | BCT | BK | BRN | HYB | RBT |
| WHISKEY CREEK_Mntp | 2000 | 40.2 | 160.9 | 0.0 | 0.0 | 0.0 | | | | | | |
| WHISKEY CREEK_Mntp | 2000 | 0.0 | 40.2 | 0.0 | 0.0 | 0.0 | | | | | | |
| WHITE CANYON CREEK | 1999 | 178.8 | 0.0 | 0.0 | 0.0 | 0.0 | | 3.7 | 0.0 | 0.0 | 0.0 | 0.0 |

**Appendix B.** Stocking history for Bear River, Malad River, and their tributaries. Total number (cumulative) of fish stocked by species from 1913 to 2002. These records represent information available from IDFGs historical and recent stocking databases. Fish stocking records are currently very good; however, some of the information gathering and record keeping between 1913 and 1960s was incomplete. Therefore, this table is a conservative summary of actual stocking effort.

**Species Codes**

| Species | Species Common Name | Species | Species Common Name |
|---|---|---|---|
| AC | ARCTIC CHAR, SUNAPPEE TROUT, BLUEBACK | LT | LAKE TROUT |
| AS | ALANTIC SALMON | PE | PERCH |
| BA | SMALLMOUTH BASS | PS | PUMPKINSEED |
| BC | BULLHEAD CATFISH | R1 | UNSPECIFIED RAINBOW |
| BG | BLUEGILL | R2 | MT WHITNEY RAINBOW |
| BK | BROOK TROUT | R3 | KOOTENAI STOCK RAINBOW |
| BL | BLUE CATFISH | R4 | MT LASSEN RAINBOW |
| BN | BROWN TROUT | R5 | MT SHASTA RAINBOW |
| BU | BULL TROUT | R6 | McCONNAUGHY RAINBOW |
| C1 | UNSPECIFIED CUTTHROAT | R7 | EAGLE LAKE RAINBOW |
| C2 | WESTSLOPE CUTTHROAT | R8 | SHEPARD OF THE HILLS RAINBOW |
| C3 | HENRYS LAKE CUTTHROAT | R9 | HAYSPUR RAINBOW |
| C4 | FINE SPOTTED CUTTHROAT | RA | ARLEE RAINBOW |
| C5 | BEAR LAKE CUTTHROAT | RB | REDBAND TROUT |
| C6 | LAHONTAN CUTTHROAT | RC | RAINBOW x CUTTHROAT |
| C7 | BEAR RIVER CUTTHROAT | RD | REDSIDE SHINER |
| CB | BLACK CRAPPIE | RE | ERWIN RAINBOW |
| CC | CHANNEL CATFISH | RF | FISH LAKE RAINBOW |
| CO | COHO SALMON | RP | PENNASK RAINBOW |
| CR | UNSPECIFIED CRAPPIE | RR | COLORADO RIVER RAINBOW |
| CS | STEELHEAD x CUTTHROAT | RS | SPOKANE RAINBOW |
| CT | CUTTHROAT | SA | STEELHEAD A-Run |
| CW | WHITE CRAPPIE | SB | STEELHEAD B-Run |
| FC | FALL CHINOOK | SC | SPRING CHINOOK |
| GA | GAMMARUS | SE | SAUGEYE |
| GC | GRASS CARP | SG | SAUGER |
| GN | GOLDEN TROUT | SH | STEELHEAD |
| GR | GRAYLING | SK | WHITE STURGEON (KOOTENAI RIVER) |
| K1 | DOMESTIC KAMLOOPS | SO | SOCKEYE SALMON |
| K2 | WILD KAMLOOPS | SP | SPLAKE |
| K3 | BLACK CANYON KAMLOOPS | SS | WHITE STURGEON (SNAKE RIVER) |
| KD | DUNCAN RIVER KAMLOOPS | ST | SPOT TAIL SHINER |
| KE | EARLY SPAWNER KOKANEE | SU | SUMMER CHINOOK |
| KL | LATE SPAWNER KOKANEE | T4 | MT LASSEN TRIPLOID |

| Species | Species Common Name | Species | Species Common Name |
|---|---|---|---|
| KM | KAMLOOPS | T9 | HAYSPUR RAINBOW TRIPLOID |
| KO | OCTOBER SPAWNER KOKANEE | TH | TRIPLOID RAINBOWxCUTTHROAT HYBRID |
| KS | TROUTLODGE | TM | TIGER MUSKIE |
| KT | HAYSPUR KAMLOOPS TRIPLOID | TT | TRIPLOID TROUTLODGE KAMLOOP |
| LB | LARGEMOUTH BASS | WE | WALLEYE |

**Appendix B. Continued (stocking records).**

| Water | Species | County | Total |
|---|---|---|---|
| ALEXANDER RES | R1 | Caribou | 48867 |
| | R8 | Caribou | 1505 |
| | R9 | Caribou | 52515 |
| | RB | Caribou | 29250 |
| | CC | Caribou | 86100 |
| | CR | Caribou | 1200 |
| | CT | Caribou | 29952 |
| | LB | Caribou | 505 |
| | C3 | Caribou | 1250 |
| | CW | Caribou | 2530 |
| BAILEY CR | C7 | Caribou | 13215 |
| BEAR L (TRIBUTARIES) | CT | Bear Lake | 100000 |
| BEAR R | KS | Bear Lake | 1752 |
| | | Caribou | 7762.4 |
| | | Franklin | 5259.7 |
| | R1 | Bannock | 184192 |
| | | Bear Lake | 80665 |
| | | Caribou | 1508651 |
| | | Franklin | 878352 |
| | R4 | Bear Lake | 1250 |
| | | Caribou | 7750 |
| | | Franklin | 7013 |
| | R8 | Bear Lake | 6330 |
| | | Caribou | 45718 |
| | | Franklin | 9535 |
| | R9 | Bear Lake | 21623 |
| | | Caribou | 118931 |
| | | Franklin | 82047 |
| | RB | Bannock | 197860 |
| | | Bear Lake | 154900 |
| | | Caribou | 247615 |
| | | Franklin | 135190 |
| | RBS | Bannock | 325 |
| | | Caribou | 305 |

| Water | Species | County | Total |
|---|---|---|---|
| | T9 | Bear Lake | 250 |
| | | Caribou | 7002 |
| | | Franklin | 4502 |
| | TT | Caribou | 7275.65 |
| | | Franklin | 4995 |
| | BA | Caribou | 2200 |
| | BL | Caribou | 34018 |
| | BN | Bear Lake | 96576 |
| | | Caribou | 255999 |
| | | Franklin | 312994 |
| | BS | Franklin | 238000 |
| | C7 | Caribou | 4000 |
| | CC | Bear Lake | 6977 |
| | | Caribou | 181377 |
| | | Franklin | 10000 |
| | CT | Bear Lake | 869828 |
| | | Caribou | 412768 |
| | K1 | Bear Lake | 2500 |
| | | Caribou | 14800 |
| | | Franklin | 14560 |
| BEAR R - 8 MILE CREEKS | BK | Caribou | 28000 |
| BEAR R (ABOVE GRACE DAM) | RB | Bannock | 18000 |
| BEAR R (BEAR R POND) | R1 | Caribou | 14000 |
| BEAR R (BLACK CANYON POND) | R1 | Caribou | 38880 |
| BEAR R (Cheese Plant Br | KS | Caribou | 2004 |
| | R9 | Caribou | 2000 |
| | T9 | Caribou | 751 |
| | TT | Caribou | 1998.5 |
| BEAR R (GRACE POND) | R1 | Caribou | 14208 |
| BEAR R (GRACE REARING POND NO. 1) | R1 | Caribou | 13800 |
| BEAR R (GRACE REARING POND NO. 2) | R1 | Caribou | 20700 |
| BEAR R (GRACE REARING PONDS) | R1 | Caribou | 12000 |
| BEAR R (GRACE RELEASE POND NO. 1) | R1 | Caribou | 27900 |
| BEAR R (GRACE RELEASE POND NO. 2) | R1 | Caribou | 20850 |
| BEAR R (GRACE RELEASE POND) | R1 | Caribou | 31040 |
| BEAR R (LAST CHANCE CANAL) | R1 | Caribou | 4483 |
| BEAR R (Near Mouth MINK CR | KS | Franklin | 2754.85 |
| | R1 | Franklin | 1252 |
| | R9 | Franklin | 3250 |
| | T9 | Franklin | 2251 |
| | TT | Franklin | 2497.5 |
| BEAR R (REARING POND NO. 1) | R1 | Caribou | 13230 |
| BEAR R (REARING POND NO. 2) | R1 | Caribou | 20790 |
| BEAR R, MINK CR | R1 | Franklin | 12000 |
| BEAR R, TWIN LAKE RES | BA | Franklin | 10000 |
| BEAVER CR | R1 | Bear Lake | 6354 |
| | BK | Franklin | 8070 |
| | CT | Bear Lake | 33098 |

| Water | Species | County | Total |
|---|---|---|---|
| BIG CR | R1 | Bear Lake | 5920 |
| | CT | Bear Lake | 560 |
| BIG CR (ST CHARLES) | R1 | Bear Lake | 3108 |
| BIG MALAD | R1 | Oneida | 8800 |
| | RB | Oneida | 14000 |
| BIRCH CR | R1 | Oneida | 2134 |
| | BK | Bannock | 3480 |
| | C4 | Franklin | 1005 |
| BLACK CANYON (BEAR R) | R1 | Caribou | 21800 |
| BLOOMINGTON CR | R1 | Bear Lake | 348294 |
| | R8 | Bear Lake | 3381 |
| | R9 | Bear Lake | 14483 |
| | RB | Bear Lake | 5400 |
| | T9 | Bear Lake | 2970.7 |
| | TT | Bear Lake | 1490.4 |
| | BK | Bear Lake | 43825 |
| | CT | Bear Lake | 12120 |
| BLOOMINGTON CR (POND) | R1 | Bear Lake | 7785 |
| BLOOMINGTON CR (REAR. POND) | R1 | Bear Lake | 2530 |
| BLOOMINGTON CR (REARING POND) | R1 | Bear Lake | 2500 |
| BLOOMINGTON CR (RELAEASE POND) | R1 | Bear Lake | 3300 |
| BLOOMINGTON CR (RELEASE POND) | R1 | Bear Lake | 2580 |
| BLOOMINGTON CR RELEASE POND | R1 | Bear Lake | 2560 |
| BLOOMINGTON CR, RELEASE POND | R1 | Bear Lake | 2697 |
| BLOOMINGTON CR, ST CHARLES CR | RB | Bear Lake | 20000 |
| BLOOMINGTON L | R1 | Bear Lake | 68253 |
| | RB | Bear Lake | 19180 |
| | C5 | Bear Lake | 3000 |
| | C7 | Bear Lake | 7116 |
| | CT | Bear Lake | 293950 |
| | C4 | Bear Lake | 32008 |
| | C3 | Bear Lake | 10000 |
| BLOOMINGTON POND | R1 | Bear Lake | 1988 |
| CLIFTON CR | R1 | Franklin | 7325 |
| | BK | Franklin | 1750 |
| COTTONWOOD CR | R1 | Bannock | 14400 |
| | BK | Bannock | 14000 |
| | BN | Franklin | 2057 |
| | C7 | Franklin | 20000 |
| | CT | Bannock | 50608 |
| | | Caribou | 25500 |
| | | Franklin | 339948 |
| | C4 | Franklin | 5025 |
| CROOKED CR | RC | Caribou | 780 |
| | CT | Caribou | 14120 |
| CROW CR, PREUSS CR | R1 | Bear Lake | 8000 |
| CUB CR, MINK CR | R1 | Franklin | 20000 |

| Water | Species | County | Total |
|---|---|---|---|
| CUB R | R1 | Franklin | 259737 |
| | R8 | Franklin | 6759 |
| | R9 | Franklin | 26320 |
| | T9 | Franklin | 6250.2 |
| | TT | Franklin | 5380.4 |
| | BK | Franklin | 63998 |
| | C5 | Franklin | 4680 |
| | CT | Franklin | 741920 |
| | C3 | Franklin | 3000 |
| | K1 | Franklin | 500 |
| CUB R (POND) | CT | Franklin | 4992 |
| CUB R (REARING POND) | CT | Franklin | 36230 |
| CUB R REARING POND | CT | Franklin | 23040 |
| CUB R REARING PONDS | CT | Franklin | 40000 |
| CUB R, MINK CR | BK | Franklin | 10000 |
| CUB RIVER POND | CT | Franklin | 20400 |
| DAIRY CR | CT | Oneida | 16000 |
| | RA | Oneida | 500 |
| DAIRY CR, WRIGHT CR | BK | Oneida | 40500 |
| DAVIS CR | CT | Oneida | 24310 |
| DAYTON CR | BK | Franklin | 1500 |
| DEEP (CURLEW) CR | BK | Oneida | 8442 |
| DEEP CR | R1 | Franklin | 900 |
| | | Oneida | 24176 |
| | RB | Oneida | 30400 |
| | TT | Oneida | 1750 |
| | BK | Oneida | 13920 |
| | CT | Caribou | 3288 |
| | | Oneida | 86520 |
| DEEP CR, FIRST CR | R1 | Oneida | 9062 |
| DEER CR, GEORGETOWN CR | BK | Bear Lake | 12000 |
| DEVIL CR | R1 | Oneida | 60017 |
| | RB | Oneida | 78250 |
| | CT | Oneida | 291318 |
| DEVIL CR, MALAD CR, BIRCH CR, ... | CT | Oneida | 31000 |
| DEVIL, DEEP, RICE (?), WRIGHT, L MALAD | CT | Oneida | 46000 |
| DEVILS CR | R1 | Oneida | 16870 |
| | CT | Oneida | 101401 |
| DEVILS CR (ST JOHNS RES) | R1 | Oneida | 4760 |
| DEVILS CREEK RES | KS | Oneida | 72050 |
| | KT | Oneida | 13860 |
| | R1 | Oneida | 354996 |
| | R4 | Oneida | 60595 |
| | R8 | Oneida | 3505 |
| | R9 | Oneida | 69002 |
| | RC | Oneida | 9010 |
| | T9 | Oneida | 13398 |

| Water | Species | County | Total |
|---|---|---|---|
| | TT | Oneida | 26280 |
| | BK | Oneida | 500 |
| | CT | Oneida | 643925 |
| | LT | Oneida | 8420 |
| | K1 | Oneida | 104965 |
| | KE | Oneida | 203404 |
| | SP | Oneida | 3414 |
| | KO | Oneida | 37955 |
| | KL | Oneida | 3500 |
| DRY CR | BK | Bannock | 2000 |
| | CT | Bear Lake | 20911 |
| EIGHTMILE CR | R1 | Bear Lake | 15295 |
| | | Caribou | 128104 |
| | R8 | Caribou | 2613 |
| | R9 | Caribou | 15727 |
| | T9 | Caribou | 3750.4 |
| | TT | Caribou | 2494.8 |
| | BK | Bear Lake | 45496 |
| | | Caribou | 117394 |
| | C7 | Caribou | 19500 |
| EIGHTEEN MILE CR | R1 | Caribou | 5535 |
| | RC | Caribou | 2850 |
| | BK | Caribou | 5730 |
| | CT | Caribou | 21400 |
| EIGHTEEN MILE CR | R1 | Caribou | 3120 |
| EIGHTMILE CR | R1 | Caribou | 4626 |
| | BK | Bear Lake | 11464 |
| | | Caribou | 39971 |
| EIGHTMILE CR | R1 | Bear Lake | 14647 |
| | | Caribou | 6000 |
| | BK | Bear Lake | 53552 |
| | | Caribou | 3090 |
| FIRST CR | CT | Oneida | 18496 |
| FISH HAVEN CR | BK | Bear Lake | 45669 |
| | CT | Bear Lake | 12445 |
| FISH HAVEN CR | CT | Bear Lake | 7158 |
| GEORGETOWN CR | R1 | Bear Lake | 80075 |
| | R8 | Bear Lake | 1310 |
| | R9 | Bear Lake | 10255 |
| | RB | Bear Lake | 4200 |
| | T9 | Bear Lake | 2079.65 |
| | TT | Bear Lake | 946.76 |
| | BK | Bear Lake | 130662 |
| | CT | Bear Lake | 31920 |
| | K1 | Bear Lake | 750 |
| GEORGETOWN CR, MONTPELIER CR, PARIS CR, ... | BK | Bear Lake | 10000 |
| GEORGETOWN, THOMAS FORK CR | RB | Bear Lake | 776366 |
| | BK | Bear Lake | 109600 |

| Water | Species | County | Total |
|---|---|---|---|
| | CT | Bear Lake | 182000 |
| | PE | Bear Lake | 114380 |
| GIRAFFE CR | CT | Bear Lake | 21499 |
| GRACE PLANT REARING POND | R1 | Caribou | 1710 |
| GRACE REARING POND | R1 | Bannock | 5040 |
| | | Caribou | 12640 |
| GRACE REARING PONDS | R1 | Bannock | 11000 |
| | RB | Bannock | 8000 |
| INDIAN MILL CR | R1 | Oneida | 10470 |
| KING CR | R1 | Caribou | 7120 |
| L F GEORGETOWN R | C7 | Bear Lake | 3000 |
| L FK GEORGETOWN CR | BK | Bear Lake | 2956 |
| LAST CHANCE CANAL | R1 | Caribou | 14796 |
| LAST CHANCE CANAL (BENCH BR) | R1 | Caribou | 1398 |
| LEFT FK GEORGETOWN CR | BK | Bear Lake | 1700 |
| LIBERTY CR | R1 | Bear Lake | 15270 |
| LIBERTY CR, PARIS CR, PERUSE CR | R1 | Bear Lake | 8000 |
| LITTLE CR | R1 | Bear Lake | 16620 |
| LITTLE MALAD R | R1 | Oneida | 246402 |
| | R9 | Oneida | 4850 |
| | BK | Oneida | 10000 |
| | CT | Oneida | 65000 |
| LITTLE ST CHARLES CR | R1 | Bear Lake | 6000 |
| MALAD R | R1 | Oneida | 34168 |
| | RB | Oneida | 9460 |
| | BK | Oneida | 10000 |
| | CC | Oneida | 2500 |
| | CT | Oneida | 18880 |
| MAPLE CR | R1 | Franklin | 1000 |
| | BK | Franklin | 10000 |
| | CT | Franklin | 37044 |
| MILL CR | R1 | Bear Lake | 3900 |
| | BK | Bear Lake | 15572 |
| | | Caribou | 1000 |
| | CT | Bear Lake | 48117 |
| | | Caribou | 9820 |
| | | Oneida | 19040 |
| MILL CREEK | R9 | Bannock | 250 |
| | T9 | Bannock | 1250.85 |
| | TT | Bannock | 498 |
| MINK CR | R1 | Bannock | 133425 |
| | | Franklin | 101924 |
| | R4 | Bannock | 569 |
| | R9 | Bannock | 7860 |
| | RB | Bannock | 36900 |
| | RBS | Bannock | 325 |
| | TT | Bannock | 290 |
| | BK | Franklin | 17000 |

| Water | Species | County | Total |
|---|---|---|---|
| | CT | Bannock | 15000 |
| | | Franklin | 300040 |
| | C3 | Bannock | 750 |
| | K1 | Bannock | 7647 |
| MONTPELIER CR | R1 | Bear Lake | 673000 |
| | | Caribou | 5930 |
| | R8 | Bear Lake | 10727 |
| | R9 | Bear Lake | 32894 |
| | RB | Bear Lake | 128375 |
| | T9 | Bear Lake | 5653.1 |
| | TT | Bear Lake | 2344 |
| | BK | Bear Lake | 3500 |
| | C5 | Bear Lake | 113011 |
| | C7 | Bear Lake | 3000 |
| | CT | Bear Lake | 139810 |
| MONTPELIER CR, THOMAS FORK CR | R1 | Bear Lake | 10000 |
| N CANYON | CT | Bear Lake | 3512 |
| N CANYON CR | BK | Bear Lake | 10452 |
| | CT | Bear Lake | 10240 |
| N FK MONTPELIER CR | R1 | Bear Lake | 900 |
| NORTH CANYON | CT | Bear Lake | 10099 |
| NORTH CANYON CR | R1 | Bear Lake | 3900 |
| | CT | Bear Lake | 6585 |
| ONID CR | R1 | Bear Lake | 25000 |
| OVID & LIBERTY CR | R1 | Bear Lake | 3036 |
| OVID (?), PARIS, MONTPELIER CR | RB | Bear Lake | 40000 |
| OVID CR | R1 | Bear Lake | 80877 |
| | BK | Bear Lake | 16625 |
| | CT | Bear Lake | 1040 |
| PARIS CR | R1 | Bear Lake | 116159 |
| | R8 | Bear Lake | 552 |
| | R9 | Bear Lake | 4681 |
| | T9 | Bear Lake | 824.4 |
| | TT | Bear Lake | 359.4 |
| | BK | Bear Lake | 16625 |
| PARIS CR, BLOOMINGTON CR, ST CHARLES CR | R1 | Bear Lake | 6000 |
| PARIS CR, OVID CR, LIBERTY CR | BK | Bear Lake | 10000 |
| PARIS CR, ST CHARLES CR | R1 | Bear Lake | 23000 |
| PEARL CR | R1 | Bear Lake | 5460 |
| | R9 | Caribou | 650 |
| | C5 | Caribou | 500 |
| | C7 | Caribou | 3000 |
| | CT | Bear Lake | 23056 |
| | | Caribou | 10340 |
| | C4 | Caribou | 4000 |
| PREUSS CR | RC | Bear Lake | 1680 |
| | CT | Bear Lake | 90201 |
| PRUESS CR | CT | Bear Lake | 24240 |

| Water | Species | County | Total |
|---|---|---|---|
| | | Caribou | 1000 |
| S FK CUB R | CT | Franklin | 5245 |
| SECOND CR | R1 | Oneida | 6180 |
| | CT | Oneida | 12064 |
| SKINNER CR | R1 | Bear Lake | 5460 |
| | CT | Bear Lake | 19374 |
| | | Caribou | 515 |
| SNOWSLIDE CANYON | R1 | Bear Lake | 7824 |
| SNOWSLIDE CANYON CR | R1 | Bear Lake | 500 |
| SNOWSLIDE CR | R1 | Bear Lake | 6240 |
| SODA CR | R4 | Caribou | 2500 |
| | R9 | Caribou | 8022 |
| | T9 | Caribou | 1000 |
| | CT | Caribou | 1360 |
| | K1 | Caribou | 2000 |
| ST CHARLES CR | R1 | Bear Lake | 365672 |
| | RB | Bear Lake | 20000 |
| | BK | Bear Lake | 26950 |
| | CT | Bear Lake | 33249 |
| ST CHARLES CR (BEAR L) | R1 | Bear Lake | 130296 |
| | BK | Bear Lake | 16625 |
| | C5 | Bear Lake | 5002 |
| | CT | Bear Lake | 118386 |
| ST CHARLES CR (BIG CR) | R1 | Bear Lake | 14930 |
| ST CHARLES CR (SPRING CR) | BK | Bear Lake | 12000 |
| ST CHAS (?), BLOOMINGTON CR | RB | Bear Lake | 40000 |
| STATION CR | R1 | Bannock | 3700 |
| | BK | Bannock | 14612 |
| STAUFFER CR | R1 | Bear Lake | 5460 |
| | CT | Bear Lake | 1059 |
| STEVE CR | RB | Oneida | 10175 |
| STRAWBERRY CR | CT | Franklin | 1696 |
| | C4 | Franklin | 1005 |
| THIRD CR | R1 | Oneida | 6180 |
| | CT | Oneida | 12064 |
| THOMAS CR | RB | Bear Lake | 22500 |
| | CT | Bear Lake | 30720 |
| THOMAS FK | RB | Bear Lake | 6475 |
| | CT | Bear Lake | 179764 |
| THOMAS FORK | R1 | Bear Lake | 15739 |
| | BK | Bear Lake | 44240 |
| | CT | Bear Lake | 88660 |
| THOMAS FORK CR | CT | Bear Lake | 449649 |
| TROUT CR | R1 | Bannock | 39608 |
| | | Caribou | 218203 |
| | | Franklin | 3750 |
| | R8 | Caribou | 4560 |
| | R9 | Caribou | 9726 |

| Water | Species | County | Total |
|---|---|---|---|
| | T9 | Caribou | 2000.85 |
| | TT | Caribou | 498 |
| | BK | Bannock | 58000 |
| | | Caribou | 78490 |
| | C7 | Caribou | 3000 |
| | CT | Caribou | 3000 |
| | K1 | Caribou | 500 |
| TROUT CR, WILLIAMS CR, WHISKEY CR | R1 | Bannock | 16875 |
| WESTON CR | R1 | Franklin | 25460 |
| | BK | Franklin | 1750 |
| WHISKEY CR | R1 | Bannock | 23020 |
| | | Caribou | 90711 |
| | R8 | Caribou | 2710 |
| | R9 | Caribou | 10081 |
| | RB | Bannock | 21350 |
| | T9 | Caribou | 1501.45 |
| | TT | Caribou | 498 |
| | BK | Bannock | 10000 |
| | CT | Bear Lake | 17560 |
| | | Caribou | 1200 |
| WHITE CR | CT | Caribou | 3800 |
| WILLIAMS CR | R1 | Bannock | 3232 |
| | | Caribou | 16860 |
| | | Franklin | 33934 |
| | BK | Franklin | 44260 |
| | C7 | Caribou | 3000 |
| WILLIAMS CR, WHISKEY CR, TROUT CR | R1 | Bannock | 14000 |
| WISKEY, TROUT, WARM CR | RB | Bannock | 25000 |
| WRIGHT CR | R1 | Oneida | 23235 |
| | CT | Oneida | 443920 |
| WRIGHT'S CR | CT | Oneida | 15200 |
| Grand Total | | | 20307005.96 |

**Appendix C**. Rating system for describing potential impacts on Bonneville cutthroat trout in each of the six Management Units. Index values were determined based on quantitative data, qualitative observations, and biologist observations and or fishery data where available. Fishery data provided by IDFG was used to rank the non-native fish threat. The harvest rating is based on quantitative creel surveys, spot creels, and (or) qualitative field observations of angling pressure. Irrigation threats were estimated by reviewing the Idaho Department of Water Resources GIS layer of irrigation diversions and assuming all diversions are unscreened. To complete the rating section for grazing impacts, an interagency, interdisciplinary team discussed each tributary and decided on a consensus rating. Participants in the process included representatives from the USFS (Forest Hydrologist Lee Leffert, Forest Fisheries Biologist Jim Capurso, Montpelier Range Conservationist Brad Transtrum, Westside Ranger District Wildlife Biologist Ken Timothy, Westside District Ranger Jerald Tower), BLM (Resource Area Range Conservationist Mike Jorgensen), IDEQ (Beneficial Use Reconnaissance Lead Dave Hull), and IDFG (Southeast Region Fisheries Biologist David Teuscher, Fisheries Biologist Jim Mende, Regional Fisheries Manager Richard Scully).

| | |
|---|---|
| Fish | 0 = allopatric BCT |
| | 1 = brook trout and BCT in about equal densities |
| | 2 = brook trout, RBT with low or no introgression, and BCT |
| | 3 = RBT introgression, brook trout or RBT dominate fish community |
| Harvest | 0 = very limited fishing pressure |
| | 1 = fishing observed on occasion |
| | 2 = IDFG stocks fish and angling common |
| | 3 = high profile fishery with high fishing pressure |
| Irrigation / | 0 = no diversion or irrigation withdrawal |
| Hydro | 1 = minor irrigation and screened to protect fish |
| | 2 = major diversion some dewatering and (or) loss of connectivity |
| | 3 = stream dewatered no fish screens and complete fish barriers (dams) |
| Grazing | 0 = no grazing impacts noticeable |
| | 1 = minor impact to stream fenced riparian |
| | 2 = grazing impact obvious to stream and riparian habitat |
| | 3 = severe habitat degradation |

Weighted values were calculated by multiplying stream length by the rank assigned to the potential threat. For example, the index rating for harvest in the Pegram MU of the Bear River was 90 (harvest rating 2 X river miles 45 = 90). The weighted values provide a relative indication of how significant the impact is to BCT as well as the

potential benefit or gain that can be achieved if the impact were improved or eliminated. The last column in the table identifies priority streams for BCT restoration. The priority ratings are copied from conservation action priorities described in the action plan of this report (pages 50 – 58). The priority ratings should be used as a guide for conservation activities. However, the table is not intended to be used to reject conservation opportunities that may arise on waters that are not ranked in this table (for instance, completing conservation work on stronghold streams).

| Stream Name | Miles | BCT Status | Fish | Harvest | Irrigation | Grazing | Threat & Benefit | Priority |
|---|---|---|---|---|---|---|---|---|
| Bear River (Pegram MU) | 44.9 | present | 2 | 1 | 3 | 2 | 359 | 1 |
| Bear Lake Outlet | 8.2 | present | 0 | 0 | 3 | | 25 | |
| Sheep Creek | 9.6 | unknown | 1 | 0 | 2 | 3 | 58 | |
| Thomas Fork | 36.7 | present | 1 | 1 | 3 | 2 | 257 | 1 |
| Preuss Creek | 15.7 | present | 0 | 0 | 2 | 1 | 47 | 2 |
| Fish Creek | 1 | unknown | 0 | 0 | 0 | 1 | 1 | 2 |
| Beaver Creek | 3.9 | unknown | 0 | 0 | 0 | 2 | 8 | 2 |
| Dry Creek_TF | 8.1 | present | 0 | 0 | 2 | 2 | 32 | 2 |
| Dip Creek | 2.1 | unknown | 0 | 0 | 0 | 1 | 2 | |
| Giraffe Creek | 3.3 | present | 0 | 0 | 2 | 1 | 10 | 2 |
| Robinson Creek | 0.1 | unknown | 0 | 0 | 0 | 1 | 0 | |
| St. Charles Creek | 11.2 | present | 3 | 1 | 3 | 1 | 90 | 1 |
| Davis Canyon | 1.3 | unknown | 3 | 0 | 0 | 1 | 5 | |
| Big Arm St. Charles | 3.5 | present | 3 | 1 | 3 | 2 | 32 | |
| Spring Creek | 1.6 | present | 3 | 1 | 3 | 1 | 13 | |
| Little Arm St. Charles | 3.2 | present | 3 | 1 | 3 | 1 | 26 | |
| Fish Haven Creek | 6 | extirpated | 2 | 0 | 3 | 1 | 36 | 1 |
| Indian Creek | 2.7 | unknown | 1 | 0 | 2 | 3 | 16 | |
| Bloomington Creek | 15.2 | extirpated | 2 | 1 | 3 | 2 | 122 | 2 |
| Paris Creek | 14.2 | present | 3 | 1 | 2 | 2 | 114 | 2 |
| **Sum of Weighted Scores** | | | **286** | **131** | **499** | **335** | **1,251** | |
| Bear River (Nounan MU) | 57.7 | present | 1 | 2 | 2 | 1 | 346 | 1 |
| Montpelier Creek | 24.1 | present | 3 | 2 | 2 | 1 | 193 | 2 |
| Telephone Draw | 2.8 | unknown | 3 | 1 | 0 | 2 | 17 | |
| Home Canyon Creek | 1.6 | present | 3 | 1 | 0 | 2 | 10 | |
| Snowslide Canyon Creek | 0.9 | unknown | 3 | 1 | 0 | 2 | 5 | |
| Whiskey_MC | 2.7 | present | 3 | 1 | 0 | 2 | 16 | |
| Little Beaver Creek | 3.8 | present | 3 | 1 | 0 | 2 | 23 | |
| Ovid Creek | 17.5 | unknown | 2 | 1 | 3 | 1 | 123 | |
| Mill Creek | 3 | present | 2 | 1 | 1 | 1 | 15 | |
| Liberty Creek | 1.9 | unknown | 2 | 1 | 2 | 1 | 11 | |
| North Canyon Creek | 12.8 | present | 2 | 2 | 2 | 1 | 90 | |
| Emigration Creek | 5 | present | 2 | 1 | 1 | 1 | 25 | |
| Copenhagen Creek | 3.9 | no fish | 0 | 0 | 1 | 1 | 8 | |
| Georgetown Creek | 14 | extirpated | 3 | 2 | 2 | 1 | 112 | 1 |
| Georgetown Left | 2 | extirpated | 3 | 1 | 2 | 1 | 14 | |
| Stauffer Creek | 10.5 | present | 1 | 1 | 1 | 2 | 53 | |

| Stream Name | Miles | BCT Status | Fish | Harvest | Irrigation | Grazing | Threat & Benefit | Priority |
|---|---|---|---|---|---|---|---|---|
| Beaver Creek | 2.5 | present | 0 | 1 | 0 | 2 | 8 | |
| South Fork Stauffer | 3 | present | 0 | 1 | 0 | 1 | 6 | |
| North Fork Stauffer | 4.4 | present | 0 | 1 | 0 | 1 | 9 | |
| Skinner Creek | 8.2 | present | 1 | 1 | 0 | 2 | 33 | 1 |
| North Skinner Creek | 2.3 | present | 0 | 1 | 0 | 0 | 2 | 1 |
| Co-op Creek | 7.3 | present | 0 | 1 | 2 | 1 | 29 | |
| Pearl Creek | 5.9 | present | 1 | 1 | 2 | 2 | 35 | |
| North Pearl Creek | 3.6 | present | 1 | 1 | 1 | 1 | 14 | |
| Eightmile Creek | 15 | present | 2 | 2 | 2 | 2 | 120 | 1 |
| Sulphur Canyon | 2.6 | unknown | 1 | 0 | 2 | 0 | 8 | |
| Bailey Creek | 6.6 | present | 2 | 1 | 2 | 2 | 46 | 2 |
| Soda Creek | 7.8 | unknown | 1 | 1 | 2 | 0 | 31 | |
| **Sum of Weighted Scores** | | | **376** | **351** | **394** | **281** | **1,401** | |
| Bear River (Dam Complex) | 6.1 | unknown | **2** | **2** | **3** | **0** | **93** | |
| Bear River (Gentile) | 31.4 | present | 2 | 2 | 2 | 2 | 194 | 1 |
| Densmore Creek | 6.3 | unknown | 1 | 0 | 1 | 1 | 19 | |
| Dry Creek | 4.7 | unknown | 1 | 1 | 2 | 1 | 24 | |
| Smith Creek | 5 | present | 1 | 0 | 2 | 2 | 25 | |
| Alder Creek | 5.2 | unknown | 1 | 1 | 2 | 2 | 31 | |
| Burton Creek | 6.6 | unknown | 1 | 1 | 2 | 2 | 40 | |
| King Creek | 5.7 | unknown | 1 | 0 | 2 | 2 | 29 | |
| Cottonwood Creek | 18.9 | present | 0 | 1 | 3 | 2 | 113 | 2 |
| Shingle Creek | 3.8 | present | 0 | 1 | 0 | 2 | 11 | |
| Jacobson Creek | 2.1 | present | 0 | 1 | 0 | 1 | 4 | |
| Trout Creek | 12 | extirpated | 2 | 2 | 2 | 2 | 96 | |
| Whiskey_BR | 3.8 | extirpated | 2 | 2 | 1 | 2 | 27 | |
| Williams Creek | 4.3 | present | 3 | 1 | 2 | 1 | 30 | 1 |
| **Sum of Weighted Scores** | | | **126** | **126** | **202** | **188** | **642** | |
| Bear River (Riverdale) | 31.1 | present | 2 | 3 | 2 | 2 | 280 | 1 |
| Mink Creek | 13.6 | present | 2 | 1 | 2 | 2 | 95 | |
| Birch Creek | 6.5 | present | 0 | 1 | 1 | 1 | 20 | |
| Dry Creek_BR | 4.8 | unknown | 1 | 1 | 1 | 1 | 19 | |
| Strawberry Creek | 3 | no fish | 0 | 0 | 0 | 2 | 6 | |
| Battle Creek | 8.3 | unknown | 1 | 1 | 2 | 2 | 50 | |
| Deep Creek | 10.8 | unknown | 1 | 1 | 3 | 2 | 76 | |
| Fivemile Creek | 9 | unknown | 1 | 0 | 3 | 1 | 45 | |
| Weston Creek | 4.7 | unknown | 1 | 1 | 3 | 1 | 28 | |
| Cub River | 19.9 | present | 2 | 3 | 3 | 1 | 179 | 1 |
| Worm Creek | 3.5 | unknown | 2 | 1 | 2 | 2 | 25 | |
| Maple Creek | 12 | present | 2 | 1 | 2 | 2 | 84 | |
| Deep Creek | 2.8 | unknown | 2 | 1 | 0 | 2 | 14 | |
| Sugar Creek | 6.6 | present | 2 | 1 | 2 | 1 | 40 | |
| Foster Creek | 2.2 | present | 2 | 1 | 1 | 1 | 11 | |
| Logan River | 3.4 | present | 0 | 2 | 0 | 1 | 10 | |

| Stream Name | Miles | BCT Status | Fish | Harvest | Irrigation | Grazing | Threat & Benefit | Priority |
|---|---|---|---|---|---|---|---|---|
| Beaver Creek_LR | 6.6 | present | 1 | 2 | 0 | 1 | 26 | |
| Boss Creek | 3.3 | present | 0 | 1 | 0 | 1 | 7 | |
| White Canyon Creek | 2.7 | present | 0 | 0 | 0 | 1 | 3 | |
| Hodge Nibley Creek | 1.9 | present | 0 | 0 | 0 | 1 | 2 | |
| Corral Hollow Creek | 1.7 | present | 0 | 0 | 0 | 1 | 2 | |
| Stockton Creek | 8.3 | present | 1 | 1 | 2 | 2 | 50 | |
| Gooseberry Creek | 5.2 | unknown | 1 | 0 | 2 | 1 | 21 | |
| Oxford Creek | 0.6 | unknown | 1 | 0 | 2 | 1 | 2 | |
| **Sum of Weighted Scores** | | | **242** | **260** | **325** | **266** | **1,093** | |
| Malad River | 31 | unknown | 1 | 1 | 3 | 3 | 248 | |
| Little Malad River | 31.7 | unknown | 1 | 1 | 3 | 3 | 254 | |
| Wright Creek | 6.6 | unknown | 1 | 1 | 2 | 3 | 46 | |
| Indian Mill Creek | 4.3 | no fish | 0 | 0 | 1 | 2 | 13 | |
| Dairy Creek | 8.4 | present | 1 | 1 | 2 | 2 | 50 | |
| Elkhorn Creek | 2.8 | unknown | 1 | 0 | 2 | 1 | 11 | |
| Devil Creek | 20.1 | present | 1 | 1 | 3 | 2 | 141 | |
| New Canyon Creek | 4.1 | unknown | 1 | 0 | 1 | 2 | 16 | |
| Deep Creek | 11.9 | unknown | 1 | 1 | 3 | 2 | 83 | 1 |
| First Creek | 2.7 | present | 2 | 1 | 2 | 2 | 19 | 1 |
| Second Creek | 5.2 | present | 0 | 1 | 2 | 2 | 26 | 1 |
| Third Creek | 6.7 | present | 0 | 1 | 3 | 1 | 34 | 1 |
| Burnett Creek | 3.2 | unknown | 1 | 0 | 2 | 2 | 16 | |
| **Sum of Weighted Scores** | | | **125** | **124** | **370** | **337** | **957** | |

| | Fish | Harvest | Irrigation | Grazing |
|---|---|---|---|---|
| **Grand Totals** | **1,155** | **991** | **1,790** | **1,408** |