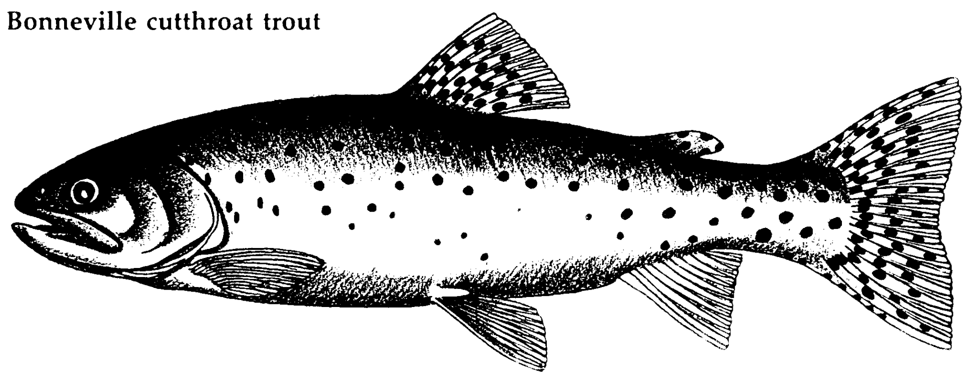
RANGE-WIDE

CONSERVATION AGREEMENT AND STRATEGY

FOR

BONNEVILLE CUTTHROAT TROUT
(*Oncorhynchus clarki utah*)



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RANGE-WIDE
CONSERVATION AGREEMENT AND STRATEGY
FOR
BONNEVILLE CUTTHROAT TROUT
(*Oncorhynchus clarki utah*)

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December 2000

ACKNOWLEDGMENTS

We thank all of the involved agencies for assisting in the development and production of this document. It outlines, reiterates, and summarizes information provided by personnel from the Idaho Department of Fish and Game, Nevada Division of Wildlife, Utah Division of Wildlife, Wyoming Department of Fish and Game, Confederated Tribes of the Goshute Reservation, Bureau of Land Management, U.S. Fish and Wildlife Service, U.S. Park Service, and the U.S. Forest Service. In particular, we thank Dick Scully, Rich Haskins, Randy Radant, Ron Remmick, Ron Bolander, Mark Maley, Yvette Converse, Tod Williams, and Dan Duffield for their assistance. We especially thank Todd Hogrefe of the Utah Division of Wildlife for analyzing and summarizing the Bonneville cutthroat trout information for Utah. We also thank members of the Bonneville Basin Conservation and Recovery Team, the Bonneville cutthroat trout technical workgroup, and other involved parties for their interest, cooperation, and contribution in developing this agreement.

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RANGE-WIDE

CONSERVATION AGREEMENT

FOR

BONNEVILLE CUTTHROAT TROUT

CONSERVATION AGREEMENT

This Conservation Agreement (Agreement) has been developed with the purpose of coordinating the implementation of conservation measures for Bonneville cutthroat trout (*Oncorhynchus clarki utah*) within its historic range. It outlines, reiterates, and summarizes the conservation measures specified in: (1) the conservation agreement and strategy for populations in Utah (Lentsch et al. 1997); (2) the species management plan and draft conservation agreement and strategy for populations in Nevada (Haskins 1987, Haskins et al. *draft*); (3) the draft statewide fish management plan and conservation agreement/strategy plan for populations in Idaho (Scully et al. *draft*); (4) the species management plan for populations in Wyoming (Remmick et al. 1993); (5) one National Park Fish Management Plan (Appendix I); (6) eight National Forest Land and Resource Management Plans (Appendix I); and, (7) five BLM Resource Area Management Plans (Appendix I). The implementation and execution of Bonneville cutthroat trout conservation measures, specified in all of these resource management plans, is the responsibility of the respective management agency. This document simply outlines the collaborative and cooperative effort between the resource management agencies that has been designed to ensure the long-term conservation of Bonneville cutthroat trout.

Goal

The primary goal of this Agreement is to ensure the long-term existence of Bonneville cutthroat trout within its historic range by coordinating conservation efforts among states, tribal governments, Federal management agencies, and other involved parties.

Objectives

Two objectives have been identified that are required to meet the goal of this Agreement. Each general objective has specific components that must also be met. These objectives were developed and quantified using the best available expertise and information. A viability analysis is outlined in the conservation strategy that will further define the objectives.

I) Manage for 191 conservation populations of Bonneville cutthroat trout.

- A) Establish and/or maintain a minimum of 5 conservation populations inhabiting 70,773 surface acres in the appropriate proportion and quality of lentic waters within the historic range.

- B) Establish and/or maintain a minimum of 186 conservation populations inhabiting 1,593 stream miles in the appropriate proportion and quality of lotic habitats within the historic range.

- C) Establish and/or maintain a minimum of one meta-population within each geographic management unit.

II) Eliminate the threats to Bonneville cutthroat trout that: (1) warrant listing as a sensitive species by state and Federal agencies, and (2) may warrant listing as a threatened or endangered species under the Endangered Species Act of 1973, as amended.

A) Eliminate or significantly reduce threats that cause any present or potential destruction, modification, or curtailment of habitat or range as outlined in the conservation strategy.

B) Eliminate or significantly reduce threats caused by disease, predation, competition and hybridization as outlined in the conservation strategy.

C) Eliminate all impacts associated with over harvesting for commercial, recreational, scientific, or educational purposes as outlined in the conservation strategy.

D) Eliminate or significantly reduce all threats caused by inadequate regulatory mechanisms as outlined in the conservation strategy.

E) Eliminate and/or significantly reduce detrimental impacts associated with threats caused by other natural or human induced factors affecting the continued existence of the species as outlined in the conservation strategy.

These objectives will be reached through implementation of the specific management actions that benefit Bonneville cutthroat trout detailed in conservation strategies (Lentsch et al. 1997, Haskins et al. *draft*, Scully et al. *draft*), species management plans (Haskins 1987, Remmick et al. 1993), and land management plans (Appendix I). The range-wide conservation strategy (Strategy), outlined below, summarizes the information contained in these documents.

Jurisdiction for the conservation of Bonneville cutthroat trout, and the habitat upon which the species is dependent, resides with four States, eight National Forests, five BLM Resource Areas, one National Park, one Indian tribe, and the US Fish and Wildlife Service. Representatives from these entities are the signatories to the range-wide Bonneville cutthroat trout Conservation Agreement. They recognize that there must be a strong commitment towards conservation and a clear allocation of resources for that purpose. To be most effective, the elements of this range-wide strategy, state-wide conservation strategies, species management plans, forest management plans, and resource management plans that benefit Bonneville cutthroat trout must be implemented in their entirety.

The signatories also agree that the status of Bonneville cutthroat trout will be evaluated annually to assess conservation progress. Amendments will be added to address newly identified Bonneville cutthroat trout recovery issues and to ensure program effectiveness as needed. Failure to implement this range-wide agreement and strategy, however, may warrant listing the species as a threatened or endangered species under the Endangered Species Act of 1973, as amended.

I. OTHER SPECIES INVOLVED

The primary focus of this agreement is the conservation and enhancement of Bonneville cutthroat trout and the ecosystems upon which they depend; however, other species occurring within or adjacent to Bonneville cutthroat trout habitat may also benefit. Some of these species include Bonneville cisco (*Prosopium gemmiferum*), Bonneville whitefish (*Prosopium spilonotus*), Bear Lake whitefish (*Prosopium abyssicola*), Bear Lake sculpin (*Cottus extensus*), Piaute sculpin (*Cottus beldingi*), leatherside chub (*Gila copei*) and boreal toad (*Bufo boreas*). Using an ecosystem approach, the Range-wide Conservation Agreement for Bonneville Cutthroat Trout could reduce or possibly eliminate threats for several of these species, which could preclude their need for Federal listing pursuant to the ESA.

II. INVOLVED PARTIES

Idaho Fish and Game Department
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Boise, Idaho 83720-0065

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Utah Division of Wildlife Resources
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Confederated Tribes of the Goshute Reservation
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United States Department of the Interior
Fish and Wildlife Service
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Conservation agreements have been developed on local and/or statewide scales in Idaho, Nevada, and Utah. These agreements include the participation of parties not listed above (Lentsch et al. 1997, Haskins et al. *draft*, Scully et al. *draft*). In addition, separate Memorandum(s) of Understanding and Cooperative Agreements will be developed with additional parties and supporting entities as necessary to ensure implementation of specific conservation measures. Interested local governments (city, county, etc.), environmental organizations, sportfishing organizations, and individuals will be given an opportunity to review and provide input on specific actions.

III. AUTHORITY

- The signatory parties hereto enter into this Conservation Agreement and the attached Conservation Strategy under Federal and State law, as applicable, including, but not limited to Section 2(c)(2) of the Endangered Species Act of 1973, as amended, which states that "the policy of Congress is that Federal agencies shall cooperate with State and local agencies to resolve water resource issues in concert with conservation of endangered species."

- All parties to this Agreement recognize that they each have specific statutory responsibilities that cannot be delegated, particularly with respect to the management and conservation of these fish, their habitat and the management, development and allocation of water resources.

Nothing in this Agreement or the Strategy is intended to abrogate any of the parties' respective responsibilities. There may not be statutory authority to implement all actions, but signatories have authority to coordinate with agencies with those specific statutory responsibilities.

C This Agreement is subject to and is intended to be consistent with all applicable Federal and State laws and interstate compacts.

C This instrument in no way restricts the parties involved from participating in similar activities with other public or private agencies, organizations or individuals.

C Modifications within the scope of this instrument shall be made by the issuance of a bilaterally-executed modification prior to any changes being performed.

C This Agreement may be executed in several counterparts, each of which shall be an original, and all of which shall constitute one and the same agreement.

IV. CONSERVATION ACTIONS

To meet the goal and objectives of this Agreement, the following conservation actions, as defined and summarized in the Strategy, must be implemented:

1) Determine Bonneville cutthroat trout population demographic and life history characteristics.

2) Genetically characterize populations of Bonneville cutthroat trout.

3) Protect the genetic integrity of Bonneville cutthroat trout populations.

4) Expand Bonneville cutthroat trout populations and distribution through introduction or reintroduction from either transplanted or a broodstock of Bonneville cutthroat trout.

5) Monitor Populations

6) Describe Bonneville cutthroat trout habitat requirements

7) Enhance and maintain habitat

8) Monitor Habitat Quantity and Quality

9) Selectively control nonnative species

10) Control and prevent the spread of whirling disease

11) Enforce regulatory mechanisms to ensure compliance

12) Ensure funding of conservation measures

13) Reduce social-political conflicts

14) Implement an information and education program

Coordinating Conservation Activities

- Administration of the conservation agreement will be conducted by a range-wide Coordination Team. The team will consist of a designated representative from each signatory to this Agreement and may include technical and legal advisors and other members as deemed necessary by the signatories.

- The designated team leader will rotate annually among representatives from the four state resource agencies involved.

- Authority of the Coordination Team is limited to making recommendations for the conservation of Bonneville cutthroat trout to the Administrators of the four state resource agencies.

- The Coordination Team will meet (annually) to develop range-wide priorities, review the annual conservation workplans developed for each state, coordinate tasks and resources to most effectively implement the workplan, and review and revise the Strategy as required.

- Modifications within the scope of this instrument shall be made by the issuance of a bilaterally executed modification prior to any changes being performed.

- The Coordination Team will also meet on a semiannual basis to report on progress and effectiveness of the Conservation Strategy implementation.

- Coordination Team meetings will be open to the public. Minutes of the meetings and progress reports will be distributed to the Coordination Team. Other interested parties may obtain minutes and progress reports upon request.

Implementing Conservation Schedule

- A total of 10 years is anticipated for completion of all actions identified and specified in the Range-wide Strategy. Some individual states may complete their identified actions in a shorter time frame. In general, the parties agree that the most significant actions to benefit Bonneville cutthroat trout will be implemented within the first five (5) years.

- Conservation actions will be scheduled and reviewed on an annual basis by the signatories on recommendations from the Coordination Team. Activities that will be conducted during the first 3-5 years of implementation are identified in conservation strategies (Lentsch et al. 1997, Haskins et al. 1999, Scully et al. 1994), species management plans (Haskins 1987, Remmick et al. 1993), and land management plans (Appendix I). The Range-wide Strategy is a flexible document and will be revised as needed.

- The agency that has the Team Leader responsibility for a given year will coordinate conservation activities and monitor conservation actions conducted by participants of this Agreement to determine if all actions are in accordance with the Range-wide Strategy and annual schedule.

Funding Conservation Actions

- Expenditures to implement this Agreement have been identified in conservation strategies (Lentsch et al. 1997, Haskins et al. *draft*, Scully et al. *draft*), species management plans (Haskins 1987, Remmick et al. 1993), and land management plans (Appendix I). It is projected that expansion of habitat and population actions will require the greatest expense during the first five years of the Agreement.

- Funding for the Conservation Agreement will be provided by a variety of sources. Federal, State and local sources will need to provide or secure funding to initiate procedures of the Conservation Agreement and Strategy.

  - Federal sources may include, but are not limited to, USFS, USFWS, BLM, Land and Water Conservation funds and the Natural Resource Conservation Service.

  - State funding sources may include, but are not limited to, direct appropriation of funds by the legislature, Community Impact Boards, Water Resources Revolving funds, State Department of Agriculture (ARD), and State Resource Management Agencies.

  - Local sources of funding may be provided by water districts, Native American affiliations, cities and towns, counties, local irrigation companies, and other supporting entities (Attachment A) and may be limited due to factors beyond local control.

- In-kind contributions in the form of personnel, field equipment, supplies, etc., will be provided by participating agencies. In addition, each agency will have specific tasks, responsibilities and proposed actions/commitments related to their in-kind contributions.

- It is understood that all funds expended in accordance with this Agreement are subject to approval by the appropriate local, state or Federal appropriations. This instrument is neither a fiscal nor a funds obligation document. Any endeavor involving reimbursement or contribution of funds between the parties to this instrument will be handled in accordance with applicable laws, regulations, and procedures, including those for Government procurement and printing. Such endeavors will be outlined in separate agreements that shall be made in writing by representatives of the parties and shall be independently authorized by appropriate statutory authority. This instrument does not provide such authority. Specifically, this instrument does not establish authority for noncompetitive awards to the cooperator of any contract or other agreement. Any contract or agreement for training or other services must fully comply with all applicable requirements for competition.

Conservation Progress Assessment

- An annual range-wide assessment of progress towards implementing actions identified in this Agreement will be provided to the signatories by the Coordination Team Leader.

V. DURATION OF AGREEMENT

The initial term of this Agreement shall be 5 years. Prior to the end of each 5 year period, a thorough analysis of actions implemented for the species will be conducted by the Coordination Team. If all signatories agree that sufficient progress has been made towards the conservation and recovery of the Bonneville cutthroat trout, this Agreement shall be extended for an additional five (5) years. Any party may withdraw from this Agreement on sixty (60) days written notice to the other parties.

VI. NATIONAL ENVIRONMENTAL POLICY ACT (NEPA) COMPLIANCE

Signing of this Agreement is covered under authorities outlined in section III listed above. We anticipate that any survey, collection or non-land disturbing research activities conducted through the Conservation Agreement will not entail significant Federal actions under the NEPA and will be given a categorical exclusion designation. However, each signatory agency holds the responsibility to review planned actions for their area of concern to ensure conformance with existing land use plans and to conduct any necessary NEPA procedures for those actions within their area.

VII. FEDERAL AGENCY COMPLIANCE

- During the performance of this Agreement, the participants agree to abide by the terms of Executive Order 11246 on non-discrimination and will not discriminate against any person because of race, color, national origin, age, religion, gender, disability, familial status or political affiliation.

- No member or delegate to Congress or resident Commissioner, shall be admitted to any share or part of this Agreement, or to any benefit that may arise therefrom, but this provision shall not be construed to extend to this Agreement if made with a corporation for its general benefit.

VIII. SIGNATORIES

Idaho Fish and Game Department
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Terry R. Crawforth   Administrator   Date

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Utah Division of Wildlife Resources
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John Kimball   Director   Date

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John Baughman   Director   Date

Confederated Tribes of the Goshute Reservation
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Milton Hooper   Chairman   Date

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Ralph Morgenweck   Regional Director   Date

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Martha G. Hahn   State Director   Date

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John Reynolds Regional Director Date

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Jack A. Blackwell Regional Forester Date

Utah Reclamation Mitigation and Conservation Commission
102 West 500 South #315
Salt Lake City, UT 84101

____

Michael C. Weland Executive Director Date

Table 1. Estimated agency in-kind contributions, actions, and responsibilities for implementation of the Range - Wide Bonneville Cutthroat Trout Conservation Agreement and Strategy.

Agency	Brief Description of Tasks and Responsibilities *
Idaho Fish and Game Department Nevada Division of Wildlife Utah Department of Natural Resources, Utah Division of Wildlife Resources Wyoming Game and Fish Department	Serve as Coordination Team Leader (e.g.: oversee administrative responsibilities of agencies, reports, meetings etc.). Consult on water protection issues. Serve as lead agency for population and habitat enhancements, re-introductions, non-indigenous control projects and monitoring projects. Assist in obtaining and/or securing water rights and land within historic Bonneville cutthroat trout range. Assist in funding enhancement projects.
Goshute Tribe	Advise and assist in implementation of conservation agreement. Cooperate and assist in habitat enhancement, re-introduction, non-indigenous species control and monitoring projects.
U.S. Forest Service	Cooperate and assist in range-wide habitat enhancement, re-introduction, non-indigenous species control, and monitoring projects. Assist in obtaining and/or securing water rights and land within historic Bonneville cutthroat trout range. Assist in funding range-wide enhancement projects on NFS lands where appropriate.
U.S. Fish and Wildlife Service	Advise and assist in implementation of conservation agreement in regard to existing laws (e.g.: ESA, NEPA, etc.). Cooperate and assist in habitat enhancement, re-introduction, non-indigenous species control and monitoring projects. Assist in funding range-wide enhancement projects. Serve as lead in projects occurring on Goshute Indian Reservation lands.
U.S. Bureau of Land Management	Cooperate and assist in range-wide habitat enhancement, re-introduction, non-indigenous species control, and monitoring projects. Support the states in obtaining and/or securing water rights and land within historic Bonneville cutthroat trout range. Assist in funding enhancement projects. Assist in funding range-wide enhancement projects with compliance to NEPA regulation. Assist in funding range-wide enhancement projects on BLM lands where appropriate.
U.S. National Park Service	Serve as lead agency within park boundaries and cooperate and assist in range-wide habitat enhancement, re-introduction, non-indigenous species control, and monitoring projects. Support the states in obtaining and/or securing water rights and land within historic Bonneville cutthroat trout range. Assist in funding enhancement projects. Assist in funding range-wide enhancement projects with compliance to NEPA regulation.
Utah Reclamation Mitigation and Conservation Commission	Advise and assist in implementation of conservation agreement. Cooperate and assist in habitat enhancement, re-introduction, non-indigenous species control and monitoring projects. Assist in funding statewide enhancement projects.

* All agencies will participate in, and provide technical and administrative assistance to the Coordination Team

Attachment A

Supporting Entities

University of Montana - Trout and Salmon Genetics Laboratory

Trout Unlimited

University of Wyoming

Utah State University

Brigham Young University

RANGE-WIDE

CONSERVATION STRATEGY

FOR

BONNEVILLE CUTTHROAT TROUT

INTRODUCTION

This Conservation Strategy has been developed to provide a framework for the long-term conservation of Bonneville cutthroat trout (*Oncorhynchus clarki utah*) throughout its historic range. It outlines, reiterates, and summarizes the conservation measures specified in: (1) the conservation agreement and strategy for populations in Utah (Lentsch et al. 1997); (2) the species management plan and draft conservation agreement and strategy for populations in Nevada (Haskins 1987, Haskins et al. *draft*); (3) the draft statewide fish management plan and conservation agreement/strategy plan for populations in Idaho (Scully et al. *draft*); and, (4) the species management plan for populations in Wyoming (Remmick et al. 1993). These state plans were developed through an interagency and interested party involvement process (Appendix II). Over 40 technical experts were involved in the development of these state plans (Appendix II). These technical experts represent a wide cross section of resource agencies, universities, and environmental organizations. In addition, conservation actions specified in eight National Forest Land and Resource Management Plans (Appendix I), six Resource Area Management Plans (Appendix I), and one National Park Fisheries Management Plan (Appendix I) are also outlined and summarized in this document. These plans have generally undergone a strict public involvement process (in accordance with NEPA guidelines). All of the specific actions that affect the status of Bonneville cutthroat trout and identified in all of the conservation/management plans are not repeated in this document. Rather, the general strategy that summarizes the actions to be taken to eliminate or significantly reduce threats is outlined. In this manner, an overall range-wide strategy for the long-term conservation of the species is presented. Implementation of the actions summarized in this document, therefore, will eliminate the threats to Bonneville cutthroat trout that: (1) warrant listing as a sensitive species by state and Federal agencies, and (2) may warrant listing as a threatened or endangered species under the Endangered Species Act of 1973, as amended.

The primary purpose of this document is to describe the specific technical procedures and strategies required to provide for the long-term conservation of Bonneville cutthroat trout. It is organized so that jurisdictional and ecologically functional boundaries can be recognized. Jurisdictional boundaries are primarily based on state boundaries. Ecologically based boundaries have been defined for five geographic management units (GMU). GMU's include: Bear Lake, Bear River, Northern Bonneville, West Desert and Southern Bonneville (Figure 1).

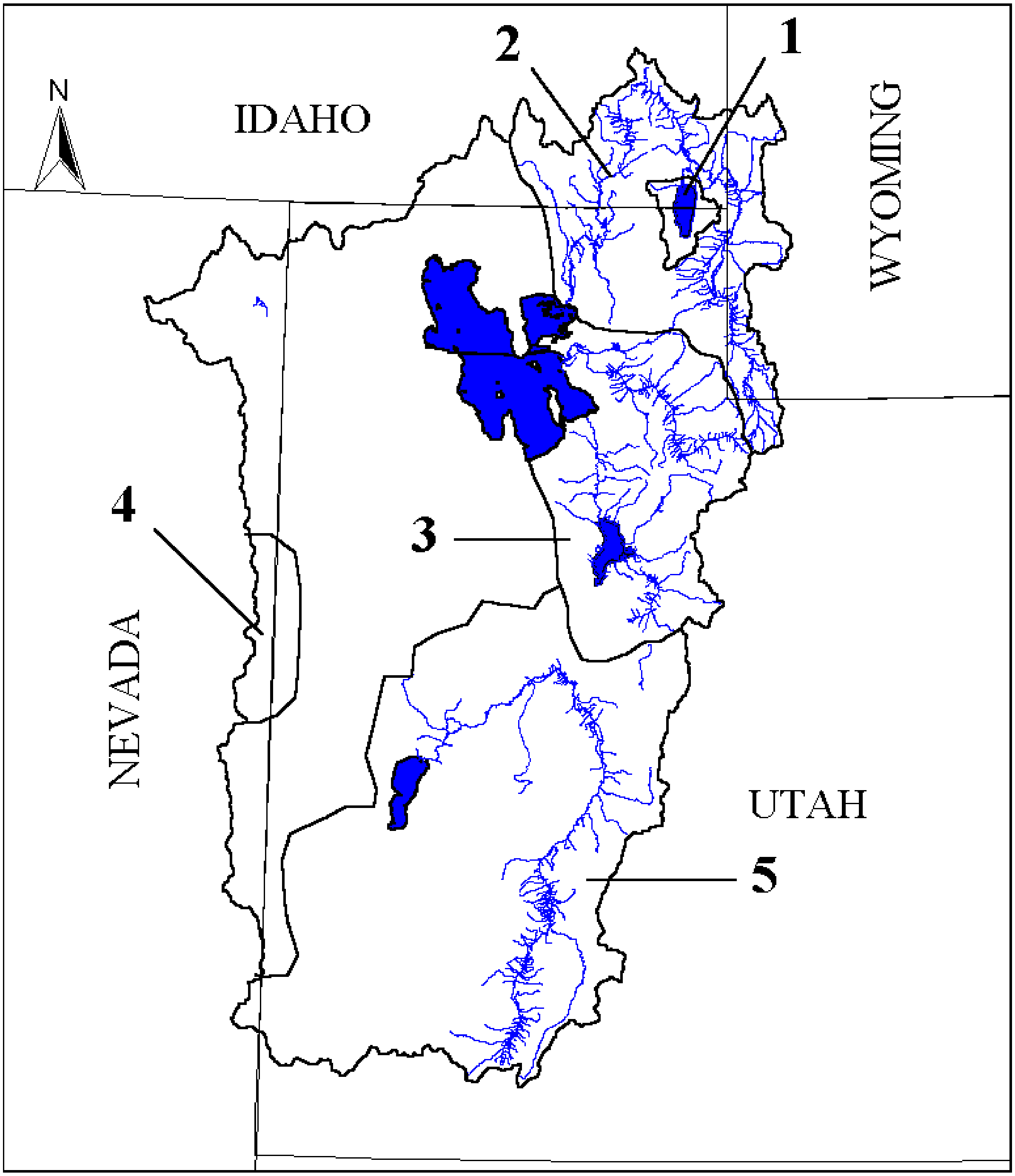

Figure 1. Geographic Management Units designated for BCT conservation. 1=Bear Lake; 2=Bear River; 3=Northern Bonneville; 4=West Desert; 5=Southern Bonneville.

DEFINITIONS

For the purposes of the Agreement and Strategy, the following terms are defined:

Allozymes - allelic forms of an enzyme that can be distinguished by electrophoresis. These are *products* of the genome.

Confirmed Population - A population that has been confirmed to contain individuals that represent the historic genetic variability of Bonneville cutthroat trout. This confirmation requires that the population is surveyed and analyzed to describe its genetic characterization.

Conservation Population - A reproducing and recruiting population of BCT that is managed to preserve the historical genome and/or unique genetic, ecological, and/or behavioral characteristics within specific populations and within geographic units. Populations should be further defined within geographic units by a quantifiable criterion (e.g., Toline and Lentsch 1999) based on molecular, meristic/morphometric, and life history characteristics or other relevant information. This criterion may vary among geographic units. In general, a conservation population is at least 90% Bonneville cutthroat trout, but may be lower depending on circumstances. Designation of conservation populations and the protections afforded them will be determined through individual basin analysis.

Core Population - Any population that has naturally persisted through modern development and that naturally occurs within historic range. These populations are believed to represent the genetic characterization of the subspecies prior to the impacts of modern man. This designation is intended to further aid in defining a conservation population by a quantifiable criterion (e.g., Toline and Lentsch 1999).

Demographic Stochasticity - Random variation in demographic processes (birth, death and growth rates) that affect individual and population survival. These changes are strictly a result of population dynamics, not environmental change. Populations are known to inherently fluctuate regardless of environmental changes. For very small populations, periods of negative growth may lead to extinction.

Distinct Population Segment - determined under ESA by discreteness of the population segment to the rest of the species; significance of the population segment to the rest of the species; and, conservation status in relation to the ESA standards for listing.

Effective Population Size (Ne) - the average number of individuals in a population that contribute genes to succeeding generations. If the population size shows a cyclical variation as a function of season of the year, predation, parasitism, and other factors, the effective population size is closer to the number of individuals observed during the period of maximal contraction.

Environmental Stochasticity - Random variation in environmental processes (fire, flood and food availability) that affect individual and population survival.

Genetically Divergent Population - a population which for any number of reasons (i.e., genetic drift, local adaptation) has undergone change in the genetic make-up of the population rendering it a unique entity within the species complex. Reproduction between individuals from separate populations that have genetically diverged could potentially lead to outbreeding depression.

Geographic Management Unit (GMU) - A distinct area defined by historic BCT range and geographic boundaries. Five GMUs have been identified within BCT historic range.

Historic Range - The area that BCT is perceived to have inhabited at the time of modern exploration and settlement of the western United States (approximately 1850).

Hybrid - Considered to have cross bred with other salmonids, commonly rainbow trout or other cutthroat subspecies. The term applies to an individual fish not to a population. Populations containing hybrids offer genetic and ecological value to conservation efforts. The number of individuals and/or genes in a population that are hybrids can vary from population to population. The percentage of individuals with hybrid genes expressed in populations therefore, can be used as a relative measure of hybridization. This measure can be used as a component to assess the role of those populations in the conservation of the species.

Introgressed Population - Any population that contains individuals that are believed to represent the genetic characterization of the subspecies prior to the impacts of modern man and contains individuals that represent related species, subspecies, or hybrids. This designation is intended to further aid in defining a conservation population by a quantifiable criterion (e.g., Toline and Lentsch 1999).

Introduction - Release of BCT into historically unoccupied sites for promoting conservation or sportfishing purposes.

Introduced Population - a population of BCT that has been reestablished outside the historic range of the subspecies. These populations may be reestablished using a core population, an introgressed population, a reintroduced population, or a introduced population.

Meristic Data - data acquired from analysis of numerical variation in taxonomic characters (dorsal rays, anal rays, pelvic rays, scales above lateral line, lateral line scales, gillrakers, basibranchial teeth, pyloric caeca).

Metapopulation - a collection of localized populations that are geographically distinct yet are genetically interconnected through natural movement of individuals among conservation populations. The effective population size of meta-populations should generally be at least 1000.

Microsatellites - Microsatellites are tandemly repeated polymorphic DNA sequences which represent a source of markers for genetic linkage, mapping and identification. Microsatellites are most commonly known in the form of dinuleotide repeats, but can also be trinucleotide and tetranucleotide repeats. The resulting markers are typically highly variable and represent variation in the nuclear genome.

Mitochondrial DNA Analysis - analysis of mitochondrial DNA is typically achieved through restriction digests of portions of or the entire mitochondrial genome. The mitochondrial genome is maternally inherited and lends itself to insight into the phylogenetic relationships among populations.

Nonnative - A fish that historically did not occur in a specific area or habitat.

Outbreeding Depression - loss of fitness due to mating two individuals that are too distantly related.

Population - any waterbody in which Bonneville cutthroat trout have been found. Populations are geographically distinct. For example, tributaries of a stream are considered separate populations.

Phenotype - the physical manifestation of the interaction of an organism's genetic information with its environment which results in a unique physical, physiological or behavioral trait (e.g. spotting patterns or coloration of cutthroat trout).

Phylogenetic - referring to the description of relationships of groups of organisms as reflected by their evolutionary history.

Potential Population - A population of Bonneville cutthroat trout that has the potential (based on relevant information) to contain individuals that represent the historic genetic variability of the subspecies. Confirmation that the population contains these individuals requires that the population is surveyed and analyzed to describe the genetic characterization.

RAPDS - Randomly Amplified Polymorphic DNA - regions of the nuclear genome that are amplified using randomly generated 10-base pair primers. Markers may be resolved using this technique without any prior knowledge of the organism's genome.

Reintroduction - Release of BCT into historically occupied sites for the purpose of reestablishing populations.

Reintroduced Population - a population of BCT that has been reestablished within the historic range of the subspecies. These populations may be reestablished using a core population, an introgressed population, a reintroduced population, or a introduced population.

SINES - Short Interspersed Elements - A type of small dispersed repetitive DNA sequence (e.g., Alu family in the human genome) found throughout a eukaryotic genome. Similar to microsatellites in that the markers are highly variable and represent variation in the nuclear genome.

Sportfishing Population - A group of BCT that is managed to provide sportfishing opportunities and with the intention of meeting a public recreational demand. These populations are maintained in addition to conservation populations and may be managed in concert with other sportfish objectives.

Tentative Population - A population of Bonneville cutthroat trout that tentatively contains individuals that represent the historic genetic variability of the subspecies. This designation requires that the population is surveyed and must be identified as such based on at least phenotypic characteristics. This designation is intended to further aid in defining a conservation population by a quantifiable criterion (e.g., Toline and Lentsch 1999).

Transplant - Removal of BCT individuals from a naturally occurring population and subsequent release of these individuals into other waters.

BACKGROUND

Cutthroat trout (*Oncorhynchus clarki)* are widely distributed from southern Alaska to northern California and inland in the Columbia River, Missouri River, Southern Rocky Mountains, and the Great Basin drainages. This species comprises fourteen subspecies according to Behnke (1992). Cutthroat trout have intrinsic value as part of the native wildlife community (Behnke and Zarn 1976, Duff 1988) as well as value as sportfish (Duff 1988, Trotter 1987, Berg and Hepworth 1992). Cutthroat trout are the only trout native to the Bonneville Basin, and they historically occurred within all major drainages (Behnke 1988). Experts attribute the decline and/or loss of cutthroat trout subspecies to impacts from commercial and private harvesting, interactions with nonnative fish, such as hybridization and predation, and to habitat loss, degradation and range fragmentation caused through a variety of land uses and water development projects (Behnke and Zarn 1976, Binns 1977, Martinez 1988, Young 1995).

During early settlement of the Bonneville Basin, cutthroat trout were exploited through private and commercial fishing. An extensive reduction in numbers of native trout in Utah led to protective legislation for trout as early as 1874 (Utah Territorial Legislation of 1874). Traditionally, cutthroat trout management actions included the use of fishing regulations and stocking programs to protect native cutthroat trout. However, as these methods failed to provide adequate protection and as the importance of preserving genetic integrity increased, management efforts began to focus on the ecology and conservation of the subspecies of cutthroat trout. Furthermore, management and protection of native cutthroat trout has been elevated, particularly in the last two decades, through increased public conservation awareness and increased sportfish demand. Protection and conservation of native cutthroat trout not only provides sportfishing opportunity but, in light of pressures of habitat loss and nonnative fish introductions, is necessary to ensure the natural long-term persistence of cutthroat trout subspecies. Until February 28, 1996, Bonneville cutthroat trout were considered candidate species for Federal listing (Notice of Review 1980; 45 FR 19857 for Bonneville cutthroat trout). Bonneville cutthroat trout are currently designated a special status species by the states of Idaho (Species of Special Concern), Nevada, Utah (Species of Special Concern) and Wyoming; and, are considered a sensitive species by the U.S. Forest Service, Bureau of Land Management and Great Basin National Park.

Bonneville Cutthroat Trout Systematics

Bonneville cutthroat trout probably evolved as the top predator of minnows, suckers and whitefish predecessors in ancient Lake Bonneville. With desiccation of the large pluvial lake, cutthroat trout diversified among remaining lakes and into upstream reaches of lake tributaries. In historical (mid 1800's) times, only Panguitch Lake, Lake Alice, Utah Lake, and Bear Lake retained lacustrine populations, and most streams with adequate habitat retained fluvial Bonneville cutthroat trout populations. Currently, all natural lake populations except that of Bear Lake and Lake Alice are extinct, and stream populations are mainly restricted to isolated headwater reaches.

Researchers have not reached consensus on the evolutionary history of Bonneville cutthroat trout. It has been proposed that ancestral coastal cutthroat trout gave rise to all interior subspecies from an invasion through the Columbia River system (Behnke 1981, Hickman 1978). From the Columbia River, the ancestral trout are thought to have migrated into the Spokane, Pend Oreille, and Snake Rivers prior to the formation of barrier falls. Cutthroat trout then, hypothetically, gained access to the Alvord and Lahonton Basins from the middle Snake River and cutthroat from the upper Snake River invaded the Yellowstone and Colorado River drainages and the Bonneville Basin. Loudenslager and Gall (1980a) suggested an alternative hypothesis to the invasion of inland cutthroat trout based upon the distribution of fish species. It has been demonstrated that there is a greater similarity between the upper Snake River, Bonneville Basin, Lahontan Basin, and the Klamath and/or Sacramento River systems than between the upper Snake River, the Great Basin, and the Columbia River system (Hubbs and Miller 1948, Miller 1965, Smith 1978). Additionally, there is zoogeographic and fossil evidence to suggest a connection between the Snake River and Klamath lakes during the Pliocene (Malde 1965, Miller 1965). Miller (1965) hypothesized that the Snake River drained toward the Pacific coast through the Sacramento or Klamath drainages. He argues that the Snake River was then impounded to form a large lake in southwestern Idaho and became connected to the Columbia River system during the Pleistocene. Loudenslager and Gall (1980a) consider this information and suggest that perhaps present inland subspecies of cutthroat trout could be the result of multiple invasions. Indeed there are two to four purported distinct groups of Bonneville cutthroat trout in the Bonneville Basin.

The groups of cutthroat trout in the Bonneville basin include: 1) those in the Bear River of Northern Utah, Southeast Idaho and Southwest Wyoming, 2) those in the Snake Valley region on the Utah-Nevada border, 3) those in the main Bonneville Basin and 4) a Southern Bonneville type. These groups can be differentiated based on morphological, ecological and molecular evidence.

Cutthroat native to the Bear River of the Bonneville Basin are a fluvial-adapted form that persist in harsh, highly-fluctuating stream environments (Behnke 1981). Morphologically, Bear River cutthroat are differentiated by a higher number of scales and pyloric caeca than their Basin counterparts. However, it has been argued that the morphological differences are not sufficient to warrant recognition as a separate subspecies of Bonneville cutthroat trout (Hickman 1978, Hickman and Duff 1978). Molecular evidence based on allozyme data (Loudenslager and Gall 1980b, Martin et al. 1985) provides evidence that Bear River cutthroat are quite distinct from Bonneville cutthroat trout in the Bonneville Basin and are, in fact, more genetically similar to Yellowstone cutthroat trout than they are to Bonneville cutthroat trout in either the main Bonneville Basin or Snake Valley. For this reason, Loundenslager and Gall (1980b) suggest that Bonneville cutthroat trout have only two variations, the Snake Valley form and those in the main Bonneville Basin. Data from mitochondrial DNA RFLP (restriction fragment length polymorphism) analysis also support the concept that Bear River cutthroat are more recently derived from Yellowstone cutthroat trout than Bonneville cutthroat trout in the main Bonneville Basin (Shiozawa and Evans 1997, Toline et al. 1999). That is, at the molecular level, Bear River cutthroat are more similar to Yellowstone cutthroat trout than to Bonneville cutthroat trout in the main Bonneville Basin. These data suggest that cutthroat trout in the Bear River drainage represent a more recent invasion of cutthroat into the Bonneville Basin. This result makes sense in terms of the historical biogeography of the area. Historically, the Bear River changed course and entered the Bonneville Basin. The increased flow into Lake Bonneville caused it to overflow approximately 30,000 years ago at Red Rock Pass and connect to the Snake River (Behnke 1992). The cutthroat trout in the Bear River drainage, therefore, may be recent ancestors of Snake River cutthroat.

The divergent group of Bonneville cutthroat trout native to the Snake Valley region differ from other Bonneville cutthroat trout both morphologically and molecularly. They have, on average, a greater number of gillrakers and basibranchial teeth and lower scale counts along the lateral line (Hickman 1978, Behnke 1979). Additionally, they have a more even distribution of spots on the body, longer head, more compressed body and a long dorsal fin positioned more posteriorly than other Bonneville cutthroat trout (Hickman 1978). Molecular evidence is based upon variation at a few allozyme loci. Klar and Stalnaker (1979) reported Snake Valley populations to be divergent at the *LDH* locus. Similarly, Loundenslager and Gall (1980b) reported Snake Valley cutthroat are divergent from Bonneville cutthroat trout along the Wasatch Front at the *SDH-1* locus. However, at this same locus, they found that Snake Valley cutthroat trout are similar to Bonneville cutthroat trout from the Sevier drainage. Evidence from other species also indicates an opportunity for divergence. For example, Utah chub (*Gila atraria*) found in springs of Snake Valley appear to be a dwarfed form. Additionally, a dwarfed speckled dace (*Rhinichthys osculus*) has been noted from springs in this region (Hubbs et al. 1974).

The opportunity for divergence of the Snake Valley populations existed during the presence of Lake Bonneville. At the maximum elevation, Snake Valley was an arm of Lake Bonneville and it has been argued that following declines in the Lake, Snake Valley became isolated from the rest of the basin (Behnke 1976). However, it has also been suggested that Snake Valley cutthroat may represent the original cutthroat trout of the Bonneville basin from pre-pluvial times, which were replaced by a later invader throughout most of the basin. Another possible scenario is an invasion of Snake Valley cutthroat from south to north. Snake Valley cutthroat share allelic patterns with Colorado River cutthroat trout (Loudenslager and Gall 1980b, Martin et al. 1985) and it is possible that fish migrated from the lower Colorado River basin onto the Snake Valley region.

Some of the confusion in understanding the historical biogeography of the Snake Valley region is due to limited data. Most samples for both morphometric and molecular analyses have been taken from Trout Creek, Birch Creek, Pine Creek and populations that were stocked from Pine Creek. These sites fall within the Snake Valley and are located in historical Snake Bay of Lake Bonneville. However, some of these samples (e.g. Trout Creek) are also located on the east side of the Deep Creek range and some reports refer to samples as being from the Deep Creek area. However, Deep Creek falls to the west of the Deep Creek range and represents an area that was also covered by an arm of Lake Bonneville. A single sample from this creek was measured for meristic traits (Behnke 1976) and no differences were found between this sample and those found in Snake Valley. However, it might be expected that populations in the Deep Creek range should be distinct.

Lake Bonneville did not reach as far south as the town of Ibapah, just west of the Deep Creek range. Molecular evidence from other species sampled in this area suggest that populations to the west of the Deep Creek range are distinct. Molecular analysis based on mtDNA RFLP analysis of spotted frog (*Rana luteiventris*) (Toline and Seitz 1999) and speckled dace (Toline et al. unpublished data) from streams and springs in the area surrounding the town of Ibapah suggest that this area may have been isolated from Lake Bonneville for a much longer period of time than any of the surrounding areas. Indeed, no mitochondrial haplotypes are shared between the Deep Creek samples and those found in the Snake Valley for either species.

Additional molecular evidence from both spotted frog and speckled dace demonstrates that populations in the Snake Valley are no more genetically distinct from samples in other parts of the Bonneville Basin than samples along the Wasatch Front or those from the Sevier drainage. This suggests that populations in the Snake Valley may not necessarily have been isolated from others in the Bonneville Basin for a significantly greater period of time. Collections of cutthroat trout from west of the Deep Creek range would lend insight into how divergent these populations may be.

Bonneville Cutthroat Trout Life History

May et al. (1978) found that Bonneville cutthroat trout sexually mature during the second year for males and the third year for females. Both the age at maturity and the annual timing of spawning vary geographically with elevation, temperature and life history strategy (Behnke 1992, Kershner 1995). Lake resident trout may begin spawning at two years and usually continue throughout their lives, while adfluvial individuals may not spawn for several years (e.g. Kershner 1995). Annual spawning of Bonneville cutthroat trout usually occurs during the spring and early summer at higher elevations (Behnke 1992) at temperatures ranging from 4-10 ^{o}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. Bonneville cutthroat trout in Bear Lake began spawning in late April and completed spawning in June (Nielson and Lentsch 1988). The wild broodstock at Manning Meadow Reservoir (9,500 ft. elevation) spawn from late June to early July (Hepworth and Ottenbacher 1995).

Typical of most trout, Bonneville cutthroat trout require relatively cool, well oxygenated, water and the presence of clean, well sorted gravels with minimal fine sediments for successful spawning. Kershner found substrate size to be proportional to body size. For example, large adfluvial Bonneville cutthroat trout typically spawn in large gravels or cobbles, while smaller, stream resident Bonneville cutthroat trout spawn over coarse sand or small gravels.

Little information exists to document fecundity of wild Bonneville cutthroat trout however, trout fecundity is typically between 1800-2000 eggs per kilogram of bodyweight (Behnke 1992). Incubation times for wild Bonneville cutthroat trout have not been verified but may be approximated from other wild cutthroat trout such as Yellowstone cutthroat trout that average 30 days of incubation (Gresswell and Varley 1988). In general, growth of trout tends to be slower in high elevation headwater drainages than in lentic environments however, growth and reproductive rates of Bonneville cutthroat trout depend greatly on stream productivity and habitat conditions. For more detailed life history information, see the Bonneville cutthroat trout review by Kershner (1995).

CONSERVATION GUIDELINES

Range-wide conservation efforts for Bonneville cutthroat trout are based on sound principles of conservation biology (Soule' and Wilcox 1980). Generally, important factors for the long-term conservation of species include: conservation genetics, Federal policies, meta-population dynamics and habitat restoration and preservation. Furthermore, loss of one species from a community can precipitate extinction of coexisting species, if they are strongly interdependent (Terbough 1976, Gilbert 1980). A sound conservation management approach will not only support the persistence of Bonneville cutthroat trout but will also promote ecosystem health.

Conservation Genetics

Effective management, preservation and recovery of any species requires a knowledge of the historic levels of genetic diversity that exist both within and among populations. Levels of genetic variation *within* populations are indicative of current and historical reductions in genetic effective population size (Ne) and can often be suggestive of the likelihood of inbreeding. *Among* population variation indicates a lack of gene flow and subsequently the opportunity for local adaptation. Indeed, local adaptation and among-population differentiation within a species is inevitable when populations are distributed among a variety of ecologically distinct habitats separated geographically. Genetically divergent populations often consist of individuals whose genes are most appropriate for their natal environment. Therefore, when individuals from genetically distinct or locally-adapted populations are allowed to interbreed, the offspring experience a reduction in relative fitness commonly referred to as outbreeding depression.

A good first step to any management or recovery program, therefore, is to identify genetically distinct populations (or management units) and manage these groups separately. No single approach is best to determine the level of differentiation among populations and it is best to incorporate a variety of different kinds of information for each population. For example, geographic, genetic and morphological or meristic data can all provide important quantitative information on population differences. Genetic analyses can offer some insights that are often more difficult to obtain using other methods. In particular, molecular markers, unlike some morphological characters (e.g. size and color) are not influenced environmentally and do not vary under different environmental conditions.

Long-term stocking of "sportfish" (e.g. rainbow trout) over many native populations of cutthroat trout has lead to high levels of hybridization and is likely responsible for the loss of several populations. Identification of potential "conservation populations" for recovery of native cutthroat trout must therefore include an assessment of their genetic purity.

Identification of conservation populations for recovery will include both an assessment of the genetic purity of the population and the determination of subspecies, appropriate geographic management units (GMUs) and populations. From a genetic perspective, identification and designation of populations will include 1) molecular analysis of nuclear markers (e.g. RAPDs, microsatellites, SINES, allozymes), 2) mitochondrial DNA analysis, 3) meristic and morphological traits and 4) historical stocking records. Toline and Lentsch (1999) outlined a standardized approach for this type of analysis. Other factors, however, will also be critical in a final assessment of what populations should be considered as potential conservation populations.

Federal Policies

In 1996, the US Fish and Wildlife Service and the National Oceanic and Atmospheric Administration proposed and adopted policy rules that influence conservation efforts for cutthroat trout: 1) The Proposed Policy on the Treatment of Intercrosses and Intercross Progeny (the issue of hybridization) (61 FR 4709), and 2) The Policy Regarding the Recognition of Distinct Population Segments Under the Endangered Species Act (61 FR 4722). The proposed policy has not been finalized. The concepts upon which both policies are based, however, are important to include in conservation efforts. The US Fish and Wildlife Service is required to use the best available scientific information in determining the status of species and making decisions on recovery and/or conservation efforts.

The proposed "intercross" policy asserts that the US Fish and Wildlife Services responsibility for conserving species under ESA extends to hybrids (intercrosses) if (1) the progeny share traits that characterize the taxon of the listed parent, and (2) the progeny more closely resemble the listed parent's taxon than an entity intermediate between it and the other known or suspected non-listed parental stock. The best biological information available, including morphometric, ecological, behavioral, genetic, phylogenetic, and/or biochemical data, can be used in this determination. The proposed policy also makes the distinction that it applies to individuals not to populations. It proposed the use of the term "intercross" for all crosses between individuals of different species (taxonomic species, subspecies, and distinct population segments of vertebrates). Populations, therefore, can contain individuals that represent the protected species and individuals that are intercross progeny between the protected species and another. This concept has significant ramifications for conserving cutthroat trout. This species has readily hybridized with other salmonids throughout its historic range. This policy, therefore, significantly influences the interpretation of genetic and biological information obtained to date on cutthroat trout populations.

The policy regarding distinct population segments (DPS) also has a significant influence on the status assessment of cutthroat trout.   The policy requires that the Fish and Wildlife Service consider three elements in decisions regarding the status of a possible DPS: 1) Discreteness of the population segment in relation to the remainder of the species to which it belongs; 2) The significance of the population segment to the species to which it belongs, and 3) The population segment's conservation status in relation to ESA standards for listing. This policy recognizes the importance of unique management units (i.e., DPS) to the conservation of a species. For cutthroat trout, populations within geographic regions (or other boundaries) of the historic range could represent DPS. The conservation of populations within various segments of the range, therefore, could receive different management priorities based on the importance of those populations as components of a DPS or to the overall conservation of the species.

The application of the DPS policy in concert with the "intercross" policy, requires that conservation actions for this species be completed by compiling standardized information for each individual population (Toline and Lentsch 1999). In this manner, the influence of hybridization (intercross policy) and an assessment of the unique characteristics of the population

(DPS policy) can be determined. It follows, therefore, that populations may need to be conserved throughout the range that contain varying degrees of individuals that are hybridized. Toline and Lentsch (1999) have proposed one possible approach that ranks populations based on information from historic stocking records, meristic, morphometric, and molecular characters. An approach such as this provides a mechanism for determining the value of an individual population for conservation efforts based on the degree that individuals within it may be hybridized.

Metapopulations

Although individual populations should be managed and protected, some degree of interconnectedness among populations is also needed to maintain genetic exchange and stabilize population dynamics (Wilcox and Murphy 1985, Hanski and Gilpin 1991). Metapopulation persistence depends on the temporal and spatial dynamics of local populations connected through unobstructed migratory corridors (Wilcox and Murphy 1985; e.g., Gilpin and Hanski 1991).

Metapopulations stabilize local population dynamics in several ways: 1) migration of individuals allows genetic exchange among local populations thereby increasing genetic heterogeneity (Simberloff and Abele 1976); 2) large, interconnected populations are less vulnerable to losses incurred through environmental and demographic stochasticity (Roff 1974, Wilcox and Murphy 1985); 3) large, interconnected populations are more resistant to changes in deterministic variables that dictate population stability, such as birth and survival rates (e.g. Connell and Sousa 1983, Rieman and McIntyre 1993).

Potential Bonneville cutthroat trout populations are mainly restricted to headwaters (1st order streams) which often reflect habitat refugia rather than habitat preference. The establishment of objectives to meet the goal of this program should be based on historically occupied miles of stream categorized by stream order. This format ensures that conservation actions are not limited to headwater streams and that all historical stream and watershed types are represented in future conservation efforts. Waters should be categorized from 1st order (headwaters) to 5th and higher order streams and lakes (lentic environments) and stream mileage should be determined and summarized by stream order from 1:100,000 scaled maps of drainages. Until historic stream miles by stream order are verified, goals should be summarized by major drainages within GMU's.

Habitat Management and Protection

Past land use activities have negatively affected habitat for Bonneville cutthroat trout. Rigorous standards for habitat protection must be incorporated into forest plans (USFS) and land use plans (BLM, counties and states). Current guidelines exist for many agencies that should be incorporated into these efforts. Examples of these guidelines might include Best Management Practices or other state water quality standards, Forest Plan Standards and Guidelines, National Park Service Natural Resources Management Guidelines (DO-77), and recommendations from related broad-scale assessments. Broad protective measures have been developed as part of the Inland Native Fish Strategy (INFISH) that have been applied to national forests in Idaho, Montana, Nevada, Oregon, and Washington. These measures are designed to protect habitat for resident salmonids such as cutthroat trout and bull trout. Currently, only the Caribou National

Forest and the Humboldt National Forest within the range of Bonneville cutthroat trout has formally adopted these guidelines. Protective measures that are defined in these guidelines include the delineation of Riparian Habitat Conservation Areas adjacent to streams and lakes, and the development of standards and guidelines that relate to land use activities that have the potential to influence water quality and Bonneville cutthroat trout habitat.

Properly Functioning Condition (PFC) protocols are found in Bureau of Reclamation Publication TR 1737-15 1998 “Riparian Area Management, A User Guide to Assessing Proper Functioning Condition and the Supporting Science for Lotic Areas”. For this evaluation, streams are subdivided into 5 categories: 1) PFC; 2) Functioning-at-risk, upward trend; 3) Functioning-at-risk, no apparent trend; 4) Functioning-at-risk, downward trend; and 5) Non-functioning. Properly Functioning means the hydrological, vegetation and soil erosion/deposition components of the stream system are in working order and functioning at a level of resiliency sufficient to withstand the energies of up to a 35 year flood event. Functioning-at-risk means the stream system components are functioning properly, but an existing condition makes the system susceptible to degradation. The categories of High, Low, or Moderate have been added by some forests to further define the condition of the system. High means the stream is functioning properly, but there is a minor problem within the watershed that could contribute to degradation of the stream channel. Conversely, Low means the system is functioning properly, but there are factors within the watershed that could easily cause the system to be non-functional. Moderate falls between these two conditions. Non-functioning means the vegetation, landform or energy dissipaters are clearly not adequate to provide for system protection or function.

The decline of salmonid fishes in the western United States has prompted new interest in the rehabilitation of degraded aquatic habitats. While habitat rehabilitation has been successful in some cases, there are numerous examples of habitat work that has failed to improve instream conditions and ultimately fish populations. The restoration of Bonneville cutthroat trout requires an understanding of the factors limiting populations at all scales because natural processes operate at a variety of spatial and temporal scales. A watershed analysis (FEMAT 1993) is often useful as a first step to prioritize the potential problems within a watershed and develop plans that will address the most significant problems early**.**

Restoration of Bonneville cutthroat trout habitat will have to address both habitat quality issues and issues of spatial limitations. Current efforts to recover Bonneville cutthroat trout have been directed toward improving instream conditions and restoring limited stream fragments. Future efforts will need to consider recovery at a much larger scale if we are to secure Bonneville cutthroat trout populations. The re-establishment of population connectivity will be a primary focus of future restoration if we are to minimize risks to Bonneville cutthroat trout over the long-term. Stream length/fish density criteria may be one way to establish potential fragment sizes in the short-term (Hilderbrand and Kershner, accepted) and/or the establishment of criteria similar to those outlined by Allendorf et al. (1997) may be useful to set long-term habitat/population goals.

Sensitive Species Designation
The Regional Forester for the Inter-mountain Region of the U.S. Forest Service (USFS) (R4) has designated the Bonneville cutthroat trout as "sensitive". This administrative designation is defined in the Forest Service Manual 2670.5 as follows: "Sensitive Species. Those plant and animal species identified by a Regional Forester for which population viability is a concern as evidenced by: a. Significant current or predicted downward trends in population numbers or density. b. Significant current or predicted downward trends in habitat capability that would reduce a species' existing distribution." Twelve criteria are used in this Region in designating species as sensitive. These are: (1) relative abundance of the species within the range, (2) recruitment potential as to life history style, (3) population trend over the past 10 years, (4) distribution across the region, (5) plant communities inhabited, (6) unique habitat or special features upon which the species depends, (7) ability of a species to disperse or relocate, (8) the species specialization for reproduction and feeding, (9) hybridization potential, (10) ability for habitat to recover, (11) potential for habitat to be impacted by human activity, and (12) habitat trend. The status of Bonneville cutthroat trout was evaluated in the late 1980's against these criteria and was determined to warrant regional designation as sensitive. The designation of the Bonneville cutthroat trout as sensitive by the USFS will be evaluated each 5 years after the signing of this agreement.

Manual Direction directs line officers to manage for and maintain viable populations of native and desirable nonnative species (FSM 2602, 1b). When a species is designated as sensitive, decision makers must review and analyze the impacts of proposed management activities on the species and their habitat. This analysis is done in a "biological evaluation" (BE). The BE is part of the project file upon which a decision maker bases their decision and allows the decision maker to understand the potential impacts on individual species of concern. While the BE does not establish standards or guidelines, it may include recommended mitigation measures. The decision maker is not forced into or required to make any particular decision based on the BE. This designation as sensitive is designed to increase awareness of population viability concerns, and therefore encourage decisions which will not contribute to those concerns and which may prevent a species from becoming a Federally threatened or endangered species.

To encourage pro-active management of this species and alleviate local concerns about effects of re-introductions on current activities, the U.S. Forest Service has agreed to not treat as 'sensitive' any Bonneville cutthroat trout population established through transplanting onto National Forest System land, proceeding from the date of signing of the Agreement. However, the U.S. Forest Service will continue to treat as 'sensitive' any core Bonneville cutthroat trout population found on National Forest System land.

STATUS ASSESSMENT

Approach

An exact assessment of the number of BCT populations currently existing is difficult to determine. Status assessments are influenced by the approach used to determine and designate populations for conservation management and population survey methodologies. Significant changes in survey techniques, genetic analysis approaches, and management directions have occurred over the past thirty years. In addition, new information is being collected at an accelerated rate. Over 250 streams in the historic range of Bonneville cutthroat trout have been surveyed in the last 8 years (Figure 2). In addition, over 100 streams will be surveyed in the next five year period (Appendix III).

One of the major areas where resource agencies have modified their conservation activities is how they manage populations that contained hybrid individuals. Bonneville cutthroat trout have hybridized with nonnative salmonids throughout the historic range. The introduction of nonnative salmonids, and their subsequent hybridization with Bonneville cutthroat trout, has been recognized as a major impact on the species. The degree of hybridization within populations has been variable. It is important to note that a large number of populations that contain hybrids still represent the original genetic profile for Bonneville cutthroat trout (Behnke 1988). In an attempt to quantify the degree of hybridization occurring within populations, scientists have used meristic characters, molecular characters, and geographic information (Binns 1977, Binns 1981, Toline and Lentsch in prep.). In Wyoming, the state management agency has used a hybrid classification scheme to designate populations that represent the range of hybridization (Binns 1981). This scheme gives population ratings (A-F) that rank populations based on the percentage of individuals that have characteristics that represent core Bonneville cutthroat trout. Within Utah, Toline and Lentsch (in prep.) have proposed one possible approach that ranks hybrid populations based on information from meristic, morphometric, and molecular characters, as well as, historic stocking records. The meristic and morphometric characters are analyzed in the same fashion as Wyoming's approach (i.e., determine percentage of individuals that represent pure individuals). However, a letter rating is not assigned. In addition, this approach uses stocking records to assess the risk of hybridization in the ranking. The Wyoming and Utah approaches provide a mechanism for determining the value of an individual population for conservation efforts based on the degree that individuals within it may be hybridized. All potential populations are recognized as having some value for conservation efforts. The hybrid ranking information is used, however, in combination with other pertinent information to select those populations that will be designated as conservation populations that may be used in future transplant efforts.

This assessment is based on concepts described in the proposed intercross policy and the distinct population segment policy. We used information contained in published reports and unpublished data.

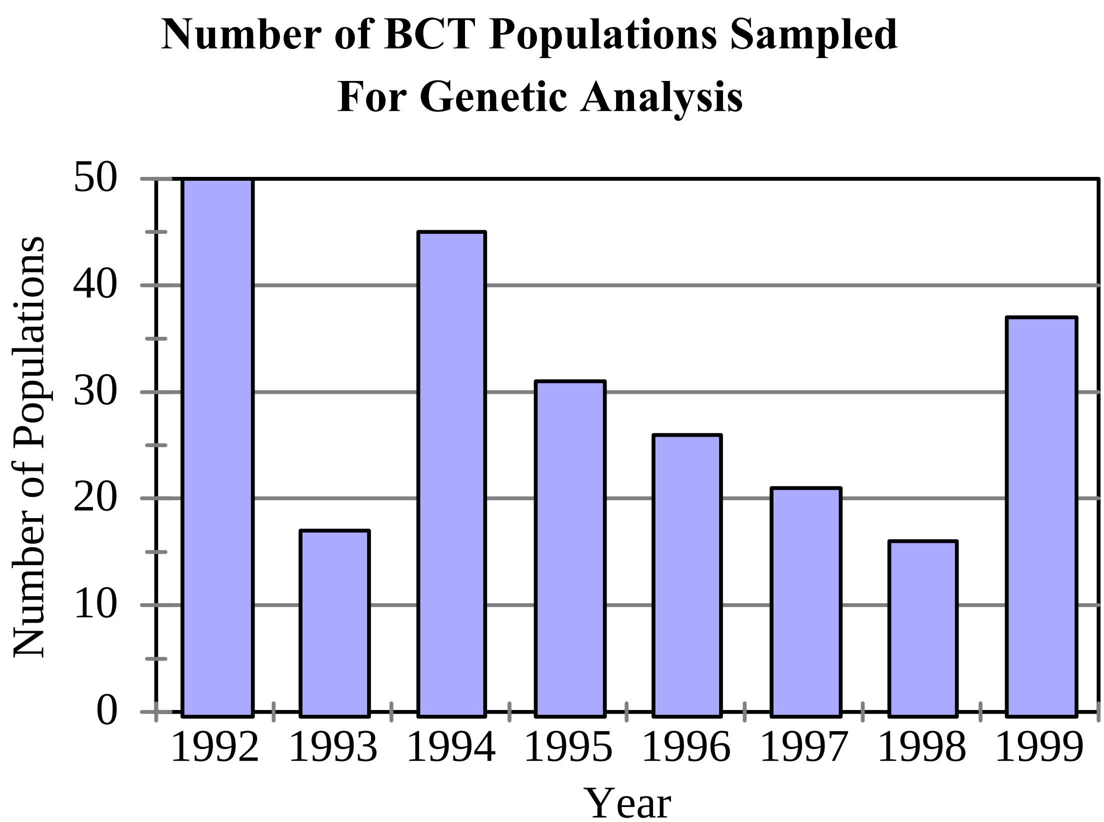

Figure 2. Number of Bonneville cutthroat trout populations sampled throughout the historic range during the past eight years.

Population Status

Current information on Bonneville cutthroat trout indicates that the range-wide status of this species has been greatly improving over the last 20 year period (Figure 3). There are currently an estimated 163 tentative populations inhabiting over 1365 miles of lotic habitats and 70,088 surface acres of lentic habitats (Table 2, Appendix IV). At an estimated 100 - 300 individuals per stream mile, the total number of Bonneville cutthroat trout may range from 166,500 to over 439,500 individuals. The largest single population occurs in Bear Lake with an estimated population size of over 30,000 individuals (Ruzycki 1995). Of the populations being managed for conservation, 62 have been identified as core or reintroduced populations and two have been designated introgressed populations (Appendix IV). This current status is significantly different from the situation that occurred in the late 1960's and early 1970's.

In the late 1960's, scientists believed that Bonneville cutthroat trout were extinct. In the early 1970's, the precarious status of the subspecies was recognized by prominent scientists and resource agencies (Miller 1972, Behnke 1973, Holden et al. 1974). In 1976, Behnke (1976) made one of the first references to recovering BCT in Utah. He suggested that individuals from two populations in the Virgin River drainage (Water Canyon and Reservoir Canyon) and one in the Sevier River drainage (Birch Creek) should be transplanted into new areas to expand BCT range. Also, after identifying pure strains of BCT in the Snake River Valley portion of Utah, Behnke (1976) suggested additional pure populations of BCT existed and could be located with additional surveys. Soon afterwards, Hickman (1978) documented 15 potential remnant populations in Utah, Nevada and Wyoming. The discovery of these populations prompted more surveys; consequently, BCT were found in areas throughout the Bonneville Basin. In addition, several streams were stocked with transplanted fish in the mid 1970's. In 1979, however, the American Fisheries Society (AFS) recommended the designation of BCT as "threatened" throughout its range because of present and/or potential habitat destruction from poor land use practices and because of hybridization and competition with nonnative species (Deacon et al. 1979).

The FWS considered BCT a candidate species for Federal listing from the early 1980's until a policy change on February 28, 1996 (Notice of Review 1980; 45 FR 19857). Duff (1988) completed the first published range-wide status review for the subspecies. He summarized the range-wide status based on actions taken by resource agencies throughout the historic range. This summary, in addition to Hickman’s (1978) report, provides a measurable benchmark for conservation efforts. He listed 39 populations inhabiting headwater streams and 2 lake dwelling populations. Of the 41 populations that he listed, 34 may be identified as core populations and 7 would be considered introgressed populations. He included 4 populations from Wyoming that had contained hybrids in his assessment. He also recognized 3 transplanted populations in Nevada that were outside of the historic range. Duff also summarized the various state and Federal management plans for the subspecies and expressed an optimistic view of its future. For example, the Nevada Division of Wildlife prepared the first Bonneville Cutthroat trout management plan in 1986. The plan identified actions that would be taken to enhance Bonneville cutthroat trout. In 1989, AFS reviewed the status of the species a second time and

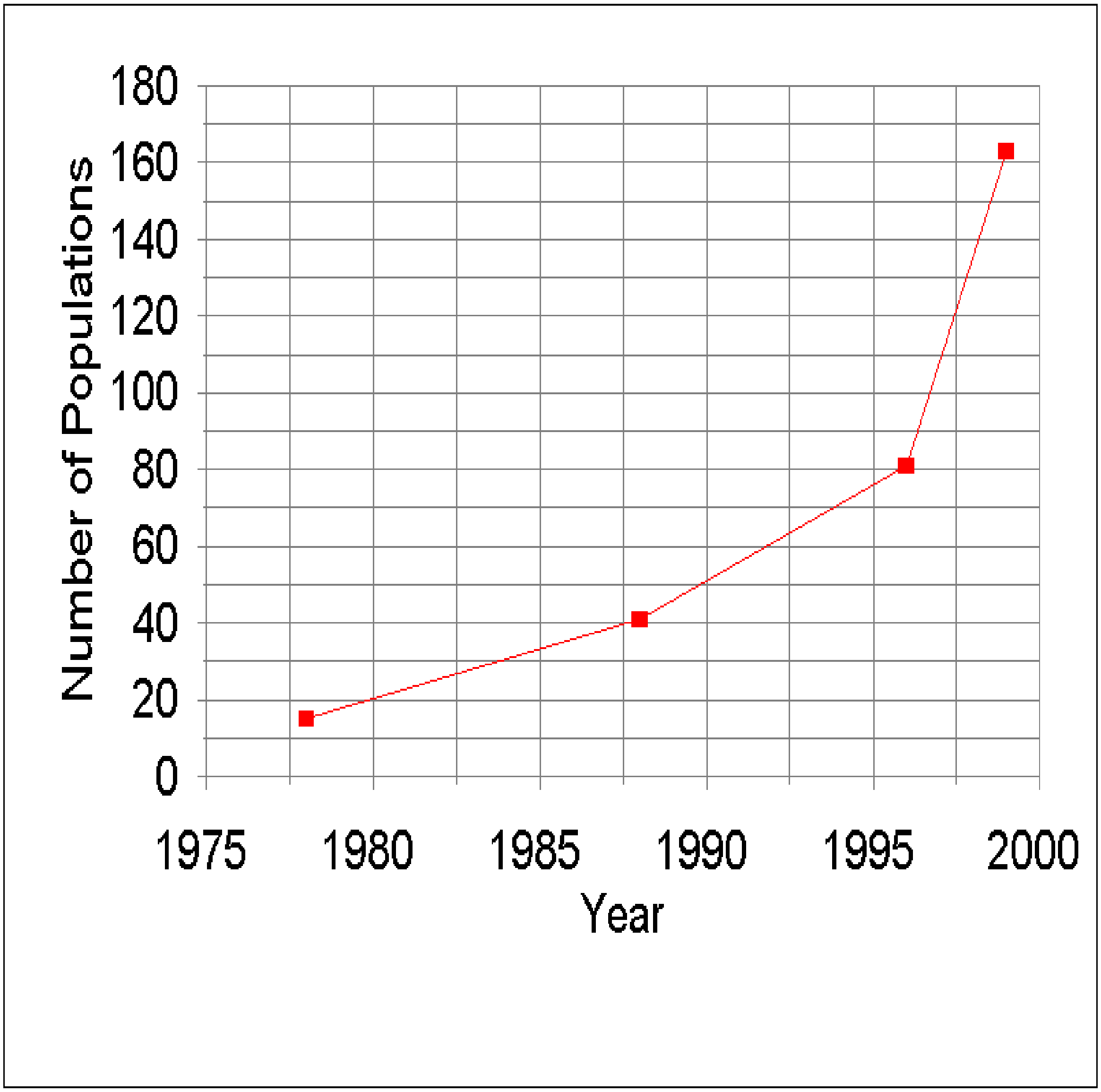

Figure 3. The number of Bonneville cutthroat trout populations indicates that the range-wide status of this species has been greatly improving over the last 20 year period.

Table 2. Summary of tentative populations, current conservation populations (Appendix IV) and conservation population objectives by GMU and state for Bonneville cutthroat trout.

Geographic Management Unit	Tentative Populations		Conservation Populations			
			Current		Objectives	
	Number	Habitat[1]	Number	Habitat[1]	Number	Habitat[1]
Bear Lake						
Lakes (acres):			***1***	***70,000***	***1***	***70,000***
Streams (mi):	*1*	*12*	***5***	***12***	***4***	***26***
Idaho	1	12			2	14
Utah			5	12	2	12
Bear River						
Lakes:			***1***	***230***		
Wyoming			1	230		
Streams:	*29*		***91***	***959***	***109***	***1054***
Idaho	5		19	456	34	531
Utah	8		30	184	39	204
Wyoming	16		42	319	36	319
Northern Bonneville (Utah)						
Lakes:			***1***	***50***	***3***	***700***
Streams:	*56*		***39***	***295***	***78***	***396***
West Desert						
Lakes:			***1***			
Nevada			1			
Streams:			***12***	***38***	***24***	***132.6***
Nevada			5	16	14	70.6
Utah			7	22	10	62
Southern Bonneville (Utah)						
Lakes:			***1***	***38***	***1***	***73***
Streams:			***25***	***45***	***10***	***79***
Range-wide						
Lakes:			***5***	***70318***	***6***	***70773***
Streams:			***172***	***1349***	***225***	***1687.6***

[1] Habitat figures refer to surface acres or stream miles for lakes and streams, respectively.

recommended reclassifying BCT as "endangered" based on information that BCT range was severely restricted (Williams et al. 1989).

In the early 1990's, the USFS conducted a habitat conservation assessment for five subspecies of cutthroat trout (Duff 1996a). USFS and state biologists were sent questionnaires to assist in the assessment. The assessment was compiled in 1996. Duff (1996b) completed his second status assessment for Bonneville cutthroat trout. This review, however, was more detailed and summarized specific information on habitat conditions. He listed 81 confirmed or transplanted populations occupying a total of 234 miles of stream. Approximately 66% were remnant populations and 34% were transplanted populations. He also indicated that approximately 72% of the confirmed populations had a status that was either secure or secure and expanding.

Management activities to enhance the status of Bonneville cutthroat trout were greatly accelerated in the 1990's. In 1993, Wyoming developed an interagency 5-year management plan (1993-1997) to direct conservation activities. In 1994, Idaho developed an interagency Conservation Agreement for the Thomas Fork of the Bear River in cooperation with the local grazing association. In 1997, Utah finalized a state-wide conservation agreement and strategy in cooperation with the USFS, BLM, BOR, URMCC (Utah Reclamation, Mitigation, and Conservation Commission), and USFWS. These management planning efforts have resulted in the surveying of over 250 streams in Utah and Idaho (Figure 2), the establishment of an additional 5 populations in Nevada, and the enhancement of habitat in all states. Most of these efforts are continuing today.

In Wyoming, population demographics and numbers indicate that the overall population status has remained stable. Eleven waters have been monitored since the late 1950's. Population surveys were sporadic in the 1950's and 1960's, but more routine sampling began to occur in the mid to late 1970's. In 1993, an Interagency 5 Year Management Plan (Remmick et al. 1993) was implemented which summarized all existing information and established specific management goals and actions. A grand average estimate from all stations on eleven waters within the Thomas Fork and Smith Fork drainages from 1956 through 1992 was 250 fish/mile. The grand average for the same waters from 1993 through 1997 was 223 fish/mile. Natural recruitment was occurring in all waters.

In a cooperative effort between the Idaho Department of Fish and Game, the Caribou National Forest, and the Wasatch-Cache National Forest, waters were inventoried for the presence of Bonneville cutthroat trout. This work has found 18 new populations. Additionally, Idaho Fish and Game has stocked 6 streams with Bonneville cutthroat trout. This increased the confirmed number of populations from 4 to 28. More streams need to be surveyed and will be surveyed in the future. Locating the additional populations indicates that the status of the species in Idaho is not as reduced as once perceived. The Forest and IDFG are treating populations as BCT and giving them the same protection as core populations.

In Utah, the USFWS, USFS, BLM, and the State of Utah have initiated stream improvement projects, population and habitat surveys, brood stock development and reintroductions over the past decade. These efforts allowed managers to expand known BCT range since the 1970's. As a result, the status of BCT in Utah has improved in some areas and is considered by some to be stable overall.

In Nevada, all streams within the historic range have been surveyed through the cooperative efforts of the Nevada Division of Wildlife, USFS-Humboldt National Forest, BLM-Ely Field Office, and Great Basin National Park. Furthermore, habitat surveys have been completed on all streams having existing populations and those proposed for reintroductions or introductions. Efforts are currently focusing on introducing Bonneville cutthroat trout in and around Great Basin National Park.

Habitat Assessment

Researchers speculate that historically BCT inhabited all systems in the Bonneville Basin with suitable habitat (Hickman 1978, Hickman and Duff 1978, Duff 1988, Behnke 1992). However, in the last one hundred years, human land use and stream alterations have restricted BCT range through loss of connectivity among populations and loss and degradation of suitable habitat.

Habitat degradation within the range of Bonneville cutthroat trout has fragmented and reduced the complexity of aquatic habitats. Habitat fragmentation is perhaps the most significant problem threatening the future survival of many species (Wilcox and Murphy 1985), and it occurs when a large area of habitat is subdivided into smaller, isolated patches (Wilcove et al. 1986). Reservoirs and irrigation diversions have eliminated migratory corridors throughout the range of BCT. Although it is unknown how much BCT may have moved within their historic range before migration barriers were created, these populations are now isolated with no opportunity for migration in many areas.

In addition to the size of a habitat, the quality of habitat is also important to a population. Complexity is one aspect of habitat quality that is thought to significantly influence the size, structure, distribution, and stability of populations. Complexity has been characterized in terms of structural components (McMahon and Hartman 1989), hydraulic variation (Lamberti et al. 1989, Pearsons et al. 1992), and a combination of depth, velocity, and substrate (Gorman and Karr 1978, Angermeier and Schlosser 1989). Complex habitats provide many important functions for stream biota. For example, the presence of complex habitats can increase a population’s resistance to a disturbance (Poff and Ward 1990, Sedell et al. 1990), and it can reduce predation risk by reducing the efficiency of a predator (Crowder and Cooper 1982). Moreover, populations in a complex habitat usually are more stable (Pearsons et al. 1992), and are more apt to recover from a disturbance (Connell and Sousa 1983), than a population living in more simple habitat. Areas with complex habitats can be considered refugia and may provide a source of colonists after a catastrophic event that results in losses in biomass or local extinctions (Kershner et al. 1997, Sedell et al. 1990).

Both fragment size and habitat quality appear to be important to cutthroat trout. However, the combination of habitat quality and fragment size may be more important to a population than either factor considered alone (Boecklen 1986, Angermeier and Schlosser 1989, Kershner et al. 1997). A population living in a habitat with low habitat quality probably requires more area than the same sized population living in a highly complex fragment. An understanding of this relation will become increasingly more important as habitats continue to be fragmented and reduced in size.

Efforts to enhance aquatic habitats have been greatly accelerated in the last five years. An example of one of the successful approaches is in Idaho. The Forest Plan for the Caribou National Forest contains numerous references to the importance, protection and improvement of habitats for Bonneville cutthroat trout (Caribou National Forest Plan). This plan provides specific language and direction for the protection of Bonneville cutthroat trout habitat. It identifies Bonneville cutthroat trout as a Management Indicator Species (MIS). MIS receive special consideration throughout the Forest Plan. For example, it specifies that impacts to important wildlife habitat will be minimized by designating wildlife management as the featured resource use. In addition, MIS habitat needs for each management area will be considered in all resource management prescriptions. Also, the habitat requirements for salmonids will be considered for all resource development projects. In addition to the Direction found in the Forest Plan, the Inland Native Fish Strategy (INFISH) has been adopted by the Forest. This strategy defines goals and objectives for the protection of native fish habitat and establishes standards and guidelines to implement defined goals and objectives.

The Caribou National Forest has been monitoring stream systems within the Bear River basin for the past 5 years. The Forest conducts both intensive and non-intensive monitoring of aquatic systems and associated riparian areas. Intensive monitoring includes site visits for various purposes that involve an evaluation of a significant portion of the stream or a concentrated evaluation of one or more stream segments. Hard data may or may not be collected, depending on the purpose of the visit or the findings of the assessment. Non-intensive monitoring is generally observations resulting from allotment inspections, compliance reviews, and so forth that may or may not include recorded documentation, unless problems are encountered or observed. Of the 30 streams within the Caribou National Forest known to contain core or re-established populations, nearly 90% have a condition better than functional at risk-moderate. Overall, the most important riparian areas and streams are functioning properly. Less than 10% are Non-functional or even at the low end of the Functional at risk. Trends are generally improving or static.

Recovery actions toward Bonneville cutthroat trout in Idaho are resulting through other avenues as well. The Federal Energy Regulatory Commission relicensing process for PacifiCorp Bear River projects began in the late 1990s, providing a potential for better stream management. In addition, in the mid 1990s, Federal Judge Dwyer directed the State of Idaho to improve water quality in Idaho streams. Actions such as these have provided for a direction of restoration of native fish such as Bonneville cutthroat trout in Idaho.

In Nevada, the BLM-Ely District wrote a habitat management plan (HMP) for Goshute Creek in 1968. It was revised in 1971 and again in 1980. The HMP focused primarily on protection and improvement of the Goshute Creek watershed for Bonneville cutthroat trout. Implementation of this plan has resulted in numerous habitat improvements benefitting Bonneville cutthroat trout in seven miles of Goshute Creek. The Egan Resource Management Plan (1987), amended for oil and gas (1994), addressed protection for Bonneville cutthroat trout and further implementation of the Goshute Creek HMP. Currently, BLM is addressing impacts of livestock, wild horses, and wildlife in the Goshute Basin and Cherry Creek allotments. Multiple-use decisions are expected to be issues in 2000 which will further address improving conditions in the Goshute Creek watershed. In addition, the BLM-Ely District is working with the Nevada Division of Wildlife, USFS-Ely Ranger District, and Great Basin National Park to implement expansion and improvement of habitat for BCT on eight streams in Snake and Spring valleys.

Threats

The Bonneville cutthroat trout is a unique subspecies of the cutthroat trout complex native to the Bonneville Basin. During the Pleistocene, Lake Bonneville and its drainage covered parts of Utah, Nevada, Idaho, and Wyoming. Historically, Bonneville cutthroat trout occurred throughout this drainage. With desiccation of ancient Lake Bonneville, Bonneville cutthroat trout became restricted to headwater streams and lakes with suitable trout habitat. Human activities such as water development, agricultural activities, energy development, mining, timber harvesting, grazing, over fishing and the introduction of non-indigenous species have directly impacted Bonneville cutthroat trout populations and altered the Bonneville Basin ecosystem. Because of the tenuous status of remaining Bonneville cutthroat trout populations and habitat, Bonneville cutthroat trout conservation efforts have been directed through Federal, state and local agencies.

The success of any conservation or recovery program depends on eliminating or reducing the impact of activities that threaten the species existence. The following list of threats to BCT is based on the five criteria considered for Federal listing of a species in Section 4(a)(1) of the Endangered Species Act of 1973, as amended. Under each of these criteria, specific activities threatening the persistence of BCT populations are described. Threats unique or extreme to drainages are discussed within individual GMUs.

I) The present or potential destruction, modification, or curtailment of habitat or range

The abundance and quality of the stream and lake habitat once available to Bonneville cutthroat trout have declined (Binns 1981, Duff 1988, Behnke 1992, Duff 1996). Historically, the primary causes of habitat loss were water development, livestock grazing, timber harvest, road construction, and energy development/mining activities.

(A) <u>Water Development.</u> Water development or diversion of stream flows which altered natural flow patterns has been one of the greatest causes of habitat loss. Water development has altered historic flow timing, duration and magnitude or completely de-watered stream segments. Diversions have fragmented stream habitats and disconnected tributary streams from mainstem rivers. Many unscreened diversions attract migrating fish into the diversion canals and these fish are lost during irrigation. These threats have ben quantified in Idaho.

Although there are over 20 known populations of BCT in Idaho, most appear to be isolated from each other. Isolation results from irrigation diversion dams on tributaries which form migration barriers, diversion of the majority of water from the stream channel, so that BCT can not pass through the bypass reaches, and loss of fish into unscreened irrigation diversion ditches. Additionally, on the mainstem Bear River, none of the hydropower or irrigation dams have fish ladders. Dams on the Bear River include Stewart near Pegram, Alexander near Soda Springs, Last Chance near Grace, Grace Dam near Grace, Cove Dam near Thatcher, and Onieda Dam near Preston.

Most tributaries to Bear Lake are completely de-watered during summer months when Bonneville cutthroat trout eggs would be incubating in stream gravels. Fifteen mile long St. Charles Creek, about 50 cfs at base flow, is the only consistent natural spawning stream feeding Bear Lake. However, when the lake is drawn down for irrigation, pre-spawn cutthroat trout are unable to get from the lake to the stream to spawn. In slightly less marginal years, adults may spawn, but eggs incubating in the gravel may be de-watered by mid-summer or low flows or stream temperatures may warm to lethal levels. Swan Creek is the only significant flow into Bear Lake. Although base flow is near 40 cfs, the stream has only 1 mile of spawning habitat. Most of the adult Bonneville cutthroat trout entering Swan Creek are captured and used in a spawn taking operation. Their progeny are stocked into Bear Lake as 6" fish.

(B) Livestock grazing. Grazing has been shown to negatively influence stream habitats and stream communities (Keller and Burnham 1982, Platts and Nelson 1985). Past and some current livestock grazing practices adversely impact BCT and their habitat. Poor grazing practices can alter sediment transport regimes and stream bank stability and can change water quality, substrate composition and channel structure. Specific ramifications include loss of pool habitat, reduced instream cover, increased water temperature, and loss of quality substrate required for spawning and food production. In Preuss, Dry, and Giraffe creeks, Idaho, habitat features in grazed sections were compared with those in ungrazed sections. Bank stability, the percentage of undercut banks, the width:depth ratio, the percentage of fine sediment indicated poor habitat quality compared with the ranges of values found in ungrazed streams; trout populations declined from 1980 to 1992 (Fallau 1992). Biologists on the Bridger-Teton National Forest have surveyed grazed streams in the Thomas Fork Bear River drainage and found that streambank stability was below the desired condition set in forest planning documents (Nelson 1993). Dufour (1992) concluded that grazing along Sugar Pine Creek, Utah, contributed to poor habitat quality.

The following is a summary of some of the actions that have been taken to reduce the threat of grazing to Bonneville cuthroat trout habitat:

Manti La Sal National Forest

The following trends in livestock management have occurred across the Manti-La Sal Forest to facilitate soil and vegetation recovery, in light of advancements in range science technologies and management approaches, and following a long history of Forest monitoring:

- Conversion of cattle or cattle/sheep “common use” to sheep on high elevation range.
- Conversion from “season-long” grazing systems to pasture rotation systems (deferred-rest rotation or rest-rotation)
- Establishment of stocking numbers to commensurate with suitable rangelands and forage production (i.e. those lands on which livestock grazing is not

precluded by instability, steep slopes, poor vegetation conditions, etc.)

- Reductions in total livestock use measured in animal unit months (AUM) has occurred. In 1965, the forest permitted 154,000 AUM's. In 1989, use was reduced to 123,000 AUMS. From 1991 to 1995, most allotments had temporary reductions to protect landscapes that were experiencing drought conditions.
- In 1990, the Forest Plan was amended to include conservative proper use criteria. Those criteria included upland forage use of 40-65% for cattle, a maximum of 45% on upland forage for sheep, 30-60% use of riparian key species by both classes of livestock, and direction that slopes over 40% are not suitable for cattle grazing.
- The effects of livestock grazing has been assessed and monitored on a wide variety of landscape parameters:
  - production site analysis (total ground cover, species composition, forage production)
  - Parker three-step (forage analysis, species composition, ground and canopy cover)
  - macroinvertebrates (water quality; inferred from Biotic Condition Index)
  - photopoint trend studies (including some comparisons with historic photo collections)
  - modified Hankin-Reeves Basin Wide Aquatic Habitat inventory (aquatic habitat)
  - Level II Riparian Inventories (riparian composition, condition)
  - Level III Riparian Inventories (transect method to assess greenline vegetation, stream conditions)
- The application of any or all of these methods depends on the resource issues, compliance history, landscape condition, and Forest Plan direction for a given allotment. All allotments have at least one production site analysis, and in most cases these sites have been monitored since the 1970's. The forest has a few production monitoring sites that have been monitored since the 1940's and 1950's.

Forest-wide rangeland summaries compiled for the forest plan concluded that sixteen percent of the suitable livestock range was in poor condition, 69 percent was in fair condition, and 12 percent was in good condition. Range trend analysis demonstrated that 5 five percent was in an "up-trend", 80 percent was "stable", and 14 percent was in a "down-trend".

The Forest has conducted Basin-Wide Habitat inventories since 1995 to assess occupied cutthroat habitats to determine "background" bank instability, and to quantify other habitat parameters within undisturbed streams. In streams within grazed watersheds on the La Sal Mountains, the forest has demonstrated that livestock-induced streambank instability is insignificant on the basin-wide scale and that water development are the primary impacts.

Caribou National Forest

The Caribou National Forest has, and will continue to modify grazing practices and take necessary permit actions to ensure aquatic resources are protected, not only in watersheds containing Bonneville cutthroat trout, but in all watersheds. The Forest entered into a conservation agreement in the Thomas Fork of the Bear River on the Montpelier-Elk Valley allotment to benefit Bonneville cutthroat trout. The agreement was signed in 1994. The intent and purpose was to protect aquatic habitat in Pruess, Dry and Giraffe Creeks. Since 1994, the Forest has spent about $20,000 for 14 new or reconstructed water developments; built 10.25 miles of new fence at a cost of $35,000; constructed 5 livestock exclosure fences at a cost of $12,000. In addition to the CA, the Forest has spent considerable time and effort in allotment administration throughout the Forest. Over the past 8 years, livestock have been reduced on several allotments in an attempt to better meet utilization standards and bring permitees into compliance with their existing permits. Many allotment plans have been updated and 83 (out of 140) are on a 15 year schedule for updates.

The NRCS has worked with some landowners on the Thomas Fork of the Bear River to improve habitat by planting riparian vegetation and constructing and maintaining livestock exclosure in sensitive riparian areas. Additionally, the US Fish and Wildlife Service recently (mid-1990s) purchased land including nearly 3.75 miles of the lower Thomas Fork of the Bear River. Livestock grazing no longer impacts the US Fish and Wildlife Service stream miles. Additionally, a new landowner recently purchased land immediately downriver from the US Fish and Wildlife Service property that contains the lower 0.5 miles of the Thomas Fork and an additional four to six miles on the north side of the Bear River downstream from the mouth of the Thomas Fork. This landowner has constructed fences on his property to keep livestock out of the riparian areas.

These efforts seem to be having a positive effect on aquatic habitat (Scully 1998). Riparian vegetation is improving. Greenline masurements are used to monitor the riparian vegetation. Stream channel conditions, however, are recovering at a slower rate. Habitat values from Pecuss and Giraffe Creeks indicated that these creeks have considerable substrate sediment. Fines constituted 48% of Preuss Creek sediment and 70% of Giraffe Creek sediment. For salmonid egg incubation to be productive, fine substrate sediment should be less than 30%.

Humboldt-Toiyabe National Forest

Several management actions undertaken during the 1990s have reduced the level of livestock grazing impacts to BCT habitat on the H-T N.F. The primary action was the incorporation of grazing standards and guidelines from the Humboldt Forest Plan Amendment Number Two into term grazing Annual Operating Permits in 1991. All BCT habitats on the H-T N.F. were categorized as Category 1 riparian areas either due to BCT occurrence or inclusion within the Mount Moriah Wilderness. Maximum allowable grazing levels in a category 1 riparian area are 45% on herbaceous vegetation for a deferred rotation grazing system. Enforcement of grazing standards has been phased in over several years.

Overall, cattle grazing in Hendry's and Hampton Creeks did not exceed forage utilization standards, but localized areas of overuse occurred, especially in the upper elevation headwater areas. This led to conflicts with recreationists, as well as increasing sedimentation into the creeks. Livestock management in Hendry's and Hampton Creeks is constrained by the rugged terrain, which also precluded changing the season of use of the upper areas to reduce impacts. The permittee waived the Term Grazing permit back to the Forest Service in December of 1999. This action implemented a Forest Plan Amendment dated 12/15/98, which closes these drainages to livestock grazing.

The reintroduction streams of Smith, Deep, and Deadman Creeks are in another allotment. Most of Deep Creek, major portions of Deadman Creek, and localized portions of Smith Creek have limited grazing impacts because vegetation or terrain limit access by cattle. Ironically, improved access into Deadman and lower Deep/Deadman Creeks for renovation treatments has increased grazing use of these areas. The headwaters of Deadman Creek and Smith Creek, and several segments of Smith Creek receive use levels that exceed grazing standards. H-T N.F. actions to reduce these grazing impacts have included improved monitoring and enforcement of grazing standards, including some temporary permit actions. Some of the problems along middle Smith Creek are due to cattle watering on the Forest while grazing adjacent BLM lands. The H-T N.F. plans to address this problem in the near future by working with the BLM to develop alternative water sources and improve gap fencing to restrict access to Smith Creek.

Aquatic macroinvertebrate monitoring has been conducted on all of these creeks in the Moriah Division, which provides some data on grazing impacts. In addition, the H-T N.F. and NDOW have cooperated on conducting stream surveys of these streams. Most have been completed, and Deep and Deadman Creeks will be completed in 2000. These stream surveys have helped quantify stream impacts from grazing.

Monitoring and enforcement of grazing standards and coordination and communication with the livestock permittee on the out-of-basin Pine/Ridge Creek has been improved since 1993, when several sheep bedding grounds were found along the creek. The EA and AMPs completed in 1996 established a maximum utilization level of 35% on these drainages due to the presence of BCT. This level is more restrictive than the maximum allowed by the Humboldt Forest Plan and has reduced grazing impacts in recent years.

The newly planted (in a barren stream) out-of-basin Deep Creek population is in a vacant allotment. The district has been taking steps to reduce feral and trespass livestock impacts in this area during the 1990s, and almost no livestock use has occurred along the perennial stream portion of this drainage above the gap fence in the last few years. The riparian area is making a dramatic recovery.

Fishlake National Forest

The Fishlake N.F. is currently in the process of conducting an Environmental Assessment for livestock grazing on Forest cattle allotments. The proposed alternative incorporates a stubble height grazing standard for herbaceous riparian species, and a percent utilization standard for woody riparian browse species. Standards require leaving more vegetation remaining in early seral status riparian areas. The Fishlake N.F. expects a gradual improvement of early seral status riparian areas towards mid-late seral status as the new grazing standards and guidelines are implemented.

One Forest BCT Creek, Sam Stowe Creek, was fenced to exclude livestock grazing in the early-mid 1990s. Prior to fencing the Forest worked with permittees to remove a small group of feral cattle in part of the canyon. About a mile of fence was constructed across the upper canyon to prevent future livestock access. Topography and thick riparian vegetation exclude cattle access in the mid and lower elevations. Riparian vegetation has responded vigorously and is now so thick as to make foot travel difficult.

As part of the INFRA process, Forest personnel monitored grazing exclosures and barrier fences along three grazed BCT creeks in 1999; Birch Creek, North Fork of North Creek, and Pine Creek. Exclosures and fences were generally found to be functional on Birch Creek and North Fork of North Creek and future maintenance needs were identified. Two of three exclosures on Pine Creek were found to be non-functional and of insufficient size to offer much protection to BCT habitat. Maintenance needs were identified and BCT population and grazing levels will be monitored in 2000, as well as identifying opportunities to expand the current exclosures or develop other habitat improvement measures.

Forest water quality and aquatic macroinvertebrate monitoring is conducted on selected streams yearly, including some BCT watersheds. This monitoring data provides a baseline of water quality conditions and has identified several stream reaches that are not up to Forest Plan standards, so that improved management can be undertaken in these reaches.

(C) Timber Harvest. Logging has been reported to significantly affect salmonids. Though logging practices probably influenced the quality of habitat in the historical range, there is little evidence of logging effects in the current range. Historical effects included railroad tie driving in the headwater streams of the Bear River. Efforts to reduce this threat include:

Caribou National Forest

The Caribou National Forest has taken considerable effort to minimize impacts to aquatic resources resulting from timber harvest activities. Every phase of the process is carefully scrutinized and evaluated, from planning to implementation, to post-harvest reviews. Full interdisciplinary teams containing hydrologists, biologists, soil scientists, engineers, and foresters are assembled for every project. Every harvesting unit is evaluated and every access road is reviewed to insure and assure locations and construction specifications are those needed to minimize environmental damage. In the past, many roads were located in areas that caused damage to the ecosystem. It is the Forest's policy to relocate or repair these less-than-acceptable roads where opportunities exist. Many miles of roads have been relocated or repaired over the last decade. The result has been a net reduction in miles of roads that impact aquatic resources. During the harvest period, Timber Sale Administrators and road construction inspectors continuously monitor contractors to ensure contract specifications and environmental constraints are enforced. The Forest has the capability and ability of terminating or suspending logging operations if any contract clause is violated. There has not been a need to take such an action in the recent past. This is largely due to the fact that inspectors and administrators are on the job and have the capacity to take any action needed to prevent environmental damage. The results of these steps have been verified through the comprehensive Best Management Practices review conducted by the Forest on an annual basis. The reviews are specified by the Memorandum of Understanding with the State of Idaho under the Idaho Forest Practices Act. This MOU specifies that Federal Agencies conduct internal reviews of Best Management Practices annually by examining a representative sample (target 10%) of timber related projects on lands they administer and prepare written evaluation reports. The Caribou National Forest has generally exceeded this standard. Annual reviews are conducted on more than 10% of ongoing or recently closed sales, and review teams not only consist of Forest personnel but individuals from Idaho State agencies such as the Fish and Game Department and the Department of Environmental Quality. Representatives from Environmental Organizations and the timber industry have also been invited. No major environmental concerns have been found as a result of the inspections, though some minor deficiencies have been corrected. This process has generally worked extremely well.

An example of the extensive efforts that the Caribou National Forest has undertaken to protect Bonneville cutthroat trout associated with a timber sale occurred at Bailey Creek. This timber sale was specifically referenced in the Petition to list Bonneville cutthroat trout as lacking in quality, content and integrity. A watershed analysis was completed in association with this project. This analysis was completed using the 6-step process outlined in the Ecosystem Analysis at the watershed scale- Federal Guide for Watershed Analysis, revised in 1995 and referenced in INFISH interim direction. In analyzing the alternatives for this project, a thorough analysis of each alternative was conducted which included several intensity levels of mitigation and protection for each alternative. The preferred alternative included the most intensive level of protection for aquatic resources. This intensity level included Best Management Practices, Forest Plan Standards and Guidelines, INFISH, IFPA and protection measures suggested by the Idaho Department of Environmental Quality. The analysis concluded no adverse impacts would occur to any streams within the sale area, and no measurable impacts would occur to downstream areas. Ultimately, the project was delayed due to issues associated with roadless areas. This example, however, demonstrates the commitment of the forest to adhere to protective measures concerning timber harvest and Bonneville cutthroat trout protection.

A second example of Caribou National Forest commitment to conserve Bonneville cutthroat trout in association with timber harvest is the St. Charles Creek timber salvage project. Again, INFISH was used as a basis for mitigation and protection measures. INFISH allows modification of objectives via thorough watershed analysis. Because of the nature of the problem in the canyon, it was necessary to manage trees in a Category 1 riparian habitat conservation area. INFISH guidelines permit this activity provided the necessary analysis is completed. The analysis was conducted and the project was implemented with no adverse impacts to St. Charles Creek or Bear Lake. Further, the long-term health of the vegetation within the canyon has been improved, reducing the chances of a catastrophic wildfire or insect infestation occurring within the drainage.

Fishlake National Forest

Currently only one BCT watershed, Manning Creek, has ongoing and proposed commercial timber harvest activities. The proposed timber harvests are intended to restore aspen woodlands by addressing conifer invasion of aspen stands and treating decadent aspen stands with limited reproduction. They are being evaluated in the NEPA process while preparing the Monroe Mountain Ecosystem Restoration Project Environmental Impact Statement (EIS). Public and agency review of the draft EIS revealed potential fisheries and watershed concerns. In response the Fishlake N.F. is working to more fully address the matter. Existing fisheries conditions will be better documented, a new alternative with less road construction is being developed, and analysis of the potential impacts of the proposed harvests will be strengthened. The goal is to develop an alternative and mitigation measures that will allow land treatments to restore upland ecological health while eliminating or minimizing negative impacts to water quality and fisheries. The interdisciplinary team includes a hydrologist and fisheries biologist.

(D) Road Construction. Road construction may affect Bonneville cutthroat trout in two ways. First, during construction sediment is generated that may reach streams during runoff. Native surface roads are particularly susceptible to short-term and long-term erosion from road surfaces and drainage ditches. The second influence is the blockage of Bonneville cutthroat trout migration in streams by poorly designed and placed road culverts. In streams throughout Idaho, Utah, and Wyoming, road culverts hinder upstream passage of trout. By preventing upstream migration, culverts effectively isolate small populations. This may have a significant effect on the long-term genetic characteristics of the subspecies.

Humboldt-Toiyabe National Forest

The majority of BCT habitat on the H-T N.F. is within the Mount Moriah Wilderness and is not generally influenced by roads. The out-of-basin Pine/Ridge Creek is not influenced by the two-track that accesses it. The newly planted out-of-basin Deep Creek population is in a roadless area and not influenced by roads.

There is some sediment production by a poorly located two-track (non-constructed) way in the headwaters of Smith Creek that could be reduced through road hardening, realignment, or closure of a short stretch along the creek.

The only creek out of 7 on the H-T N.F. with moderate potential for road impacts is Hampton Creek, which has a two-mile road along the length of the populated section of the creek. This native surface road is of generally good condition, and the H-T N.F. has had a policy to avoid unnecessary maintenance, which stirs up fine dust, which then erodes from the road surface. After these fines are blown or washed from the road surface the remaining surface is relatively hardened. When Millard Co., Utah, graded the road in 1995 without consultation/approval from the Forest, some sediment was pushed into the stream channel in one location and several drainage ditches were left as potential sediment contributors to the channel. The H-T N.F. required the placement of straw bale sediment control structures in several of the drainage structures and along several areas of unstable fill slope. In addition, the entire road surface and all unstable fill slopes were hand broadcast seeded. These measures have reduced the sediment contribution from the road to Hampton Creek. An additional measure to reduce road impacts to this population was the movement of BCT upstream above the end of the road in 1997 and 1998 in an attempt to expand this population.

Fishlake National Forest

Newly constructed roads and road maintenance in conjunction with proposed timber harvest activities in section (C) are also being evaluated in the Monroe Mountain Ecosystem Restoration Project EIS. All new roads and road maintenance in the treatment area within the BCT watershed will be designed to contribute minimum sediment to the stream.

The Fishlake N.F. is also beginning to coordinate planned road maintenance between the Forest engineering staff and fisheries biologist, to allow fisheries input to road maintenance planning and to identify road problems that can be fixed to improve fisheries conditions in BCT watersheds.

(E) To date, energy development and mining activities have had effects in some areas, and impacts have been localized. Potential threats include mine tailing leaching, especially during spring runoff, road building with associated sedimentation and migration corridor blockage, and water depletions for dust control, maintenance activities, and fossil fuel exploration. Historically, mining severely affected streams in the West (Nelson et al. 1991). Currently, there are few reported mining effects on the remaining populations of Bonneville cutthroat trout with the possible exception of Hendry's Creek and Hampton Creek, Nevada (Haskins 1993).

II) Disease, predation, competition and hybridization

Sportfish stocking programs have been responsible for the introduction of many nonnative species that impacted native cutthroat trout. For example, within the Bonneville Basin in Utah, over 1,039 waters have been stocked during the last 60 year period. Many of these waters were only stocked once (approximately 145) while a majority of these waters were stocked fifteen times or fewer (Figure 4). For a majority of the stocked waters, fish introductions were initiated over 40 years ago (Figure 5). In addition, the level of stocking was relatively low for a majority of the waters (Figure 6).

During the past 50 years, the Idaho Department of Fish and Game has authorized fish stocking in much of the Bear River drainage. One reason for stocking was the decline of wild native cutthroat trout populations from a variety of causes: irrigation practices, stream bank and channel degradation, hydro-power development, a demand by anglers for more fish than streams could produce on a sustainable basis. Species stocked were rarely Bonneville cutthroat trout. The most commonly stocked fish has been rainbow trout (8 in or larger) and Yellowstone cutthroat trout. Additionally, brook trout were stocked into some of the tributaries. More recently, brown trout were stocked into the mainstem of the Bear River. However, brook trout stocking has not occurred in the Bear River drainage since 1991 and brown trout stocking in the mainstem of the Bear River was discontinued in 1998.

It appears that Yellowstone cutthroat trout stocked as fry or small fingerlings in tributaries, survived poorly and probably contributed very little progeny. The reason for this is that they were ill adapted to the receiving environment. The Yellowstone cutthroat trout were adfluvial and adapted to cold clear water. In Idaho, they were stocked primarily into streams without any connections to lakes, streams with man made migration barriers, and streams with channel and riparian alterations.

The stocked catchable size rainbow trout also seemed to survive poorly. It is probable that interbreeding with rainbow trout was minimized because the spawning times of hatchery reared rainbow trout had been artificially altered in the hatchery system. To further reduce the chance of hybridization, the Idaho Department of Fish and Game has altered its stocking program to include only sterile rainbow trout in a reduced number of sites where there is sufficient fishing effort and demand for hatchery trout. IDFG will continue to stock rainbow trout into many irrigation reservoirs in the Bear River drainage. There is little or no spawning habitat associated with most of these reservoirs.

Idaho Department of Fish and Game is trying to coordinate its stocking program with native species in mind. They are not cross-planting native species into non-historical waters. They are stocking sterile fish in waters currently occupied, or potentially occupied by native species in areas where warranted by high fishing pressures. These fish may compete for available habitat, but additional hybridization will not occur. Further, these nonnative fish may reduce fishing pressures on native fish.

Nevada Division of Wildlife ceased stocking of nonnative salmonids in waters containing Bonneville cutthroat trout over 40 years ago. Furthermore, this activity is now prohibited by Nevada Board of Wildlife Commissioners Policy.

(A) Hybridization. Because both native (Behnke 1992) and nonnative (Duff 1988) salmonids have been stocked throughout the historic range, hybridization poses a significant threat to the genetic integrity of BCT populations. BCT can hybridize with rainbow trout and other cutthroat subspecies in some situations. Hybridization with nonnative fish leads to an eventual swamping of the native BCT genotype. Hybridization among cutthroat trout subspecies can result in the loss of the characteristic BCT phenotype (Kershner 1995).

(B) Competition. Several studies suggest that introduced salmonids will competitively replace native cutthroat species (Griffith 1988, Kershner 1995). However, the extent to which competition is a threat has not been thoroughly assessed.

(C) Predation. Predation is a potential threat (especially to early life stages) where other predaceous fish occupy the same area as BCT.

(D) Disease. The recent introduction of whirling disease into Utah river systems poses the greatest disease threat. The parasites plestophera and epitheliocystis have been found in the Bonneville Basin drainages as well. BCT may be more vulnerable to disease and parasites when exposed to adverse conditions and unnatural or human induced forces. Currently, the number of streams containing individuals that have the disease is small (Appendix V).

Transmission of diseases to wild cutthroat trout populations through hatchery-reared fish stocking is the most significant threat. In Nevada, Utah, and Wyoming, statewide policies and regulations address fish health status, disease certification of stocked and imported fish, and stocking protocols, which are designed to reduce disease threats. Fish testing positive for whirling disease in Utah and Wyoming will not be stocked.

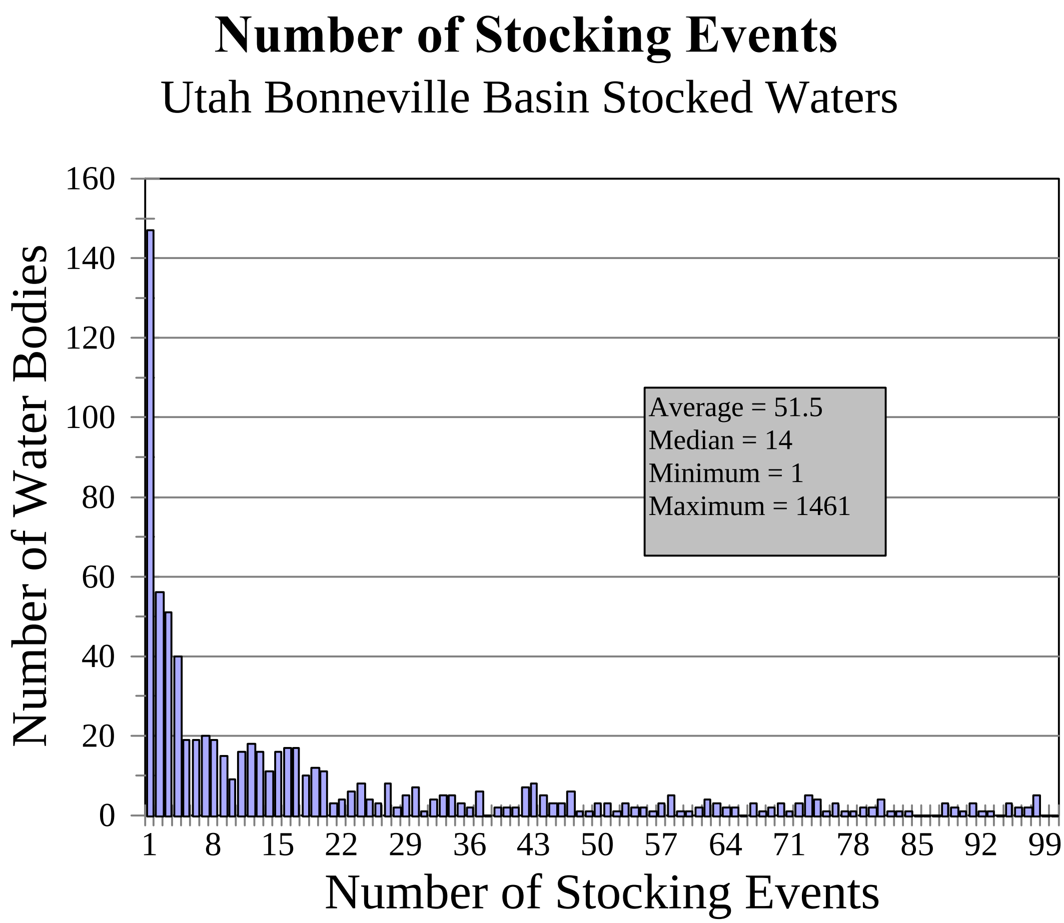

Figure 4. Number of Utah waters and the number of times each of those waters was stocked.

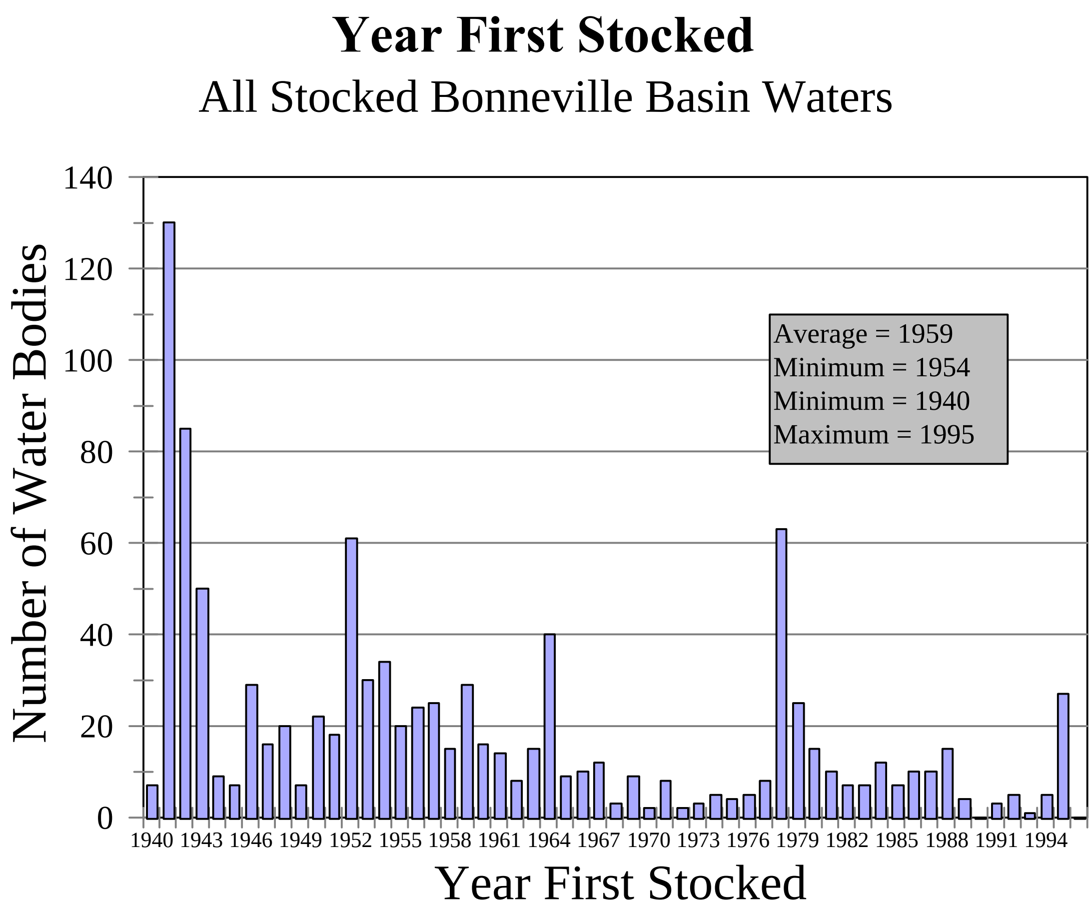

Figure 5. Number of Utah waters and the corresponding year those waters were first stocked.

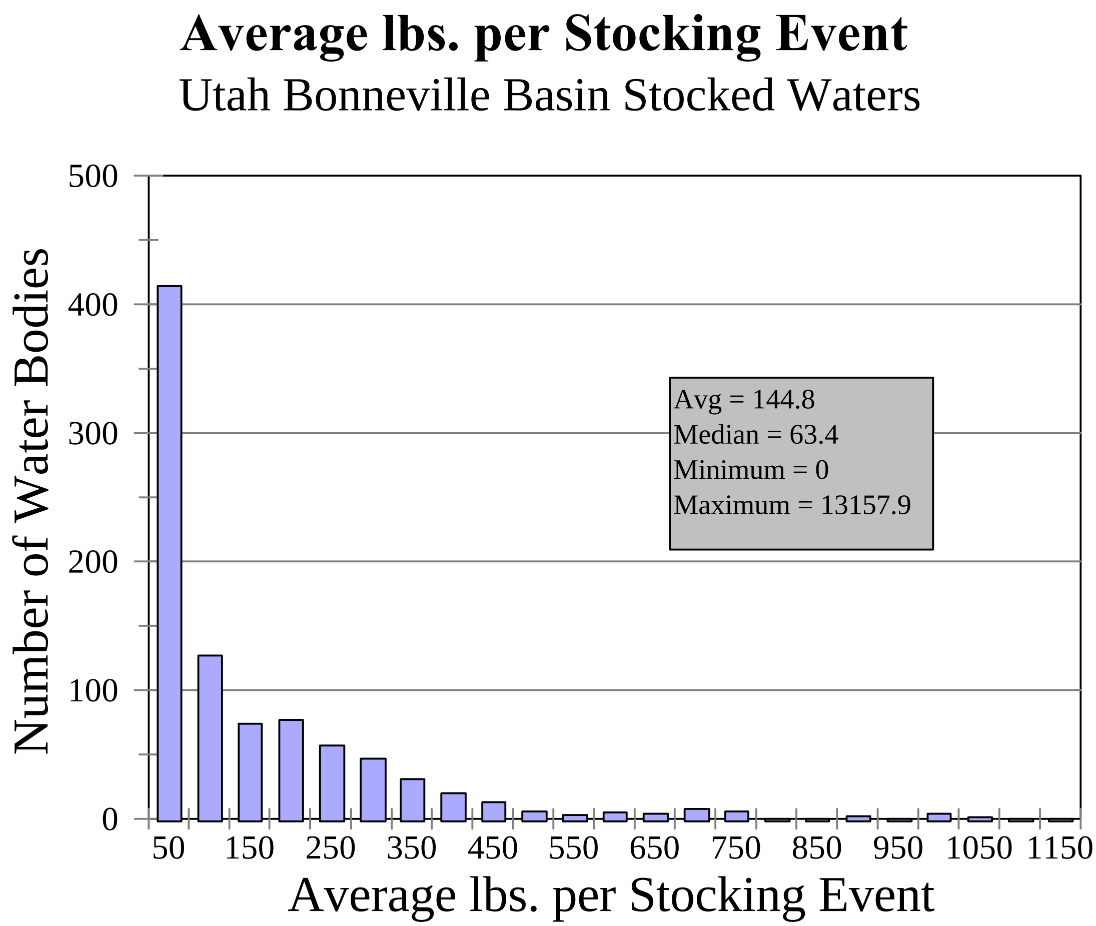

Figure 6. Average number of pounds stocked per stocking event in Utah waters over past 50 years.

III) Over harvesting for commercial, recreational, scientific, or educational purposes

Angling has been shown to depress populations of cutthroat trout (Behnke 1992). Unrestricted angling can effectively displace cutthroat trout populations where they coexist with other salmonids, because cutthroat trout are generally easier to catch (Behnke 1992). Cutthroat trout may be more susceptible to angling than other trouts. Binns (1981) noted that BCT were easy to catch but that catchability was variable. In Bear Lake, vulnerability to harvest was highest during the winter (Nielson and Lentsch 1988), probably because of increased angler access. State agencies have restricted angling to protect Bonneville cutthroat trout. Idaho and Utah have closed tributaries of Bear Lake to angling during spawning, and Idaho and Wyoming have imposed regulations to reduce harvest in tributaries of Bear Lake containing Bonneville cutthroat trout. The State of Utah currently enforces angling restrictions in portions of BCT range to protect this subspecies (Nielson and Lentsch 1988).

IV) Inadequate regulatory mechanisms

Bonneville cutthroat trout is designated as a special status species by Idaho, Nevada, Utah, and Wyoming. The fish is also classified as a sensitive species by the Forest Service, Bureau of Land Management, and Great Basin National Park. As such, populations are protected by state regulations concerning stocking restrictions, fishing closures, harvest and gear restrictions, stream barriers to fish passage, and disease control. Further Federal protection is contained in the Clean Water Act, NEPA, and other Federal Mandates such as the U.S Forest Service Sensitive Species and Wilderness Areas programs.

V) Other natural or human induced factors affecting the continued existence of BCT

Natural climatic events such as flood, fire and drought may threaten specific populations of BCT; however, these forces only pose threats as long as BCT range remains fragmented and populations are small and when they are combined with other poor land use practices, such as overgrazing or some timber harvests. Small, isolated populations are more susceptible to catastrophic loss and impacts from demographic stochasticity.

One of the most imposing threats to the persistence of BCT at this time is the socio-political pressure associated with managing a species recognized as sensitive by state and Federal agencies. Existing or potential sensitive recognition has endowed BCT with a perceived status which elicits public and governmental resistance to BCT conservation and management. This socio-political pressure can block conservation efforts at the state and local levels.

RANGE-WIDE CONSERVATION

The range-wide approach for conservation of Bonneville cutthroat trout is based on the conservation strategies and management plans developed by the resource management agencies, sound conservation guidelines and principals, and current information on the status and threats to the species. The range-wide goals, objectives, and management actions represent a conservation strategy, based on all available information, for Bonneville cutthroat trout within the species historic range. This information is presented in a broad context so that the actions needed at the range-wide scale can be described. Detail information on specific goals, objectives, and management actions needed to conserve Bonneville cutthroat trout at the state and GMU scale is contained in three conservation strategies (Lentsch et al. 1997, Haskins et al. *draft*, Scully et al. *draft*), five species management plans (Haskins 1987, Remmick et al. 1993, USDI National Park Service 1999), and fourteen land management plans (Appendix I). That detailed information is not repeated here.

Goal

The primary goal of Bonneville cutthroat trout conservation is to ensure the long-term existence of Bonneville cutthroat trout within its historic range by coordinating conservation efforts among states, tribal governments, Federal management agencies, and other involved parties.

Objectives

Two objectives have been identified that are required to meet the goal of this strategy. Each general objective has specific components that must also be met. These objectives were developed and quantified using the best available expertise and information. A viability analysis is outlined in the conservation strategy that will further define the objectives.

I) Manage for 191 conservation populations of Bonneville cutthroat trout.

- A) Establish and/or maintain a minimum of 5 conservation populations inhabiting 70,773 surface acres in the appropriate proportion and quality of lentic waters within the historic range (Table 2).

- B) Establish and/or maintain a minimum of 186 conservation populations inhabiting 1,593 stream miles in the appropriate proportion and quality of lotic habitats within the historic range (Table 2).

- C) Establish and/or maintain a minimum of one meta-population within each GMU.

II) Eliminate the threats to Bonneville cutthroat trout that: (1) warrant listing as a sensitive species by state and Federal agencies, and (2) may warrant listing as a threatened or endangered species under the Endangered Species Act of 1973, as amended.

A) Eliminate or significantly reduce threats that cause any present or potential destruction, modification, or curtailment of habitat or range.

1) Maintain or restore water quality to a degree that provides for stable and productive riparian and aquatic ecosystems;

2) Maintain or restore stream channel integrity, channel processes, and the sediment regime (including the elements of timing, volume, and character of sediment input and transport) under which the riparian and aquatic ecosystems developed;

3) Maintain or restore instream flows to support healthy riparian and aquatic habitats, the stability and effective function of stream channels, and the ability to route flood discharges;

4) Maintain or restore the natural timing and variability of in and out-of-channel stream flows, including meadows and wetlands;

5) Maintain or restore the diversity and productivity of desired plant communities in riparian zones;

6) Maintain or restore riparian vegetation to:

a) provide an amount and distribution of large woody debris characteristics of natural aquatic and riparian ecosystems;

b) provide adequate summer and winter thermal regulation within the riparian and aquatic zones;

c) help achieve rates of surface erosion, bank erosion, and channel migration characteristic of those under which the communities developed;

7) Maintain or restore riparian and aquatic habitats and conditions necessary to foster the evolution of distinct populations segments within specific geo-climatic regions;

8) Maintain or restore habitat to support populations of well-distributed plants, vertebrates, and invertebrates that contribute to the viability of riparian dependent communities.

B) Eliminate or significantly reduce threats caused by disease, predation, competition and hybridization.

1) Maintain or restore populations in a condition where hybridization, competition, and predation does not significantly alter the ecological processes under which the species evolved.

2) Maintain or restore populations in a condition where disease does not significantly alter the ecological processes under which the species evolved.

C) Eliminate all impacts associated with over harvesting for commercial, recreational, scientific, or educational purposes.

1) Maintain or restore population numbers and demographics in a condition that is not significantly altered from those population characteristics under which the species evolved.

D) Eliminate or significantly reduce all threats caused by inadequate regulatory mechanisms.

1) Enhance or maintain regulatory mechanisms that prevent or curtail destruction of habitat.

2) Enhance or maintain regulatory mechanisms that prevent the introduction or spread of nonnative species that exhibit detrimental interactions (hybridization, competition, predation) with Bonneville cutthroat trout.

3) Enhance or maintain regulatory mechanisms that prevent the introduction or spread of detrimental diseases.

4) Enhance or maintain regulatory mechanisms that prevent commercial harvest.

5) Enhance or maintain regulatory mechanisms that prevent impacts associated with recreational angling.

6) Enhance or maintain regulatory mechanisms that prevent impacts associated with scientific and educational collections

E) Eliminate and/or significantly reduce detrimental impacts associated with threats caused by other natural or human induced factors affecting the continued existence of the species.

Conservation Actions

The following section outlines a general list of actions that eliminate or reduce threats to Bonneville cutthroat trout persistence. Each general action includes a list of specific actions which may be implemented. The specific detailed information on the these actions is contained in the conservation strategies (Lentsch et al. 1997, Haskins et al. 1999, Scully et al. 1994), species management plans (Haskins 1987, Remmick et al. 1993, USDI National Park Service 1999), and land management plans (Appendix I). Because the potential for Bonneville cutthroat trout restoration varies among GMUs, actions will be prioritized and implemented within GMUs.

Objective I) Expand the number and/or range of a large enough number of genetically appropriate populations within a significant representative portion of the historic range to ensure the long-term existence of the species.

Action: Determine Bonneville cutthroat trout population demographic and life history characteristics.

a) Locate and assess additional Bonneville cutthroat trout populations and confirm population status. Over 115 streams need to be surveyed to determine the distribution of Bonneville cutthroat trout (Appendix III).

b) Analyze habitat fragmentation to determine the degree of connectedness required for meta-population persistence.

c) Determine the number of individuals and habitat requirements needed to maintain each conservation population.

Action: Genetically characterize populations of Bonneville cutthroat trout.

a) Improve and refine identification techniques for Bonneville cutthroat trout.

b) Conduct standardized genetic surveys of Bonneville cutthroat trout populations within GMUs:

i) Identify populations to sample
ii) Prioritize populations to sample
iii) Collect samples
iv) Prioritize samples for meristic analysis
v) Conduct meristic analysis
vi) Prioritize samples for molecular analysis
vii) Conduct molecular analysis
viii) Prepare reports
ix) Peer review reports
x) Summarize all relevant information

xi) Make recommendations on population designations
xii) Get interagency agreement on designations

c) Rank and prioritize introgressed populations based on the degree of hybridization.

Action: Protect the genetic integrity of Bonneville cutthroat trout populations.

a) Establish introduction, reintroduction and introduction protocols based on criteria of maximizing genetic integrity among GMU's and maximizing genetic variability within populations.

Action: Expand Bonneville cutthroat trout populations and distribution through introduction or reintroduction from either transplanted or broodstock Bonneville cutthroat trout.

a) Establish protocols and criteria for introduction and reintroduction of Bonneville cutthroat trout based on conservation objectives or sportfishing objectives.

b) Identify and develop broodstock sources including identification of wild sources, disease certification, rearing facilities, and protocols for taking wild fish and eggs.

c) Reintroduce Bonneville cutthroat trout populations into appropriate streams/lakes. Where feasible, identify areas to restore Bonneville cutthroat trout meta-populations.

d) Establish a Bonneville cutthroat trout hatchery program within the state hatchery program that will be responsible for cultivation of Bonneville cutthroat trout to be used in introduction, reintroduction and stocking programs for conservation and sportfishing populations.

Action: Monitor Populations.

a) Develop and implement Bonneville cutthroat trout population monitoring protocol to determine program effectiveness.

b) Evaluate conditions of populations using baseline data.

Objective II) Eliminate the threats to Bonneville cutthroat trout that: (1) warrant listing as a sensitive species by state and Federal agencies, and (2) may warrant listing as a threatened or endangered species under the Endangered Species Act of 1973, as amended.

A) Eliminate or significantly reduce threats that cause any present or potential destruction, modification, or curtailment of habitat or range.

Action: Describe Bonneville cutthroat trout habitat requirements.

a) Identify Bonneville cutthroat trout habitat requirements and conditions through surveys and studies of hydrologic, hydraulic, biologic and watershed features.

   i) flow quantity, timing, and duration;
   ii) riffle to pool ratios and substrate size and composition;
   iii) sympatry and macroinvertebrate community composition and ecology, and
   iv) water quality, riparian condition, percent coarse woody debris and percent undercut bank.

Action: Enhance and maintain habitat.

a) Enhance and/or restore connectedness and opportunities for migration to disjunct populations where possible. Migratory corridors should retain some degree of their natural physical and biological condition to enable migration and gene flow.

b) Enhance fish passage in designated waters throughout the range of Bonneville cutthroat trout. Actions may include culvert replacements, improved road drainage, road decommissioning, road surfacing with gravel or paving, and stabilizing road fill and cut-slope areas.

c) Restore altered channel and habitat features to historic conditions. Actions may include stream bank stabilization, large woody debris introduction, and vegetation planting for improved riparian areas.

c) Restore natural hydraulic and sediment regimes, restore floodplain and riparian function, and expand available spawning and rearing habitat.. This action includes securing instream flow needs through water acquisition or regulation.

d) Develop a mitigation protocol for proposed water development and future habitat alteration, where needed.

e) For land management activities to enhance and maintain habitat, consider utilizing the guidelines listed in the Inland Native Fish Strategy (USFS 1995, Appendix VI) as they relate to the following management activities:

   i) Timber Management
   ii) Roads Management
   iii) Grazing Management
   iv) Recreation Management
   v) Minerals Management
   vi) Fire/Fuels Management
   vii) General Riparian Area Management

viii) Watershed and Habitat Restoration
ix) Fisheries and Wildlife Restoration

Action: Monitor Habitat Quantity and Quality.

a) Develop and implement habitat monitoring protocol to determine program effectiveness.

b) Evaluate conditions of habitats using baseline data.

B) Eliminate or significantly reduce threats caused by disease, predation, competition and hybridization.

Action: Selectively control nonnative species.

a) Determine where detrimental interactions, such as hybridization, competition and disease occur or could occur between Bonneville cutthroat trout and sympatric nonnative species.

b) Control or modify stocking, introductions, spread of nonnative aquatic species where appropriate. Implement measures to ensure the spread of disease (i.e. whirling disease) is prevented through disease certification and adequate stocking and fishing regulation.

c) Eradicate or control detrimental nonnative fish where feasible. Targeted species may include brook trout, rainbow trout, brown trout and some hybrid populations. This action includes construction of fish barriers to prevent nonnative fish movement where presence of nonnative species preclude reestablishment of migratory corridors. This action also includes the limited use of piscicides (i.e. rotenone) to remove competing or hybridizing nonnative salmonids with intent to restore and maintain Bonneville cutthroat trout populations in drainages within their natural range. Standard procedure for chemical stream treatment will include investigation of the feasibility and effectiveness of post-treatment macroinvertebrate community restoration.

Action: Control and prevent the spread of whirling disease.

a) Implement measures that control the spread of whirling disease.

C) Eliminate all impacts associated with over harvesting for commercial, recreational, scientific, or educational purposes.

D) Eliminate or significantly reduce all threats caused by inadequate regulatory mechanisms.

Action: Enforce regulatory mechanisms to ensure compliance.

a) Enhance or maintain regulatory mechanisms that prevent or curtail destruction of habitat.

b) Enhance or maintain regulatory mechanisms that prevent the introduction or spread of nonnative species that exhibit detrimental interactions (hybridization, competition, predation) with Bonneville cutthroat trout.

c) Enhance or maintain regulatory mechanisms that prevent the introduction or spread of detrimental diseases.

d) Enhance or maintain regulatory mechanisms that prevent commercial harvest.

e) Enhance or maintain regulatory mechanisms that prevent any impacts associated with recreational angling.

f) Enhance or maintain regulatory mechanisms that prevent any impacts associated with scientific and educational collections

E) Eliminate and/or significantly reduce detrimental impacts associated with threats caused by other natural or human induced factors affecting the continued existence of the species.

Action: Develop and implement a public information and education program.

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APPENDICES

APPENDIX I

List of Land Management Plans

United States Department of Agriculture
Forest Service
National Forest Plans

- Bridger-Teton National Forest
- Caribou National Forest
- Dixie National Forest
- Fishlake National Forest
- Humboldt National Forest
- Manti-La Sal National Forest
- Uinta National Forest
- Wasatch-Cache National Forest

United States Department of Interior
Bureau of Land Management
Resource Area Plans

- Nevada State Office
  - Schell Management Framework Plan
- Utah State Office
  - Cedar Beaver Garfield Antimony Resource Management Plan
  - House Range Resource Management Plan
  - Pony Express Resource Management Plan
- Wyoming State Office
  - Kemmerer Resource Management Plan

United States Department of Interior
National Park Service
National Park Plan

- Great Basin National Park Bonneville Cutthroat Trout Reintroduction and Recreational Fisheries Management Plan

APPENDIX II

List of Technical Experts Participating in Bonneville Cutthroat Trout Conservation

Utah Division of Wildlife Resources
- Chuck Chamberlain
- Dale Hepworth
- J. Michael Hudson
- Bryce Nielson
- Tom Pettengill
- Kent Sorenson
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- Fred Mangum
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- Steve Phillips
- Steve Robertson
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Maureen Wilson

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Academia
Dr. Jeff Kershner
Dr. Robert Behnke
Dr. Bob Hilderbrand
Dr. Paul Spruell
Dr. Dennis Shiozawa
Dr. Paul Evans

APPENDIX III

Populations to be surveyed in Utah

Bear Lake GMU

Swan Creek	2000
Laketown Creek	2000

Bear River GMU

Christmas Tree	2006
East Fork	2006
Boundary Creek	2006
Left Hand Fork	2006
Left Hand FK 8	2006
Right Hand Fork	2006
Right Hand FK 1	2006
Right Hand FK 2	2006
West Basin Creek	2007
West Basin Creek Fork 1	2007
West Basin Creek Fork 2	2007
Mid Basin Creek	2007
Mid Basin Creek Fork 1	2007
Mid Basin Creek Fork 2	2007
Gold Hill Creek	2006
Teal Lake Creek	2006
Mid Basin Creek West Fork	2005
Mill City Creek	2005
Mill City Cr 25	2005
Coyote Hollow	2005
Humpy Creek	2006

Meadow Creek	2006
Box Elder Creek	2003
Blacksmith Fork	2003
Left Fork Blacksmith Fork	2003
Saddle Cr.	2003
Rock Creek	2003
Curtis Creek	2003
Mill Creek	2003
Sheep Creek	2003
Green Creek	2003
East Fork Little Bear	2005
Pole Creek	2005
Scare Canyon	2005
Cinnamon Creek	2005
South Fork Little Bear	2005
Davenport Creek	2005
Pole Creek	2005
Bald Head Cr.	2005
Fish Creek	2005
Wellsville Cr.	2005
Woodruff Creek	2000
Big Spring Fork	2000
Birch Creek	2001

Northern Bonneville GMU

Mill Creek	2004
Wheeler Creek	2004
Wolf Creek	2004

Broadmouth Creek	2004
Cutler Creek	2004
Cobble Creek	2004
Middle Fork	2004
Gertsen Creek	2004
South Fork	2004
Beaver Creek	2004
Dry Bread	2004
Right Fork Dry Bread	2004
Weber River (headwaters)	2002
Strawberry Creek	2000
Dry Creek	2000
Gordon Creek	2000
Cottonwood Creek	2000
Arbuckle Creek	2000
Peterson Creek	2000
Dalton Creek	2000
Smith Creek	2000
Line Creek	2000
Deep Creek	2000
North Fork Deep Creek	2000
Farrels Creek	2007
Cataract Creek	2007
Sheep Canyon	2001
Right Hand FK	2001
Porcupine Creek	2001
Three Mile Cyn	2001
Pine Canyon	2001

Echo Creek	2001
Sawmill Creek	2001
Rees Creek	2001
Porcupine Creek	2007
Florence Creek	2007
Pecks Canyon	2001
Alexander Creek	2001
Neel Hollow	2001
Beaver Creek	2003
Shingle Creek	2003
Slate Creek	2003
Yellow Pine Cr.	2003
Whites Creek	2003
Nobletts Creek	2002
White Pine Creek	2002
Maxwells Creek	2002
Pullem Creek	2002
Young Creek	2002
Stillman Creek	2002
Smith-Morehouse Cr.	2002
Red Creek	2002
Larabee Creek	2002
Moffit Creek	2002
East Fork Moffit	2002
Dry Fork	2002
Middle Fork	2002
City Creek	1999
Red Butte Creek	1999

Red Butte Reservoir	1999
Lamb’s Creek	1999
Little Dell Reservoir	1999
N. Fork American Fork Creek	1999
Sixth Water Creek	1999

West Desert GMU

Birch Creek	1999
Trout Creek	1999
Toms Creek	1999

Southern Bonneville GMU

Asay Creek	2000
Birch Creek	1999
Pole Canyon Creek	1999

APPENDIX IV

Populations identified as Bonneville cutthroat trout, designation of management status, and identification of source populations for brood sources or transplant sources.

Bear Lake GMU

Water ID	***Water Body***	***Population Identification***[1]	***Management Designation***[2]	***Source Population***[3]
IV 405	Bear Lake	Core	Conservation	Source
IV AQ 120B	Swan Creek	Confirmed	Conservation	Source
IV AQ 120C	Big Spring Creek	Confirmed	Conservation	
IV AQ 120D	Laketown Creek	Reintroduced	Conservation	
IV AQ 120F	North Eden Creek	Core	Conservation	Source
IDAHO	St. Charles Creek	Tentative		

Bear River GMU

Water ID	***Water Body***	***Population Identification***[1]	***Management Designation***[2]	***Source Population***[3]
IV AQ 01	Bear River	Confirmed	Conservation	
IV AQ 040A 03A1 01	Saddle Creek	Tentative		
IV AQ 040A 03B 01	Rock Creek	Tentative		
IV AQ 040A 03C 01	Curtis Creek	Confirmed	Conservation	
IV AQ 040A 08A 01	Spawn Creek	Confirmed	Conservation	
IV AQ 040A 12 01	Little Bear Creek	Confirmed	Conservation	
IV AQ 040A 14 01	Bunchgrass Creek	Confirmed	Conservation	
IV AQ 040A 16 01	Beaver Creek	Confirmed	Conservation	
IV AQ 120C 01	Big Spring Creek	Tentative		
IV 407B	Woodruff Creek Res	Core	Conservation	
IV AQ 200 03	Woodruff Creek	Tentative		
IV AQ 200B 01	Sugar Pine Creek	Core	Conservation	
NO WATER ID	Meecham Creek	Core	Conservation	
IV AQ 200C 01	Wheeler Creek	Confirmed	Conservation	
IV AQ 230 01	Mill Creek	Core	Conservation	
IV AQ 230B 01	Deadman Creek	Core	Conservation	
IV AQ 230C 01	Carter Creek	Core	Conservation	
IV AQ 230E 01	Mckenzie Creek	Core	Conservation	
IV AQ 230F 01	Lower NF Mill Creek	Core	Conservation	
IV AQ 230F 02	Upper NF Mill Creek	Core	Conservation	
IV AQ 240 01	Lower WF Bear River	Confirmed	Conservation	
IV AQ 240 02	Upper WF Bear River	Confirmed	Conservation	
IV AQ 240A 01	Deer Creek	Confirmed	Conservation	
IV AQ 240B 01	Mill City Creek	Confirmed	Conservation	

Water ID	*Water Body*	*Population Identification*[1]	*Management Designation*[2]	*Source Population*[3]
IV AQ 240D 01	Meadow Creek	Confirmed	Conservation	
IV AQ 250 01	EF Bear River	Confirmed	Conservation	
IV AQ 250A 01	Boundary Creek	Confirmed	Conservation	
IV AQ 250Q 01	Left Hand EF Bear River	Confirmed	Conservation	
IV AQ 260 01	Lower Stillwater Fork	Confirmed	Conservation	
IV AQ 260 02	Upper Stillwater Fork	Confirmed	Conservation	
IV AQ 260A 01	Lower Main Fork	Confirmed	Conservation	
IV AQ 260A 02	Upper Main Fork	Confirmed	Conservation	
IV AQ 260D 01	Lower Ostler Fork	Tentative		
IV AQ 260D 02	Upper Ostler Fork	Tentative		
IV AQ 260E 01	West Basin Creek	Tentative		
IV AQ 270 01	Hayden Fork	Confirmed	Conservation	
IV AQ 270A 01	Gold Hill Creek	Confirmed	Conservation	
IV AQ 270I 01	Teal Lake Creek	Tentative		
IDAHO	Preuss Creek	Confirmed	Conservation	
IDAHO	Dry Creek	Confirmed	Conservation	
IDAHO	Giraffe Creek	Confirmed	Conservation	
IDAHO	Thomas Fork	Tentative		
IDAHO	Bear River - WY border to Stewart Dam	Tentative		
IDAHO	Bear River - Bear Lake outlet to Alexander Res	Tentative		
IDAHO	Bear River - Oneida Narrows	Tentative		
IDAHO	Co-op Creek	Confirmed	Conservation	
IDAHO	Cottonwood Creek	Confirmed	Conservation	
IDAHO	Cub River	Confirmed	Conservation	
IDAHO	Dairy Creek - tributary to Malad River	Confirmed	Conservation	
IDAHO	Logan River	Confirmed	Conservation	
IDAHO	Maple Creek	Confirmed	Conservation	
IDAHO	Mink Creek	Confirmed	Conservation	
IDAHO	North Creek - tributary to Ovid Creek	Core	Conservation	Source
IDAHO	Pearl Creek	Confirmed	Conservation	
IDAHO	Second Creek - tributary to Deep Creek	Confirmed	Conservation	
IDAHO	Stauffer Creek	Confirmed	Conservation	
IDAHO	Sugar Creek - tributary to Cub River	Confirmed	Conservation	

Water ID	***Water Body***	***Population Identification***[1]	***Management Designation***[2]	***Source Population***[3]
IDAHO	Birch Creek - tributary to Mink Creek	Confirmed	Conservation	
IDAHO	Mill Creek - tributary to Ovid Creek	Confirmed	Conservation	
IDAHO	Beaver Creek - tributary to Logan River	Confirmed	Conservation	
IDAHO	Bloomington Creek	Tentative		
IDAHO	Montpelier Creek	Confirmed	Conservation	
GR190270LN	Lake Alice	Core	Conservation	
GR891020LN	Bear River - Section 1	Tentative		
GR891040VA	Bear River - Section 2	Tentative		
GR891050VA	Bear River - Section 3	Tentative		
GR892690VA	Yellow Creek	Tentative		
GR891060LN	Thomas Fork	Tentative		
GR891080LN	Raymond Creek	Core	Conservation	Source
GR891100LN	Raymond Creek, SF	Core	Conservation	Source
GR891105LN	Raymond Creek, NF	Core	Conservation	Source
GR891120LN	Giraffe Creek	Core	Conservation	
GR891140LN	Robinson Creek	Core	Conservation	
GR891160LN	Salt Creek	Confirmed	Conservation	
GR891180LN	Dipper Creek	Tentative		
GR891200LN	Packstring Creek	Tentative		
GR891220LN	Little White Creek	Tentative		
GR891260LN	Water Canyon Creek	Core	Conservation	
GR891280LN	Huff Creek	Confirmed	Conservation	
GR891300LN	Little Muddy Creek	Tentative		
GR891320LN	Coal Creek	Confirmed	Conservation	
GR891400LN	Smiths Fork (below USFS)	Confirmed	Conservation	
GR891410LN	Smiths Fork (on USFS)	Confirmed	Conservation	
GR891520LN	Muddy Creek	Tentative		
GR891600LN	Coal Creek (Howland)	Core	Conservation	
GR891610LN	Sawmill Creek	Core	Conservation	
GR891650LN	Smiths Fork, Dry Fork	Tentative		
GR891660LN	Hobble Creek	Core	Conservation	
GR891670LN	Cliff Creek	Core	Conservation	
GR891680LN	Sams Creek	Core	Conservation	
GR891690LN	Coantag Creek	Core	Conservation	
GR891700LN	Mistum Creek	Core	Conservation	
GR891710LN	Slide Creek	Core	Conservation	
GR891720LN	Way Creek	Core	Conservation	

Water ID	Water Body	Population Identification[1]	Management Designation[2]	Source Population[3]
GR891730LN	Fawn Creek	Core	Conservation	
GR891740LN	Coantag Creek, SF	Core	Conservation	
GR891750LN	Rough Creek	Core	Conservation	
GR891760LN	Electric Creek	Core	Conservation	
GR891765LN	Bull Creek	Core	Conservation	
GR891790LN	Alice Creek (Lake Creek)	Core	Conservation	
GR891810LN	Poker Creek	Core	Conservation	
GR891830LN	Isabel Creek	Core	Conservation	
GR891840LN	Murdock Creek	Core	Conservation	
GR891850LN	Scotty Creek	Core	Conservation	
GR891860LN	Travis Creek	Core	Conservation	
GR891870LN	Porcupine Creek	Core	Conservation	
GR891880LN	Trespass Creek	Core	Conservation	
GR891890LN	Smiths Fork, WF	Confirmed	Conservation	
GR891900LN	Trail Creek	Confirmed	Conservation	
GR891910LN	Smiths Fork, NF	Confirmed	Conservation	
GR891920LN	Lander Creek	Confirmed	Conservation	
GR891940LN	Lander Creek, NF	Confirmed	Conservation	
GR891960LN	Poker Hollow Creek	Confirmed	Conservation	
GR892330LN	Twin Creek	Tentative		
GR892390LN	Rock Creek	Tentative		
GR892410LN	Watercress Canyon	Tentative		
GR892420LN	Seaweed Creek (L Beaver)	Tentative		
GR892780VA	Sulphur Creek	Tentative		

Northern Bonneville GMU

Water ID	Water Body	Population Identification[1]	Management Designation[2]	Source Population[3]
IV 414AA	Mountain Dell Reservoir	Introgressed	Conservation	Source
IV 704	Upper Yellowpine	Tentative		
IV 704A	Lower Yellowpine	Tentative		
IV AA 010 02	City Creek	Confirmed	Conservation	
IV AA 020 02	Red Butte Creek	Confirmed	Conservation	
IV AA 030 01	Emigration Creek	Confirmed	Conservation	
IV AA 040 02	Parleys Creek	Core	Conservation	Source
IV AA 040A 01	Mountain Dell Creek	Confirmed	Conservation	
IV AA 040B 01	Lambs Creek	Confirmed	Conservation	
IV AA 080F 01	Red Pine Creek	Confirmed	Conservation	
IV AA 090 01	Bell Creek	Confirmed	Conservation	
IV AP 030A 01	Wheeler Creek	Confirmed	Conservation	

Water ID	*Water Body*	*Population Identification*[1]	*Management Designation*[2]	*Source Population*[3]
IV AP 030B 03 01	Wheatgrass Creek	Tentative		
IV AP 030B 05 01	LF SF Ogden River	Confirmed	Conservation	
IV AP 030B 05D 01	Bear Canyon	Confirmed	Conservation	
IV AP 030C 02	MF Ogden River	Tentative		
IV AP 030C 02	Geertson Creek	Confirmed	Conservation	
IV AP 060 01	Strawberry Creek	Tentative		
IV AP 070A 01	Gordon Creek	Tentative		
IV AP 080A 01	Arbuckle Creek	Tentative		
IV AP 090 01	Peterson Creek	Tentative		
IV AP 100 01	Dalton Creek	Tentative		
IV AP 130 01	Line Creek	Tentative		
IV AP 140 01	Deep Creek	Tentative		
IV AP 140A 01	NF Deep Creek	Tentative		
IV AP 150A 01	Hardscrabble Creek	Tentative		
IV AP 150A 02 01	Arthur Fork	Tentative		
IV AP 150A 04 01	Walton Creek	Tentative		
IV AP 150A 05 01	Shingle Mill Creek	Tentative		
IV AP 150F 01	Monument Creek	Tentative		
IV AP 150O 01	Toll Creek	Tentative		
IV AP 150P 01	Two Mile Creek	Confirmed	Conservation	
IV AP 150Q 01	Three Mile Canyon	Confirmed	Conservation	
IV AP 180 02	Upper Lost Creek	Confirmed	Conservation	
IV AP 180G 01 01	Hornet Gulch	Confirmed	Conservation	
IV AP 230	Chalk Creek	Tentative		
IV AP 230A 01	SF Chalk Creek	Confirmed	Conservation	
NO WATER ID	Elkhorn Canyon	Tentative		
NO WATER ID	Lodgepole Creek	Tentative		
NO WATER ID	RF SF Chalk Creek	Tentative		
NO WATER ID	Unnamed Trib to SF Chalk Creek	Tentative		
IV AP 230A 05 01	Fish Creek	Confirmed	Conservation	
IV AP 230B	Huff Creek	Tentative		
IV AP 230C 01	EF Chalk Creek	Confirmed	Conservation	
NO WATER ID	Unnamed Trib to EF Chalk Creek	Tentative		
NO WATER ID	Red Hole	Tentative		
NO WATER ID	Mill Fork	Tentative		
NO WATER ID	Unnamed Trib to Mill Fork	Tentative		
NO WATER ID	Middle Fork	Tentative		

Water ID	*Water Body*	*Population Identification*[1]	*Management Designation*[2]	*Source Population*[3]
NO WATER ID	LF of Unnamed Trib to Chalk Creek	Tentative		
NO WATER ID	RF of Unnamed Trib to Chalk Creek	Tentative		
IV AP 280 01	Silver Creek	Confirmed	Conservation	
IV AP 330CA 01	Slate Creek	Tentative		
IV AP 330D 01	Lower Co-op Creek	Tentative		
IV AP 330D 02	Upper Co-op Creek	Tentative		
IV AP 330E 01	Shingle Mill Creek	Tentative		
IV AP 350 01	Lower SF Weber River	Tentative		
IV AP 350 02	Upper SF Weber River	Tentative		
IV AP 400 01	Smith-Morehouse Creek	Tentative		
IV AP 400D 01	Red Pine Creek	Confirmed	Conservation	
IV AP 400D 01 01	Box Canyon Creek	Confirmed	Conservation	
IV AP 430 01	Moffitt Creek	Confirmed	Conservation	
IV AP 450A 01	Gardners Fork	Confirmed	Conservation	
V AB 01	American Fork Creek	Confirmed	Conservation	
V AB 020 01	NF American Fork Creek	Confirmed	Conservation	
V AF 040A 01	SF Little Deer Creek	Tentative		
V AF 050B 01	Main Creek	Confirmed	Conservation	
V AF 170 01	Bench Creek	Tentative		
V AF 180 01	Little SF Provo River	Introgressed	Conservation	
V AF 190 01	Upper SF Provo River	Tentative		
V AF 200 01	Upper NF Provo River	Tentative		
V AF 200A 01	Lower Boulder Creek	Tentative		
V AF 200A 02	Upper Boulder Creek	Confirmed	Conservation	
V AF 210 01	Rock Creek	Tentative		
V AF 220 01	Soapstone Creek	Tentative		
V AJ 010 01	LF Hobble Cr	Confirmed	Conservation	
V AJ 020 01	RF Hobble Cr	Tentative		
V AJ 020E 01	Wardsworth Creek	Tentative		
NO WATER ID	Peteetneet Creek	Tentative		
NO WATER ID	Wimmer Ranch Creek	Tentative		
V AK 020B 01	Little Diamond Creek	Confirmed	Conservation	
V AK 020C 01	Wanrhodes Creek	Confirmed	Conservation	
V AK 020G 01	Cottonwood Creek	Tentative		
V AK 020H 01	Sixth Water	Tentative		
V AK 020H 01 01	Fifth Water	Confirmed	Conservation	
V AK 020J 01	Halls Fork	Tentative		
V AK 020J 01 01	Chases Creek	Confirmed	Conservation	
V AK 020J 01A 01	Shingle Mill Creek	Confirmed	Conservation	

Water ID	*Water Body*	*Population Identification*[1]	*Management Designation*[2]	*Source Population*[3]
V AK 030E 01	Nebo Creek	Confirmed	Conservation	
V AK 030E 04 01	Holman Creek	Confirmed	Conservation	
V AK 040 01	Soldier Creek	Tentative		
V AK 040H 01	RF Clear Creek	Tentative		
V AK 040F 01	Tie Fk Creek	Confirmed	Conservation	
V AK 040I 01	SF Soldier Creek	Tentative		
V AK 040I 01 01	Bennion Creek	Tentative		

West Desert GMU

Water ID	*Water Body*	*Population Identification*[1]	*Management Designation*[2]	*Source Population*[3]
IV AR 360 01	Birch Creek	Confirmed	Conservation	
IV AR 370 01	Trout Creek	Confirmed	Conservation	
IV AR 410 01	Toms Creek	Confirmed	Conservation	
NEVADA	Douglass' Pond	Confirmed	Conservation	
NEVADA	Hendry's Creek	Core	Conservation	Source
NEVADA	Goshute Creek	Introduced	Conservation	
NEVADA	Pine Creek	Introduced	Conservation	
NEVADA	Hampton Creek	Confirmed	Conservation	
GOSHUTE RES	SF Johnson Creek	Confirmed	Conservation	
GOSHUTE RES	Spring Creek	Confirmed	Conservation	
GOSHUTE RES	Bird Creek	Confirmed	Conservation	
GOSHUTE RES	Steve's Creek	Confirmed	Conservation	
GBNP	Mill Creek	Confirmed	Conservation	

Southern Bonneville GMU

Water ID	*Water Body*	*Population Identification*[1]	*Management Designation*[2]	*Source Population*[3]
I AA 020C 01	Water Canyon	Core	Conservation	Source
I AA 020C 02	Reservoir Canyon	Core	Conservation	Source
I AA 040	Leeds Creek	Introduced	Conservation	
I AA 040C	Spirit Creek	Introduced	Conservation	
I AA 040C 01	Horse Creek	Introduced	Conservation	
I AA 040D	Pig Creek	Introduced	Conservation	
I AA 060A	South Ash Creek	Introduced	Conservation	
I AA 060A 01	Harmon Creek	Introduced	Conservation	
I AA 060A 02	Mill Creek	Introduced	Conservation	
I AA 060B	Leap Creek	Introduced	Conservation	
VI 402	Manning Meadow Res	Reintroduced	Conservation	Source

Water ID	***Water Body***	***Population Identification***[1]	***Management Designation***[2]	***Source Population***[3]
VI AA 360A	Sam Stowe Creek	Reintroduced	Conservation	
VI AA 430	Manning Creek	Reintroduced	Conservation	
VI AA 430A	Vale Creek	Reintroduced	Conservation	
VI AA 430C	Barney Outlet	Reintroduced	Conservation	
VI AA 430D	East Fork Manning Creek	Reintroduced	Conservation	
VI AA 510G 01 01	Deep Creek	Core	Conservation	
VI AA 510M 01 01	Ranch Creek	Core	Conservation	
VI AA 680	Threemile Creek	Reintroduced	Conservation	
VI AA 680A	Delong Creek	Reintroduced	Conservation	
VI AA 680A 01	Indian Hollow	Reintroduced	Conservation	
VI AB 050A 02	Birch Creek	Core	Conservation	Source
VI AB 070A 01	NF North Creek	Core	Conservation	Source
VI AB 070A 01	Pole Creek	Reintroduced	Conservation	
VI AB 070B 01 01	Pine Creek	Reintroduced	Conservation	
VI AB 070B 02	Briggs Creek	Reintroduced	Conservation	

[1] Populations are identified as tentative, confirmed, introgressed, or core, as defined in Definitions section of the Conservation Strategy.

[2] Management Designation of a conservation population identified. This designation indicates the population is being managed for persistence of the Bonneville cutthroat trout independent of the Population Identification assessment.

[3] Identification of conservation populations that are currently being used as source populations. This may be through the use of the population as either a brood source or a transplant source.

APPENDIX V

List of Utah waters testing Whirling disease positive.

Water ID	Water Name
IV AP 030B 02	Beaver Creek
VI AB	Beaver River
IV AQ 040A 03	Blacksmith Fork River
VI AA 510B 11	Burr Creek
IV 832	Causey Reservoir
IV AP 150	East Canyon Creek
NO WATER ID	Flamm's Pond
IV 042	Hyrum Reservoir
NO WATER ID	Kendall Hyde
IV AQ 040	L. Bear River
IV AQ 040D	L. Bear River (E. Fork)
IV AQ 040A	Logan River
IV AP 180	Lost Creek
VI 017	Minersville Reservoir
NO WATER ID	Munn's Pond
IV AP 030B	Ogden River (South Fork)
VI AA 510B	Otter Creek
VI 403	Otter Creek Reservoir
IV 045	Porcupine Reservoir
V AF	Provo River
V AF 190	Provo River (South Fork)
NO WATER ID	Robbin's Pond
IV 669	Rockport Reservoir
NO WATER ID	Tooele Army Depot
IV AP	Weber River
V AF 130	Weber/Provo Canal

APPENDIX VI

Specific action items that will occur toward enhancing and maintaining habitat as listed in the Inland Native Fish Strategy (USFS 1995) for each of the respective management areas.

Timber Management

TM-1 Prohibit timber harvest, including fuelwood cutting, in Riparian Habitat Conservation Areas, except as described below:

a. Where catastrophic events such as fire, flooding, volcanic, wind, or insect damage result in degraded riparian conditions, allow salvage and fuelwood cutting in Riparian Habitat Conservation Areas only where present and future woody debris needs are met, where cutting would not retard or prevent attainment of other Riparians Management Objective, and where adverse effects can be avoided to inland native fish. For priority watersheds, complete watershed analysis prior to salvage cutting in RHCAs.

b. Apply silviculturalpractices for Riparian Habitat Conservation Areas to acquire desired vegetation characteristics where needed to attain Riparian Management Objectives. Apply silvicultural practices in a manner that does not retard attainment of Riparian Management Objectives and that avoids adverse effects on inland native fish.

Roads Management

RF-1 Cooperate with Federal, Tribal, State, and county agencies, and cost-share partners to achieve consistency in road design, operation, and maintenance necessary to attain Riparian Management Objectives.

RF-2 For each existing or planned road, meet the Riparian Management Objectives and avoid adverse effects to inland native fish by:

a. Completing watershed analyses prior to construction of new roads or landings in Riparian Habitat Conservation Areas within priority watersheds.

b. Minimizing road and landing locations in Riparian Habitat Conservation Areas.

c. Initiating development and implementation of a Road Management Plan or a Transportation Management Plan. At a minimum, address the following items in the plan:

1) Road design criteria, elements, and standards that govern construction and reconstruction.

2) Road management objectives for each road.

3) Criteria that govern road operation, maintenance, and managment.

4) Requirements for pre-, during-, and post-storm inspections and maintenance.

5) Regulation of traffic during wet periods to minimize erosion and sediment delivery and accomplish other objectives.

6) Implementation and effectiveness monitoring plans for road stability, drainage, and erosion control.

7) Mitigation plans for road failures.

d. Avoiding sediment delivery to streams from the road surface.

1. Outsloping of the roadway surface is preferred, except in cases where outsloping would increase sediment delivery to streams or where outsloping is infeasible or unsafe.

2. Rout road drainage away from potentially unstable stream channels, fills, and hillslopes.

e. Avoiding disruption of natural hydrologic flow paths.

f. Avoiding sidecasting of soils or snow. Sidecasting of road material is prohibited on road segments within or abutting RHCAs in priority watersheds.

RF-3 Determine the influence of each road on the Riparian Management Objectives. Meet Riparian Management Objectives and avoid adverse effects on inland native fish by:

a. Reconstructing road and drainage features that do not meet design criteria or operation and maintenance standards, or that have been shown to be less effective than designed for controlling sediment delivery, or that retard attainment of Riparian Management Objectives, or do not protect priority watersheds from increased sedimentation.

b. Prioritizing reconstruction based on the current and potential damage to inland native fish and their priority watersheds, the ecological value of the riparian resources affected, and the feasibility of options such as helicopter logging and road relocation out of Riparian Habitat Conservation Areas.

c. Closing and stabilizing or obliterating and stabilizing roads not needed for future management activities. Prioritize these actions based on the current and potential damage to inland native fish in priority watersheds, and the ecological value of the riparian resources affected.

RF-4 Construct new, and improve existing culverts, bridges, and other stream crossings to accommodate a 100-year flood, including associated bedload and debris, where those improvements would/do pose a substantial risk to riparian conditions. Substantial risk improvements include those that do not meet design and operation maintenance criteria, or that have been shown to be less effective than designed for controlling erosion, or that retard attainment of Riparian Management Objectives, or that do not protect priority watersheds from increased sedimentation. Base priority for upgrading on risks in priority watersheds and the ecological value of the riparian resources affected. Construct and maintain crossings to prevent diversion of streamflow out of the channel and down the road in the event of crossing failure.

RF-5 Provide and maintain fish passage at all road crossings of existing and potential fish-bearing streams.

Grazing Management

GM-1 Modify grazing practices (e.g., accessibility of riparian areas to livestock, length of grazing season, stocking levels, timing of grazing, etc.) that retard or prevent attainment of Riparian Management Objectives or are likely to adversely affect inland native fish. Suspend grazing if adjusting practices is not effective in meeting Riparian Management Objectives.

GM-2 Locate new livestock handling and/or management facilities outside of Riparian Habitat Conservation Areas. For existing livestock handling facilities inside the Riparian Habitat Conservation Areas, assure that facilities do not prevent attainment of Riparian Management Objectives. Relocate or close facilities where these objectives cannot be met.

GM-3 Limit livestock trailing, bedding, watering, salting, loading, and other handling efforts to those areas and times that would not retard or prevent the attainment of Riparian Management Objectives or adversely affect inland native fish.

GM-4 Adjust wild horse and burro management to avoid impacts that prevent attainment of Riparian Management Objectives or adversely affect inland native fish.

Recreation Management

RM-1 Design, construct, and operate recreation facilities, including trails and dispersed sites, in a manner that does not retard or prevent attainment of the Riparian Management Objectives and avoids adverse effects on inland native fish. Complete watershed analysis prior to construction of new recreation facilities in Riparian Habitat Conservation Areas within priority watersheds. For existing recreation facilities inside Riparian Habitat Conservation Areas, assure that the facilities or use of the facilities would not prevent attainment of Riparian Management Objectives or adversely affect inland native fish. Relocate or close recreation facilities where Riparian Management Objectives cannot be met or adverse effects on inland native fish cannot be avoided.

RM-2 Adjust dispersed and developed recreation practices that retard or prevent the attainment of Riparian Management Objectives or adversely affect inland native fish. Where adjustment measures such as education, use limitations, traffic control devices, increased maintenance, relocation of facilities, and/or specific site closures are not effective in meeting Riparian Management Objectives and avoiding adverse effects on inland native fish, eliminate the practice or occupancy.

RM-3 Address attainment of Riparian Management Objectives and potential effect on inland native fish in Wild and Scenic Rivers, Wilderness, and other Recreation Management plans.

Mineral Management

MM-1 Avoid adverse effects to inland native fish species habitat from mineral operations. If the Notice of Intent indicates a mineral operation would be located in a Riparian Habitat Conservation Area, or could affect attainment of Riparian Management Objectives, or adversely affect inland native fish, require a reclamation plan, approved Plan of Operations (or other such governing document), and reclamation bond. For effects that cannot be avoided, sucha plans and bonds must address the costs of removing facilities, equipment, and materials; recontouring disturbed areas to near pre-mining topography; isolating and neutralizing or removing toxic or potentially toxic materials; salvage and replacement of topsoil; and seedbed preparation and revegetation to attain Riparian Management Objectives and avoid adverse effects on inland native fish. Ensure Reclamation Plans contain measurable attainment and bond release criteria for each reclamation activity.

MM-2 Locate structures, support facilities, and roads outside Riparian Habitat Conservation Areas. Where no alternative to siting facilities in Riparian Habitat Conservation Areas exists, locate and construct the facilities in ways that avoid impacts to Riparian Habitat Conservation Areas and streams and adverse effects on inland native fish. Where no alternative to road construction exists, keep roads to the minimum necessary for the approved mineral activity. Close, obliterate and revegetate roads no longer required for mineral or land management activities.

MM-3 Prohibit solid and sanitary waste facilities in Riparian Habitat Conservation Areas. If no alternative to locating mine waste (waste rock, spent ore, tailings) facilities in Riparian Habitat Conservation Areas exists, and releases can be prevented and stability ensured, then:

a. Analyze the waste material using the best conventional sampling methods and analytic techniques to determine its chemical and physical stability characteristics.

b. Locate and design the waste facilities using the best conventional techniques to ensure mass stability and prevent the release of acid or toxic materials. If the best conventional technology is not sufficient to prevent such releases and ensure stability over the long term, prohibit such facilities in Riparian Habitat Conservation Areas.

c. Monitor waste and waste facilities to confirm predictions of chemical and physical stability, and make adjustments to operations as needed to avoid adverse effects to inland native fish and to attain Riparian Management Objectives.

d. Reclaim and monitor waste facilities to assure chemical and physical stability and revegetation to avoid adverse effects to inland native fish and to attain Riparian Management Objectives.

e. Require reclamation bonds adequate to ensure long-term chemical and physical stability and successful revegetation of mine waste facilities.

MM-4 For leasable minerals, prohibit surface occupancy within Riparian Habitat Conservation Areas for oil, gas, and geothermal exploration and development activities where contracts and leases do not already exist, unless there are no other options for location and Riparian Management Objectives can be attained and adverse effects to inland native fish can be avoided. Adjust the operating plans of existing contracts to (1) eliminate impacts that prevent attainment of Riparian Management Objectives and (2) avoid adverse effects to inland native fish.

MM-5 Permit sand and gravel mining and extraction within Riparian Habitat Conservation Areas only if no alternative exist, if the action(s) would not retard or prevent attainment of Riparian Management Objectives, and adverse effects to inland native fish can be avoided.

MM-6 Develop inspection, monitoring, and reporting requirements for mineral activities. Evaluate and apply the results of inspection and monitoring to modify mineral plans, leases, or permits as needed to eliminate impacts that prevent attainment of Riparian Management Objectives and avoid adverse effects on inland native fish.

<u>Fire/Fuels Management</u>

FM-1 Design fuel treatment and fire suppression strategies, practices, and actions so as not to prevent attainment of Riparian Management Objectives, and to minimize disturbance of riparian ground cover and vegetation. Strategies should recognize the role of fire in ecosystem function and identify those instances where fire suppression or fuel management actions could perpetuate or be damaging to long-term ecosystem function or inland native fish.

FM-2 Locate incident bases, camps, helibases, staging areas, helispots, and other centers for incident activities outside of Riparian Habitat Conservation Areas. If the only suitable location for such activities is within the Riparian Habitat Conservation Area, an exemption may be granted following a review and recommendation by a resource advisor. The advisor would prescribe the location, use conditions, and rehabilitation requirements, with avoidance of adverse effects to inland native fish a primary goal. Use an interdisciplinary team, including a fishery biologist, to predetermine incident base and helibase locations during presuppression planning.

FM-3 Avoid delivery of chemical retardant, foam, or additives to surface waters. An exception may be warranted in situations where overriding immediate safety imperatives exist, or, following a review and recommendation by a resource advisor and a fishery biologist, when the action agency determines an escape fire would cause more long-term damage to fish habitats than chemical delivery to surface waters.

FM-4 Design prescribed burn projects and prescriptions to contribute to the attainment of the Riparian Management Objectives.

FM-5 Immediately establish and emergency team to develop a rehabilitation treatment plan to attain Riparian Management Objectives and avoid adverse effects on inland native fish whenever Riparian Habitat Conservation Areas are significantly damaged by a wildfire or a prescribed fire burning out of prescription.

Lands

LH-1 Require instream flows and habitat conditions for hydroelectric and other surface water development proposals that maintain or restore riparian resources, favorable channel conditions, and fish passage, reproduction, and growth. Coordinate this process with the appropriate State agencies. During relicensing of hydroelectric projects, provide written and timely license conditions to the Federal Energy Regulatory Commission (FERC) that require fish passage and flows and habitat conditions that maintain/restore riparian resources and channel integrity. Coordinate relicensing projects with the appropriate State agencies.

LH-2 Locate new hydroelectric ancillary facilities outside Riparian Habitat Conservation Areas. For existing ancillary facilities inside the RHCA that are essential to proper management, provide recommendations to FERC to assure that the facilities would not prevent attainment of the Riparian Management Objectives and that adverse effects on inland native fish are avoided. Where these objectives cannot be met, provide recommendations to FERC that such ancillary facilities should be relocated. Locate, operate, and maintain hydroelectric facilities that must be located in Riparian Habitat Conservation Areas to avoid effects that would retard or prevent attainment of the Riparian Management Objectives and avoid adverse effects on inland native fish.

LH-3 Issue leases, permits, rights-of-way, and easements to avoid effects that would retard or prevent attainment of the Riparian Management Objectives and avoid adverse effects on inland native fish. Where the authority to do so was retained, adjust existing leases, permits, rights-of-way, and easements to eliminate effects that would retard or prevent attainment of the Riparian Management Objectives or adversely effect inland native fish. If adjustments are not effective, eliminate the activity. Where the authority to adjust was not retained, negotiate to make changes in existing leases, permits, rights-of-way, and easements to eliminate effects that would prevent attainment of the Riparian Management Objectives or adversely effect inland native fish. Priority for modifying existing leases, permits, rights-of-way, and easements would be based on the current and potential adverse effects on inland native fish and the ecological value of the riparian resources affected.

LH-4 Use land acquisition, exchange, and conservation easements to meet Riparian Management Objectives and facilitate restoration of fish stocks and other species at risk of extinction.

General Riparian Area Management

RA-1 Identify and cooperate with Federal, Tribal, State and local governments to secure instream flows needed to maintain riparian resources, channel conditions, and aquatic habitat.

RA-2 Trees may be felled in Riparian Habitat Conservation Areas when they pose a safety risk. Keep felled trees on site when needed to meet woody debris objectives.

RA-3 Apply herbicides, pesticides, and other toxicants, and other chemicals in a manner that does not retard or prevent attainment of Riparian Management Objectives and avoids adverse effects on inland native fish.

RA-4 Prohibit storage of fuels and other toxicants within Riparian Habitat Conservation Areas. Prohibit refueling within Riparian Habitat Conservation Areas unless there are no other alternatives. Refueling sites within a Riparian Habitat Conservation Area must be approved by the Forest Service or Bureau of Land Management and have an approved spill containment plan.

RA-5 Locate water drafting sites to avoid adverse effects to inland native fish and instream flows, and in a manner that does not retard or prevent attainment of Riparian Management Objectives.

Watershed and Habitat Restoration

WR-1 Design and implement watershed restoration projects in a manner that promotes the long-term ecological integrity of ecosystems, conserves the genetic integrity of native species, and contributes to attainment of Riparian Management Objectives.

WR-2 Cooperate with Federal, State, local, and Tribal agencies, and private landowners to develop watershed-based Coordinated Resource Management Plans (CRMPs) or other cooperative agreements to meet Riparian Management Objectives.

Fisheries and Wildlife Restoration

FW-1 Design and implement fish and wildlife habitat restoration and enhancement actions in a manner that contributes to attainment of the Riparian Management Objectives.

FW-2 Design, construct, and operate fish and wildlife interpretive and other user-enhancement facilities in a manner that does not retard or prevent attainment of the Riparian Management Objectives or adversely effect inland native fish. For existing fish and wildlife interpretive and other user-enhancement facilities inside Riparian Habitat Conservation Areas, assure that Riparian Management Objectives are met and adverse effects on inland native fish are avoided. Where Riparian Management Objectives cannot be met or adverse effects on inland native fish avoided, relocate or close such facilities.

FW-3 Cooperate with Federal, Tribal, and State wildlife management agencies to identify and eliminate wild ungulate impacts that prevent attainment of the Riparian Management Objectives or adversely effect inland native fish.

FW-4 Cooperate with Federal, Tribal, and State wildlife management agencies to identify and eliminate adverse effects on native fish associated with habitat manipulation, fish stocking, fish harvest, and poaching.