Appendix 53

Status Review for Westslope Cutthroat Trout in the United States

Status Review for Westslope Cutthroat Trout in the United States

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I. Executive Summary

On June 6, 1997, the U.S. Fish and Wildlife Service (Service) received a formal petition to list the westslope cutthroat trout *Oncorhynchus clarki lewisi* as threatened throughout its range pursuant to the Endangered Species Act (ESA) of 1973. The westslope cutthroat trout (WCT) is one of 14 subspecies of cutthroat trout *O. clarki* native to interior regions of western North America. The historic distribution of WCT in the United States consists of several major drainages of the upper Columbia River basin (Idaho and Montana), the Methow River and Lake Chelan drainages (Washington), the John Day River drainage (Oregon), the headwaters of the South Saskatchewan River (Montana), and the upper Missouri River basin (Montana and Wyoming). The historic range of WCT is the most widespread geographically among the 14 subspecies of inland cutthroat trout.

On June 10, 1998, the Service published a notice in the **Federal Register** of a 90-day finding that an amended WCT petition (received January 25, 1998) provided substantial information indicating that the petitioned action may be warranted. The Service promptly began a status review for WCT to assemble information pertinent to the question of whether the listing of the subspecies as threatened or endangered under the ESA was warranted.

The Service subsequently received information pertinent to WCT from several state game and fish departments, the U.S. Forest Service, National Park Service, tribal governments, and private corporations, as well as private citizens, organizations, and other entities. The Service also reviewed information on WCT obtained from refereed journal articles, agency reports and file documents, telephone interviews and written correspondence with natural resources managers familiar with WCT, and other sources.

For the purposes of the status review, the Service assumed that the fish stocks that the state game and fish departments classified as WCT represented that subspecies, even though the precise genetic characteristics of those stocks may not have been known or the stocks consisted of intercross progeny that were the product of some low or non-detectable level of interbreeding between WCT and another fish species. In addition, the Service evaluated WCT status solely on the basis of WCT stocks that presently occur within the historic range of the subspecies.

The Service found no compelling evidence in support of recognizing distinct population segments for WCT. Instead, a single WCT population was recognized for purposes of the status review. The Service found that WCT presently inhabit about 4,275 tributaries or stream reaches that collectively encompass more than 23,000 linear miles of stream habitat, distributed among 12 major drainages and 62 component watersheds in the Columbia, Missouri, and Saskatchewan River basins. In addition, WCT presently inhabit 6 lakes in Idaho and Washington and at least 20 lakes in Glacier National Park, Montana. Although WCT stocks that formerly occupied large, mainstem rivers and lakes and their principal tributaries are reduced from their historic levels, to a degree that cannot be determined precisely because definitive historic data are limited, the Service found that viable, self-sustaining WCT stocks remain widely distributed throughout the historic range of the subspecies, most notably in headwater areas.

Evidence from the Missouri River basin indicated that a conspicuous decline in WCT stocks occurred early in the twentieth century. That decline was largely attributed to rapid, abundant colonization of mainstem rivers and their major tributaries by one or more introduced, nonnative fish species (i.e. brown trout *Salmo trutta* and rainbow trout *O. mykiss*) that had adverse effects on WCT. There was also evidence, however, that many of the headwater streams inhabited by extant WCT stocks are relatively secure from colonization by nonnative fish species that are known to adversely affect WCT, because those headwater streams are not suitable habitat for the nonnative trout.

The Service found that most of the habitat for extant WCT stocks lies on lands administered by federal agencies, particularly the U.S. Forest Service. Moreover, many of the strongholds for WCT stocks occur within roadless or wilderness areas or national parks, all of which afford considerable protection to WCT. There are numerous federal and state regulatory mechanisms that, if properly administered and implemented, protect WCT and their habitats throughout the range of the subspecies. For example, the States generally restrict the harvest of WCT, and in many regions only catch-and-release angling is allowed. Some regulatory mechanisms in some regions, however, serve to maintain current, perhaps degraded habitat conditions, rather than improve habitat for WCT. In addition, the U.S. Forest Service, state game and fish departments, and National Park Service reported more than 700 ongoing projects directed toward the protection and restoration of WCT and their habitats. Finally, WCT accrue some level of protection from the ESA's Section 7 consultation process in geographic areas where WCT distribution overlaps with the distributions of one or more ESA-listed fish species, specifically, bull trout *Salvelinus confluentus*, steelhead *O. mykiss*, and Pacific salmon *Oncorhynchus* species and their habitats on federal lands in the Columbia River basin.

On the basis of the available information, the Service concluded that the WCT is not likely to become a threatened or endangered species within the foreseeable future. Therefore, listing of the WCT as a threatened or endangered species under the ESA is not warranted at this time.

The Service strongly recommends that state game and fish departments, federal land-management agencies, tribal governments, private groups, and other concerned entities continue to work individually and cooperatively to develop and implement programs to protect and restore stocks of WCT throughout the historic range of the subspecies. The Service believes additional actions should be taken (e.g., selective placement of barriers to prevent the upstream movement of nonnative fishes) to further protect extant WCT stocks throughout their historic range from the adverse effects of nonnative fishes. The Service is encouraged by ongoing and planned state and local programs, most notably those in Montana, to protect and restore WCT within its historic range.

Results of this status review define baseline conditions for the population of WCT in the U.S. to which future population assessments may be compared. Such comparisons would be important not only to determining the efficacy of ongoing and planned actions to protect and restore WCT stocks, but to future reassessments of the status of WCT from the perspective of possible ESA listing.

II. Introduction and Approach

Endangered Species Act Requirements

Section 4(b) (3) (A) of the Endangered Species Act (ESA) of 1973 (16 U.S.C. 1531 *et seq*.), as amended, requires that the U.S. Fish and Wildlife Service (Service) make a finding on whether a petition to list, delist, or reclassify a species (or subspecies or unique population for vertebrate animals) presents substantial scientific or commercial information indicating the requested action may be warranted. To the maximum extent practicable, the finding is to be made within 90 days of receipt of the petition and on the basis of all information available to the Service. Notice of the 90-day finding is to be published in the **Federal Register**. If the finding is that substantial information was presented in the petition and a status review for the species has not already been initiated under the Service's candidate assessment process, the Service is required to promptly begin a 12-month review of the status of the species to determine whether the petitioned action is warranted.

Petition History for the Westslope Cutthroat Trout

On June 6, 1997, the Service received a formal petition to list the westslope cutthroat trout *Oncorhynchus clarki lewisi* as threatened throughout its range and designate critical habitat for this subspecies pursuant to the ESA. Petitioners were American Wildlands, Clearwater Biodiversity Project, Idaho Watersheds Project, Inc., Montana Environmental Information Center, the Pacific Rivers Council, Trout Unlimited's Madison-Gallatin Chapter, and Mr. Bud Lilly.

On July 2, 1997, the Service notified the petitioners that the Service's Final Endangered Species Act Listing Priority Guidance, published in the December 5, 1996 **Federal Register** (61 FR 64425), designated the processing of new listing petitions as a Tier 3 activity, i.e. of lower priority than completion of emergency listings (Tier 1) and processing of pending proposed listings (Tier 2). The Service further indicated that personnel and budget in the Service's Mountain-Prairie Region, which had been assigned responsibility for Service activities pertaining to the WCT petition, would continue to be directed toward accomplishment of ongoing Tier 2 activities and Tier 3 activities for species judged to be in greater need of ESA protection than WCT. As these higher-priority activities were accomplished and personnel and funds became available, however, the Service would proceed with its finding on the WCT listing petition.

On September 24, 1997, the Earthjustice Legal Defense Fund, legal representatives of the petitioners, sent a Notice of Intent to Interior Secretary Babbitt and the Service stating that, unless the Service promptly issued the 90-day finding, the petitioners intended to pursue federal court litigation for alleged violations of the ESA. On November 20, 1997, the Service responded to the Earthjustice Legal Defense Fund, reiterating that the Service would proceed with the 90-

day finding when completion of ongoing, higher-priority activities allowed available funds to be allocated to WCT.

On January 25, 1998, the Service received from the petitioners an amended petition to list the WCT as threatened throughout its range and designate critical habitat for the subspecies. The amended petition contained additional new information in support of the requested action. Because substantial new information had been provided, the Service treated the amended petition as a new petition.

On March 17, 1998, the petitioners filed a complaint in the U.S. District Court for the District of Columbia requesting that the court declare that the Service's failure to issue a 90-day finding on the June 6, 1997 petition was a violation of the ESA, its implementing regulations, and the Administrative Procedures Act, and that the court issue a preliminary and permanent injunction requiring the Service to issue a 90-day finding on the petition and promptly publish such finding in the **Federal Register**. On April 1, 1998, the Service sent a letter to the petitioners stating that, although the tier system for prioritizing listing actions remained in full force and effect, the Service was proceeding with preparation of a 90-day finding on the amended petition.

On June 10, 1998, the Service published a notice in the **Federal Register** (63 FR 31691) of a 90-day finding that the amended WCT petition provided substantial information indicating that the petitioned action may be warranted and immediately began a status review for WCT. In the notice, the Service requested data, information, technical critiques, comments, or questions relevant to the amended petition.

In July, 1998, the Service received requests to extend the comment period from the Montana Department of Fish, Wildlife and Parks, the Idaho Department of Fish and Game, and U.S. Forest Service Regions 1 and 4. As a result, the Service announced reopening of the comment period in the August 17, 1998 **Federal Register** (63 FR 43901) and indicated that comments on the 90-day finding should be submitted to the Service by October 13, 1998. A September 23, 1998 **Federal Register** (63 FR 50850) notice described corrections to the preceding notice and the Service's need for 9 months from the date of the 90-day finding (June 10, 1998) to complete the status review. On September 30, 1998, the U.S. District Court dismissed the petitioner's March 17, 1998 complaint pertaining to WCT.

On March 26, 1999, legal representatives of the petitioners sent a Notice of Intent to Interior Secretary Babbitt and the Service stating that, unless the Service promptly issued the 12-month finding, the petitioners intended to pursue federal court litigation for alleged violations of the ESA. On August 5, 1999, legal representatives of the petitioners filed a complaint in the U.S. District Court for the District of Columbia requesting that the court declare that the Service's failure to issue a 12-month finding on the June 6, 1997 petition is a violation of the ESA, its implementing regulations, and the Administrative Procedures Act, and that the court issue a preliminary and permanent injunction requiring the Service to issue a 12-month finding on the petition and promptly publish such finding in the **Federal Register**.

Public Comment Period

The purpose of this WCT status review is to assemble information pertinent to the question of whether the listing of WCT as a threatened or endangered species under the ESA may be warranted. By way of publication of both the June 10, 1998 notice of the 90-day finding in the **Federal Register** (63 FR 31691) and the subsequent reopening of the comment period announced in the August 17, 1998 **Federal Register** (63 FR 43901), the Service requested information on the current status of WCT, the threats to the subspecies and the management actions intended to ameliorate or eliminate those threats, technical critiques of the listing petition, and other comments. The notice and request for information were sent to federal, state, tribal and corporate natural resources management agencies, as well as to concerned private citizens and organizations within the geographic area of this status review, i.e. the historic range of WCT in the U.S.

Response to the Information Request

The Service received information on WCT in responses to the two **Federal Register** notices. Information was provided by state game and fish departments, the U.S. Forest Service, National Park Service, tribal governments, and private corporations, as well as private citizens, organizations and other entities (Appendix Table 1). Legislated authority for the management of WCT resides with state game and fish departments, tribal governments and, in certain parks, the National Park Service. However, authority for management of the habitat of WCT resides with the federal land-management agencies (e.g., U.S. Forest Service, Bureau of Land Management, National Park Service), state land-management agencies, tribal governments, and private and corporate landowners. The Service also reviewed information on WCT obtained from refereed journal articles, agency reports and file documents, telephone interviews and written correspondence with natural resources managers familiar with WCT, and the Interior Columbia Basin Ecosystem Management Project (ICBEMP 1996).

Distinct Population Segments

The historic range of WCT occurs both east and west of the Continental Divide in the Missouri, Saskatchewan, and Columbia River basins (Figure 1). It is believed that the ancestral WCT moved upstream into the upper Columbia River basin before geologic events formed impassable water falls on the Pend Oreille River near the present-day border between Washington and Idaho (Roscoe 1974; Behnke 1992). In turn, periodic connections between headwater streams allowed

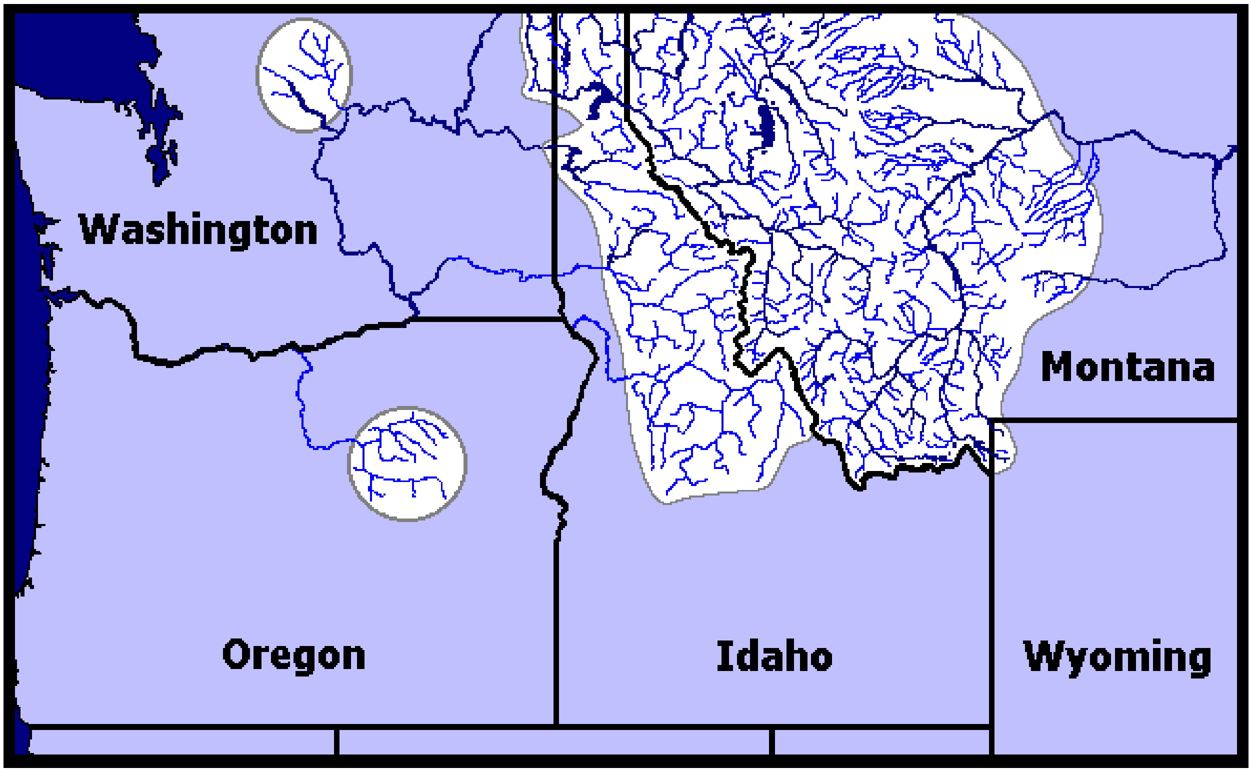

Figure 1.--The historic distribution of westslope cutthroat trout in the United States (modified from Behnke 1992). The large region consists primarily of the upper Columbia River and upper Missouri River basins; some waters in the eastern part of this region may not have been occupied historically (MTFWP, *in litt*. 1998). Also shown are the Lake Chelan and Methow River drainages in Washington and the John Day River drainage in Oregon.

WCT from the Columbia River basin to enter the Missouri and Saskatchewan River basins until soon after the last glacial period (i.e. the Pleistocene Epoch), 7,000 to 10,000 years ago (Behnke 1979, 1992; Trotter 1987). As the post-glacial waters receded, however, stocks of WCT east of the Continental Divide became isolated from those in the Columbia River basin.

The present-day, disjunct WCT stocks in Washington and Oregon (Figure 1) may have been deposited there by late-Pleistocene floods (Behnke 1992). Massive floods accompanied periodic bursting of the ice dams that formed glacial Lake Missoula, a large, prehistoric lake that was inhabited by WCT and occupied major valleys in present-day western Montana.

Because WCT east of the Continental Divide became reproductively isolated from WCT west of the divide 7,000 to 10,000 years ago, it is possible that subsequent evolution has led to genetic differences in WCT between the Missouri and Columbia River basins or among these and other reproductively isolated WCT stocks elsewhere in the historic range of the subspecies. Fish stocks that are reproductively isolated can evolve unique characteristics (i.e. adaptations) that can be important to survival of the stocks (Scudder 1989).

The U.S. Fish and Wildlife Service and National Marine Fisheries Service have adopted criteria (61 FR 4722) for the designation of such unique stocks, termed a distinct population segment (DPS), under the ESA. To constitute a DPS, a stock or group of stocks must be (1) discrete (i.e. spatially separated from other stocks of the taxon), (2) significant (e.g., ecologically unique for the taxon; extirpation would produce a significant gap in the taxon's range; the only surviving native stock of the taxon; or there is substantial genetic divergence between the stock and other stocks of the taxon), and (3) the status of the stock must warrant protection under the ESA.

Westslope cutthroat trout have probably been reproductively isolated among the Missouri and upper Columbia River basins, the disjunct drainages in Washington and Oregon, and the Saskatchewan River basin for thousands of years. Westslope cutthroat trout inhabiting these five regions therefore meet the first criterion, discreteness, for DPS designation. Consequently, the second criterion, that of significance (e.g., genetically or ecologically unique), must be addressed.

On the basis of protein electrophoretic data, Leary *et al.* (1988) reported substantial genetic divergence between WCT from the Missouri and upper Columbia River basins. That assessment was based on only one sample (i.e. a group of fish from a single location) of WCT from the Missouri basin, however. Because substantial genetic differences occur among WCT stocks within river basins (Allendorf and Leary 1988), it is unlikely that data from a single stock can be representative of all stocks in a basin (Leary *et al.* 1998).

Subsequent genetic testing performed on WCT that included more numerous samples from the Missouri River basin revealed little genetic variation between WCT from the Missouri and Columbia basins (Leary *et al.* 1998). Instead, most (64.95 %) of the total amount of genetic variation detected was attributed to genetic differences among fish within samples, 33.8 % to differences among samples within basins, and only 1.3 % to genetic differences between samples from the Columbia and Missouri River basins.

On the basis of that new evidence, Leary *et al.* (1998) concluded that treatment of WCT stocks in the Missouri or upper Columbia River basins as DPSs solely on the basis of molecular genetic markers was unwarranted. However, the data also indicated that little gene flow has occurred among westslope stocks and that, even over short geographic distances, WCT stocks can differ genetically. Thus, Leary *et al.* (1998) recommended that conservation programs for WCT focus on ensuring the continued existence of all remaining genetically pure WCT stocks.

Gilpin (1997) speculated that the genetic structure described by Leary *et al.* (1998) for WCT in the Columbia and Missouri River basins resulted from recent fragmentation of a metapopulation, i.e. a network of local populations formerly interconnected by the movement and exchange of fish and their genetic material. He further concluded that little genetic divergence has occurred between the WCT stocks east and west of the Continental Divide, which collectively constituted the former metapopulation, since their separation 7,000 to 10,000 years ago. Nonetheless, Gilpin (1997) advocated treating the WCT stocks in the Missouri River basin as a DPS.

In support of his position, Gilpin (1997) indicated that WCT east and west of the Continental Divide are likely to have evolved local adaptations because rainfall and temperature patterns differ greatly between the Columbia and Missouri River basins, as do the historic fish communities (see **III. Life History and Ecology . . .**). Westslope cutthroat trout in the Missouri River basin, for example, do not coexist with bull trout *Salvelinus confluentus*, an indigenous species that coexists with and preys upon WCT in the Columbia River basin. Similar speculative arguments for the existence of possible local adaptations could be made to support treating WCT in the disjunct regions of Washington and Oregon, or in the Saskatchewan River basin, as DPSs.

While conducting this status review, the Service found no morphological, physiological, or ecological data for WCT that indicated unique adaptations of individual WCT stocks or assemblages of stocks anywhere within the historic range of the subspecies. Thus, some of the remaining stocks of WCT met the first criterion for DPS designation, discreteness, but evidence in support of the second criterion, significance, appeared entirely speculative. In the absence of compelling evidence of genetic, ecological or other characteristics that indicate a unique significance of a stock or assemblage of stocks, the Congress has made clear (61 FR 4722) that DPSs should be used "sparingly" in the context of the ESA. There is presently no compelling evidence in support of recognizing distinct population segments for WCT. Instead, a single WCT population is recognized for purposes of this status review.

State Game and Fish Department Information

State game and fish departments provided information on the status, distribution, abundance, and genetic and other characteristics of WCT in their respective states. The existence of WCT in any particular stream or stream reach was based on field sampling or the professional judgements of fisheries biologists familiar with that geographic region. Because it is generally not feasible to sample all stream reaches in a watershed, especially in remote and mountainous regions, information concerning linear stream distances occupied by WCT that the departments supplied were often total lengths for an entire stream in which WCT were known or suspected to occupy some portion. In addition, the departments provided information on the threats confronting extant WCT stocks and the likelihood that those threats will lead to the loss or extinction of WCT, as well as responses to the allegations made in the petition to list WCT as a threatened species.

Classification of WCT by Management Agencies

As recently as the 1970s, there was confusion regarding the appropriate taxonomic classification of the WCT (Roscoe 1974). Today, however, WCT are considered a distinct taxonomic form, distinguishable from the Yellowstone and other subspecies of cutthroat trout on the basis of spotting pattern, karyotype (66 chromosomes; other inland subspecies, 64), and biochemical characteristics (Allendorf and Leary 1988; Behnke 1992).

Throughout the historic range of WCT, however, few of the remaining stocks of WCT have been genetically classified on the basis of chromosome counts, biochemical characteristics, or molecular genetic information. Although application of such genetic techniques for characterizing fish stocks is becoming more common today, in most cases the taxonomic classification of existing WCT stocks has been based largely on spotting pattern and the professional judgements and experiences of the fishery biologists who examined the fish in the field. Those classifications are often supported by information on the probable historic distribution of WCT, the known occurrence of WCT in nearby areas, and fish-stocking records that reveal which nonnative species have been previously stocked in the area. Such classifications provide the basis for much of the information on WCT described in this status review.

Stocking of nonnative fish species within the historic range of WCT began more than 100 years ago (e.g., Jordan 1891). Among the nonnative species stocked were rainbow trout *O. mykiss* and Yellowstone cutthroat trout, both of which can interbreed with WCT. Interbreeding, particularly with rainbow trout or Yellowstone cutthroat trout, has led to genetically introgressed stocks of WCT in most regions of the subspecies' historic range. Introgression is the incorporation of genes from one species into the genetic material of a recipient species via repeated backcrossing of the recipient species with its fertile hybrid descendants. Analyses of spotting patterns and other morphological characteristics are not able to identify all instances of introgression in WCT (Leary *et al.* 1984b). Moreover, biochemical or molecular genetic techniques are not entirely diagnostic for distinguishing introgressed and non-introgressed stocks because (1) these techniques measure only a small part of the total genetic material and (2) it is often impossible to distinguish between low levels of introgression and the natural sharing of alleles that may be common in one species but naturally rare in a closely related species.

Importance of Introgressed WCT in the Status Review

Introgression can alter the genetically based, morphological traits that characterize WCT and distinguish the subspecies from rainbow trout, Yellowstone cutthroat trout, or other fish species with which WCT can interbreed and produce fertile offspring (Allendorf and Leary 1988). However, the degree of genetic introgression that can occur before the unique characteristics of WCT are no longer diagnostic for the subspecies is unknown.

In 1996, the U.S. Fish and Wildlife Service and National Marine Fisheries Service published a draft intercross policy (61 FR 4710) pertaining to the interbreeding (termed intercrossing) between species, subspecies, or DPSs of vertebrate species and the offspring that result from such intercrosses (termed intercross progeny). Although this draft policy was written to address problems involving the management and recovery of species already designated as threatened or endangered under the ESA, it is also relevant to the issue of introgressed stocks (i.e. intercross progeny) of WCT in the status review for this subspecies.

The draft intercross policy (61 FR 4711, column 2, paragraph 3) states: *Where intercross progeny are produced as a result of a cross between an individual of a listed taxon and an individual of a taxon that is not listed, the Services believe the responsibility to conserve endangered and threatened species under the Act extends to those intercross progeny if (1) the progeny share the 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.*

Although the draft policy has not been made final, the policy connotes importance or value (e.g., ecological or evolutionary) to wild intercross progeny of petitioned species that look and behave like their non-introgressed ancestors and contemporaries. Therefore, for the purposes of the status review for WCT, the Service assumed that the fish stocks that state, tribal and National Park Service fisheries managers classified as WCT represented that subspecies, even though the precise genetic characteristics of those stocks may not have been known or the stocks consisted of intercross progeny (as defined in the preceding quote from 61 FR 4711) that were the product of some low or non-detectable level of genetic introgression from rainbow trout, Yellowstone cutthroat trout or another fish species with which WCT can interbreed.

Importance of Introduced WCT Stocks in the Status Review

In evaluating the status of WCT, the Service considered: (1) How introduced, self-sustaining WCT stocks that occur outside the historic range of the subspecies would be treated in the review, and (2) how these introduced stocks would be treated if listing of WCT under the ESA was determined to be warranted. The Service has no established policies that address the first question. Instead, the importance of introduced stocks to the survival and recovery of a species must be judged on a case-by-case basis. For the status review for WCT, we evaluated WCT status solely on the basis of fish stocks that presently occur within the historic range of the subspecies.

The second consideration, regarding how the introduced stocks would be treated if listing of WCT under the ESA was determined to be warranted, is more speculative. In a recent proposed rule to list the Santa Ana sucker *Catostomus santaanae* as threatened (64 FR 3915), for example, an introduced, self-sustaining Santa Ana sucker population occurring outside the species' historic range was not included in the proposed listing. The proposed listing rule acknowledged, however, that the introduced population may be important (e.g., as a source of fish for reintroduction) for recovery of the Santa Ana sucker within the species' historic range.

In recovery of listed species, the Service generally does not support introductions of the species outside its historic range and probably would not consider populations that result from such introductions as contributing to the recovery of the species. Exceptions to these general guidelines do occur, however. For example, survival of the June sucker *Chasmistes liorus* in its historic habitat (Utah Lake) is unlikely because of predation on young suckers by abundant, nonnative white bass *Morone saxatilis*. Because white bass cannot be eliminated from Utah Lake, a reproducing population of June suckers has been established in a reservoir outside the June sucker's historic range. No other options to preserve a self-sustaining June sucker population are evident (60 FR 29711). In that case, the introduced June sucker population is considered important to recovery of the species, even though it occurs outside the historic range.

ICBEMP Data

The Interior Columbia River Basin Ecosystem Management Project (ICBEMP) was initiated by the U.S. Forest Service and U.S. Bureau of Land Management (BLM) in July 1993. The goal of ICBEMP is to develop a management strategy for public lands administered by the two agencies in eastern Oregon and Washington, Idaho, western Wyoming, western Montana, and portions of northern Utah and northern Nevada. Two draft environmental impact statements (EISs) have been prepared for different portions of the geographic region covered by the ICBEMP. The planning area for the Eastside EIS includes lands administered by the BLM or Forest Service in the interior Columbia River basin, upper Klamath River basin, and northern Great Basin that lie east of the Cascade Mountain Range in Oregon and Washington. The planning area for the Upper Columbia River Basin EIS includes lands administered by the BLM or Forest Service in parts of Idaho, western Montana and Wyoming, and northern Nevada and Utah within the Columbia River basin.

Data provided in these EISs (ICBEMP 1996) include information on WCT distribution and status in 6th-field hydrologic units (described below) in the Columbia River basin. As part of the ICBEMP data-compilation process, agency, tribal and private fishery biologists familiar with WCT were asked to provide their professional judgements on the status of the subspecies in the individual biologist's particular geographic area of knowledge. Only naturally reproducing WCT stocks were considered. Biologists classified WCT stocks in hydrologic units having either spawning and rearing habitat, overwintering and migratory-corridor habitat, or WCT present but of unknown status. Westslope cutthroat trout stocks inhabiting hydrologic units that had spawning and rearing habitat were further classified as strong or depressed on the basis of the life-history forms that occurred there historically and remained today, recent trends in WCT abundance, and current WCT abundance. Additional data were obtained from databases maintained by state and federal agencies and other sources. Detailed information on the procedures used to obtain and summarize the data provided in the ICBEMP EISs is provided by Lee *et al.* (1996).

Data Analyses

The Service summarized and analyzed information on WCT from throughout the historic range of the subspecies in the U. S. Results are summarized in four Appendix Tables presented at the end of this report, the first pertaining to the distribution of WCT across its range (Appendix Table 2), the second to the genetic characteristics of WCT (Appendix Table 3), the third to ongoing WCT conservation actions (Appendix Table 4), and the fourth to current threats to the subspecies (Appendix Table 5). The data presented in these Appendix Tables are grouped primarily on the basis of major river drainages designated by 4th-field hydrologic unit codes (HUCs) in the U.S. Geological Survey's system for classifying watersheds. Within these 4th-field HUCs, many of the results are further grouped on the basis of smaller, component hydrologic units, the 6th-field HUCs (hereinafter referred to only as either HUC or HUCs) used by the ICBEMP (1996). Tabularized data are supported by narrative discussions, wherein the specific information sources are cited. All information sources are noted in the references section (i.e. **IX. References**) of this document.

Because the types of data on the status, distribution, abundance, and genetic and other characteristics of WCT provided primarily by the four state game and fish departments differed to widely varying degrees among the states, and individual status review team members independently analyzed and summarized the state data sets or subsets for their respective geographic areas of responsibility, the reader will note some inevitable differences in the analyses performed and supporting narratives presented among the drainages and watersheds.

Status Review Team

A status review team consisting of Service biologists from Service Region 1, headquartered in Portland, Oregon, and Service Region 6, headquartered in Denver, Colorado, was appointed to prepare the status review for WCT and make appropriate recommendations in response to the petitioned listing action. Status review team members were: Scott A. Deeds, Fish and Wildlife Biologist, Upper Columbia River Basin Field Office, Spokane, WA; Lynn R. Kaeding, Team Leader and Chief, Branch of Native Fishes Management, Montana Fish and Wildlife Management Assistance Office, Bozeman, MT; Dr. Samuel C. Lohr, Fishery Biologist, Snake River Basin Office, Boise, ID; and Douglas A. Young, Fish and Wildlife Biologist, Central Oregon Field Office, Bend, OR.

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Fishes Management, Montana Fish and Wildlife Management Assistance Office, Bozeman, MT, assisted in assembling the document.

III. Life History and Ecology of Westslope Cutthroat Trout

Description

The WCT is one of 14 subspecies of cutthroat trout *O. clarki* native to interior regions of western North America (Trotter 1987; Behnke 1992). Cutthroat trout owe their common name to the distinctive red slash that occurs just below both sides of the lower jaw. Adult WCT typically exhibit bright yellow, orange and red colors, especially among males during the spawning season. Characteristics of WCT trout that distinguish this fish from the other cutthroat subspecies include a pattern of irregularly shaped spots on the body that has few spots below the lateral line, except near the tail (see cover image); a unique chromosome complement (2n = 66 vs 64 for other inland subspecies); and other genetic and morphological traits that appear to reflect a distinct, evolutionary lineage (Trotter 1987; Behnke 1992).

Taxonomy

Cutthroat trout of the subspecies that we today recognize as WCT were first described in 1805 by the Lewis and Clark expedition on the basis of specimens caught near the Great Falls of the Missouri River, near the present-day city of Great Falls, Montana (Behnke 1992). However, as recently as the 1970s there was confusion regarding the appropriate taxonomic classification of the WCT (Roscoe 1974). Today, WCT are considered a distinct taxonomic form, distinguishable from the Yellowstone and other subspecies of cutthroat trout on the basis of spotting pattern, karyotype (66 chromosomes), and biochemical characteristics (Behnke 1992). These features separate WCT from the other subspecies of inland cutthroat trout to a substantial degree atypical of fishes representing different taxons within a single species (Leary *et al.* 1987; Allendorf and Leary 1988). The subspecies *Oncorhynchus c. alpestris*, known as the "mountain cutthroat trout," is considered a synonym of WCT; it occurs as disjunct stocks ranging from the John Day River drainage in eastern Oregon into British Columbia (Trotter 1987; Behnke 1992).

Historic Distribution

The historic distribution of WCT (Behnke 1992; Figure 1) in streams and lakes is not known precisely but can be summarized as follows: West of the Continental Divide, the subspecies is native to several major drainages of the Columbia River basin, including the upper Kootenai River drainage from its headwaters in British Columbia, through northwest Montana, and into northern Idaho; the Clark Fork River drainage of Montana and Idaho downstream to the falls on the Pend Oreille River near the Washington-British Columbia border; the Spokane River above Spokane Falls and into Idaho's Coeur d'Alene and St. Joe River drainages; and the Salmon and Clearwater River drainages of Idaho's Snake River basin. The historic distribution of WCT also includes disjunct areas draining the east slope of the Cascade Mountains in Washington (Methow River and Lake Chelan drainages), the John Day River drainage in northeastern Oregon, and the headwaters of the Kootenai River and several other, disjunct regions in British Columbia. East of the Continental Divide, the historic distribution of WCT includes the headwaters of the South Saskatchewan River drainage (U.S. and Canada); the entire Missouri River drainage upstream from Fort Benton, Montana, and extending into northwest Wyoming; and the headwaters of the Judith, Milk, and Marias rivers, which join the Missouri River downstream from Fort Benton. The historic range of WCT is considered the most widespread geographically among the 14 subspecies of inland cutthroat trout.

Life History

Reproduction

Westslope cutthroat trout usually mature at 4 or 5 years of age and spawn entirely in streams, primarily small tributaries. Spawning occurs between March and July, when water temperatures warm to about 10 C (50 F) (Trotter 1987; Behnke 1992; McIntyre and Rieman 1995). Natal homing, the return of adult fish to spawning areas where they themselves were produced, is believed to occur in WCT. Individual fish may spawn only in alternate years (Shepard *et al.* 1984; Liknes and Graham 1988). Fertilized eggs are deposited in stream gravels where the developing embryos incubate for several weeks, with the actual time period inversely related to water temperature. Several days after hatching from the egg, WCT fry about 2.5 cm (1 inch) long emerge from the gravel and disperse into the stream.

Westslope cutthroat trout fry may grow to maturity in the spawning stream or they may migrate downstream and mature in larger rivers or lakes. Consequently, three WCT life-history types are recognized (Trotter 1987; Liknes and Graham 1988; Behnke 1992; McIntyre and Rieman 1995): *Resident* fish spend their lives entirely in the natal tributaries; *fluvial* fish spawn in small tributaries but their resulting young migrate downstream to larger rivers where they grow and mature; and *adfluvial* fish spawn in streams but their young migrate downstream to mature in lakes. After spawning in tributaries, adult fluvial and adfluvial WCT return to the rivers or lakes (Rieman and Apperson 1989; Behnke 1992). All three life-history types may occur in a single drainage (Bjornn and Liknes 1986; Rieman and Apperson 1989). Whether these life-history types represent opportunistic behaviors or genetically distinct forms of WCT is unknown. However, establishment of numerous, self-sustaining stocks of WCT in streams and lakes outside the historic range of the subspecies as the result of widespread introductions of hatchery WCT in Washington state (WDFW, *in litt.* 1998a), for example, suggests the life-history types represent opportunistic behaviors.

Feeding habits

Westslope cutthroat trout feed primarily on macroinvertebrates, particularly immature and mature forms of aquatic insects, terrestrial insects, and, in lakes, zooplankton (Liknes and

Graham 1988). These preferences for macroinvertebrates occur at all ages in both streams and lakes. Westslope cutthroat trout rarely feed on other fishes (Liknes and Graham 1988; Behnke 1992).

Growth

Growth of individual WCT, like that of fish of other species, depends largely upon the interaction of food availability and water temperature. Resident WCT usually do not grow longer than 30 cm (12 inches), presumably because they spend their entire lives in small, coldwater tributaries. In contrast, fluvial and adfluvial WCT often grow longer than 30 cm (12 inches) and attain weights of 0.9-1.4 kg (2-3 pounds). Such rapid growth results from the warmer, more-productive environments afforded by large rivers, lakes, and reservoirs (Trotter 1987; Behnke 1992).

Habitat Use

Spawning

Spawning habitat for WCT occurs in low-gradient stream reaches that have gravel substrate ranging from 2 mm to 75 mm (0.8 to 3 inches) in diameter, water depths near 0.2 m (0.7 ft), and mean water velocities from 0.3 to 0.4 m/sec (1 to 1.3 ft/sec) (Liknes 1984; Shepard *et al.* 1984). Proximity to cover (e.g., overhanging stream banks) is an important component of spawning habitat for adult WCT. On the basis of information for other salmonid species, survival of developing WCT embryos is probably inversely related to the amount of fine sediment in the substrate in which the fertilized WCT eggs were deposited (Alabaster and Lloyd 1982; Waters 1995).

Growth and survival

After they emerge from the spawning gravel, WCT fry generally occupy shallow waters near stream banks and other low-velocity areas (e.g., backwaters, side channels) (McIntyre and Rieman 1995). Fry move into main-channel pools as they grow to fingerling size (7.6-12.7 cm long; 3-5 inches). Juvenile WCT are most often found in stream pools and runs that have summer water temperatures of 7-16 C (45-61 F) and a diversity of cover (Fraley and Graham 1981; McIntyre and Rieman 1995). Adult WCT in streams are strongly associated with pools and cover (Shepard *et al.* 1984; Pratt 1984a; Peters 1988; Ireland 1993; McIntyre and Rieman 1995). During winter, adult WCT congregate in pools (Lewynsky 1986; Brown and Mackay 1995; McIntyre and Rieman 1995), while juvenile fish often use cover provided by boulders and other large instream structures (Wilson *et al.* 1987; Peters 1988; McIntyre and Rieman 1995). During summer in lakes and reservoirs, the primary habitat for rearing and maturation of adfluvial fish, WCT are often found at depths where temperatures are less than 16 C (61 F) (McIntyre and Rieman 1995).

Environmental Tolerances

Elevated Temperatures

Although studies detailing the specific critical thermal maximum (CTM) and upper incipient lethal temperature (UILT) for WCT were not found during this status review, data on other subspecies of cutthroat trout and nonnative salmonids that now occur in the historic range of WCT are available. DeStaso and Rahel (1994) reported the median CTM for 10 C-acclimated juvenile Colorado River cutthroat trout *O. c. pleuriticus* and juvenile brook trout *Salvelinus fontinalis* were 28 and 29 C, respectively. Lee and Rinne (1980) reported a median CTM of 28.7 C for brook trout acclimated to 10 C and found no significant differences among the CTMs for juveniles of brook trout, brown trout *Salmo trutta*, rainbow trout, Apache trout *O. gilae apache*, and Gila trout *O. gilae gilae*. The median CTM for these fish ranged from 28.3-29.0 C for 10 C-acclimated fish and from 29.4-29.9 C for 20 C-acclimated fish. Thus, the limited number of laboratory studies indicated that the CTM for cutthroat trout is not notably different from those for introduced, nonnative species such as brook and rainbow trout.

Data on the distributions of various species of native and nonnative salmonids in nature also suggest cutthroat trout are typical in thermal tolerance. Eaton *et al.* (1995) reported thermal tolerance limits for 4 species of salmonids at the 95th percentile of observed maximum water temperatures inhabited by each species. Tolerance limits for brook, cutthroat, rainbow, and brown trout were 22.3, 23.2, 24.0, and 24.1 C, respectively.

DeStaso and Rahel (1994) found juvenile Colorado River cutthroat trout and brook trout were equally competitive in a laboratory stream at 10 C, but brook trout were more aggressive, consumed more food, and occupied the most advantageous stream positions at 20 C. DeStaso and Rahel (1994) suggested warmer temperatures, lower stream gradients, and the size advantage afforded the fall-spawned, young-of-the-year brook trout are important mechanisms in replacement of cutthroat trout by nonnative brook trout in streams. However, that study was limited to behavioral interactions and did not include long-term observations of possible sublethal temperature effects (e.g., on growth or disease resistence) on either species.

Habitats of historic stocks of WCT ranged from cold headwater streams to warmer, mainstem rivers (Shepard *et al.* 1984; Behnke 1992). Today, remaining stocks of WCT occur primarily in colder, headwater streams (Liknes and Graham 1988). Westslope cutthroat trout may exist in these streams not because the thermal conditions there are optimal for WCT, but because nonnative salmonid competitors like brook trout cannot exploit these cold, high-gradient waters (Griffith 1988; Fausch 1989).

Turbidity and Fine Sediment

Few field studies have investigated fine-sediment effects on cutthroat trout. Irving and Bjornn (1984) reported on cutthroat embryo survival versus percentage of fine substrate materials < 6.35 mm in diameter and found embryo survival was reduced 25-50 % when fines where 10-20 % of total substrate volume, respectively. Mortality was nearly 100 % at 45 % fines. Cutthroat trout embryo survival in that study was consistently lower than embryo survival of rainbow trout and steelhead *O. mykiss*, kokanee *O. nerka*, and chinook salmon *O. tshawytscha* (Tappel and Bjornn 1983; Irving and Bjornn 1984).

In contrast, Magee *et al.* (1996) reported on WCT in the Taylor's Fork basin, a sediment-rich watershed in the upper Missouri River drainage, Montana. Highly erosive, sedimentary geology and poor land-use practices contributed to high levels of fine sediments < 6.35 mm in diameter (mean volume, 41.6 %) and < 0.85 mm (mean volume, 17.9 %). Those researchers found recruitment of WCT was not limited despite low estimated embryo survival (mean, 8.5 %) at those levels of fine sediments. Magee *et al.* (1996) suggested compensatory juvenile survival and higher survival of WCT embryos in a small portion of redds with high-quality substrate offset WCT losses due to high sediment levels. Concurrently, Ireland (1993) reported high densities (0.6-28.8 fish/100 m^2) of WCT in the basin. These densities were higher than those reported for streams in the upper Flathead basin, Montana (0.7-17.7 fish/100 m^2), where stream substrates contained lower amounts of fine sediments (14-20 % of volume < 2 mm in diameter) (Shepard *et al.* 1984). These results emphasize the need to investigate potential sediment effects in the context of the entire life cycle of WCT, not only on embryo survival.

Movements

In addition to the seasonal movements related to spawning and growth described above, WCT often move in response to seasonal changes in habitat conditions and habitat requirements. Fluvial and adfluvial WCT have been shown to migrate more than 100 km (62 miles) in response to habitat needs (Bjornn and Mallet 1964; Liknes 1984). For example, there can be considerable movement to suitable pools used as overwintering habitats (Brown and Mackay 1995). Among resident WCT in tributaries, less extensive, seasonal movements may be made in response to changing habitat requirements and conditions, particularly water temperatures. Westslope cutthroat trout may move relatively little in stream reaches that have numerous pools (Peters 1988), whereas movement can be more extensive in stream reaches with few pools (Lewynsky 1986; Peters 1988; McIntyre and Rieman 1995).

Interactions with other Fish Species

During their evolutionary history in the Columbia River basin, WCT shared habitats with several piscivorous (i.e. fish-eating) fish species, namely northern pikeminnow *Ptychocheilus oregonensis*, bull trout, chinook salmon, and rainbow trout and their sea-run form, steelhead. In the Missouri River basin, where WCT have probably occurred for 7,000 to 10,000 years (Behnke 1992), the subspecies formerly coexisted with fewer species of fish, all of them essentially nonpiscivorous (e.g., Arctic grayling *Thymallus arcticus* and mountain whitefish *Prosopium williamsoni)*. In both river basins, WCT also coexisted with sculpins *Cottus* spp., suckers *Catostomus* spp., and dace *Rhinichthys* spp. and other minnows.

Today, many of the historic habitats of WCT have been extensively colonized by introduced (stocked), nonnative fishes. Among these nonnative species are brook trout, rainbow trout, brown trout, and lake trout *Salvelinus namaycush*. Griffith (1988) considered brook trout to be the most significant competitor with all subspecies of cutthroat trout in streams, leading to the elimination of WCT in some areas. Nonnative fish species and subspecies can also pose threats to the genetic integrity of WCT. Liknes and Graham (1988) considered genetic introgression (interbreeding), particularly with rainbow trout or Yellowstone cutthroat trout, to be the primary threat to the continued existence of WCT where these species coexist.

IV. Geographic Summaries of Biological Information for Westslope Cutthroat Trout

Oldman River Drainage

Status and Distribution

The Oldman River drainage encompasses 671 square miles (429,161 acres) in northcentral Montana (MTFWP, *in litt.* 1999). The principal tributaries composing the Oldman River drainage are the Belly and St. Mary rivers. Land ownership in the Belly River watershed is 97.6 % National Park Service (i.e. Glacier National Park) and 2.4 % private. In the St. Mary River watershed, land ownership is 53.5 % National Park Service, 29.1 % tribal (Blackfeet Tribe), and 17.4 % private (MTFWP, *in litt.* 1999).

The westslope cutthroat trout (WCT) apparently gained access to the Belly and St. Mary River watersheds from the Columbia River basin sometime after the last glacial period, but may have never attained widespread abundance (Marnell 1988; Marnell, NPS, *pers. comm*. 1999). The WCT stocks that did establish in the Glacier National Park portions of these watersheds probably maintained viable populations only in headwater areas, where they were secure from the highly predacious, native lake trout that subsequently and naturally colonized the principal lacustrine (lake) habitats (i.e. Waterton Lake, Alberta, and the St. Mary Lakes, Montana) of the drainage. In turn, a large proportion of these stream-dwelling WCT appear to have subsequently interbred with introduced rainbow trout (e.g., in the Belly River) or were eliminated entirely by negative interactions with this introduced species. Today, WCT survive only as isolated stocks in a few headwater streams along the park's east boundary, north of St. Mary Lake.

Missouri River Headwaters Drainage

Status and Distribution

The Missouri River headwaters drainage encompasses 14,034 square miles (8,981,455 acres) in southwest Montana (MTFWP, *in litt.* 1999). The principal tributaries composing the Missouri River headwaters are the Red Rock, Beaverhead, Ruby, Big Hole, Jefferson, Boulder, Madison, and Gallatin rivers. Land ownership in the drainage is 39.2 % U.S. Forest Service, 12.2 % U.S. Bureau of Land Management, 1.5 % National Park Service, 7.2 % State of Montana, and 39.9 % private and other public entities (Appendix Table 4; MTFWP, *in litt.* 1999).

In response to the June 10, 1998, **Federal Register** notice (63 FR 31691) , Montana Fish, Wildlife and Parks (MTFWP) provided information on the distribution, abundance and other characteristics of WCT in the watersheds (i.e. 4th-field HUCs; see **II. Introduction and Approach**) that constitute the Missouri River headwaters drainage (MTFWP, *in litt.* 1998). Accordingly, the information on WCT provided in this status review document is presented by watershed.

Westslope cutthroat trout are believed to have historically occupied all of the streams and lakes to which they had access in the Missouri River headwaters drainage (MTFWP, *in litt.* 1998). In the drainage, however, only 6,290 miles (34 %) of the estimated 18,634 miles of historic stream habitat have been surveyed for WCT. Thus, WCT could occupy additional stream miles that have not yet been surveyed. Among those 6,290 surveyed stream miles, WCT have been documented in 2,279 miles of stream (36 %). Those WCT stocks have various degrees of genetic purity or have not yet been tested genetically. Of the total linear amount of stream habitat known to be occupied by WCT in the Missouri River headwaters drainage, 52.9 % lies on lands administered by federal agencies (Appendix Table 4; MTFWP, *in litt.* 1999).

Among the 6,290 miles of stream surveyed, stocks of genetically pure WCT occupy 384 miles (64 stream reaches); stocks that are 99.9 to 90.0 % pure occupy 351 miles; and stocks that are < 90.0 % pure occupy 298 miles (MTFWP, *in litt.* 1998). Westslope cutthroat trout stocks inhabiting 1,246 miles of stream (340 stream reaches) remain untested genetically (Appendix Table 3). Among the 2,279 miles of stream occupied by WCT stocks, 177 of the stream miles have stocks that are genetically pure and considered by MTFWP to be abundant; genetically pure stocks in the remaining 207 miles of stream are considered rare. Of the 735 stream miles with WCT stocks that have genetic purity of ≥ 90 %, fish in 379 miles of stream are considered abundant.

The Red Rock River watershed encompasses 2,330 square miles (1,491,200 acres) (MTFWP, *in litt.* 1999). Land ownership in the Red Rock watershed is 26.0 % U.S. Forest Service, 29.3 % U.S. Bureau of Land Management, 2.4 % National Park Service, 12.5 % State of Montana, and 29.9 % private and other public entities (Appendix Table 4; MTFWP, *in litt.* 1999). In the watershed, stocks of genetically pure WCT occupy 79 miles (11 stream reaches); stocks that are 99.9 to 90.0 % pure occupy 138 miles; stocks that are < 90.0 % pure occupy 68 miles; and stocks in 197 miles of stream (47 stream reaches) remain untested genetically (Appendix Table 3; MTFWP, *in litt.* 1998). Among the total 482 miles of stream occupied by WCT stocks, 334 of the stream miles have stocks that are considered abundant; stocks in the remaining 148 miles of stream are considered rare. Of the total linear amount of stream habitat known to be occupied by WCT in the Red Rock River watershed, 48.5 % lies on lands administered by federal agencies (Appendix Table 4; MTFWP, *in litt.* 1999).

<u>The Beaverhead River watershed</u> encompasses 1,460 square miles (934,400 acres) (MTFWP, *in litt.* 1999). Land ownership in the Beaverhead watershed is 14.6 % U.S. Forest Service, 23.9 % U.S. Bureau of Land Management, 14.3 % State of Montana, and 47.2 % private and other public entities (Appendix Table 4; MTFWP, *in litt.* 1999). In the watershed, stocks of genetically pure WCT occupy 91 miles (13 stream reaches); stocks that are 99.9 to 90.0 % pure occupy 27 miles; stocks that are < 90.0 % pure occupy 17 miles; and stocks in 87 miles of stream (21 stream reaches) remain untested genetically (Appendix Table 3; MTFWP, *in litt.* 1998). Among the total 222 miles of stream occupied by WCT stocks, 150 of the stream miles have stocks that are considered abundant; stocks in the remaining 72 miles of stream are considered rare. Of the total linear amount of stream habitat known to be occupied by WCT in the Beaverhead River watershed, 32.3 % lies on lands administered by federal agencies (Appendix Table 4; MTFWP, *in litt.* 1999).

<u>The Ruby River watershed</u> encompasses 988 square miles (632,320 acres) (MTFWP, *in litt.* 1999). Land ownership in the Ruby watershed is 35.7 % U.S. Forest Service, 15.0 % U.S. Bureau of Land Management, 7.1 % State of Montana, and 42.1 % private and other public entities (Appendix Table 4; MTFWP, *in litt.* 1999). In the watershed, stocks of genetically pure WCT occupy 52 miles (nine stream reaches); stocks that are 99.9 to 90.0 % pure occupy 63 miles; stocks that are < 90.0 % pure occupy 49 miles; and stocks in 87 miles of stream (38 stream reaches) remain untested genetically (Appendix Table 3; MTFWP, *in litt.* 1998). Among the total 251 miles of stream occupied by WCT stocks, 150 of the stream miles have stocks that are considered abundant; stocks in the remaining 101 miles of stream are considered rare. Of the total linear amount of stream habitat known to be occupied by WCT in the Ruby River watershed, 54.0 % lies on lands administered by federal agencies (Appendix Table 4; MTFWP, *in litt.* 1999).

<u>The Big Hole River watershed</u> encompasses 2,790 square miles (1,785,600 acres) (MTFWP, *in litt.* 1999). Land ownership in the Big Hole watershed is 58.3 % U.S. Forest Service, 9.4 % U.S. Bureau of Land Management, 5.6 % State of Montana, and 26.7 % private and other public entities (Appendix Table 4; MTFWP, *in litt.* 1999). In the watershed, stocks of genetically pure WCT occupy 107 miles (25 stream reaches); stocks that are 99.9 to 90.0 % pure occupy 71 miles; stocks that are < 90.0 % pure occupy 75 miles; and stocks in 443 miles of stream (122 stream reaches) remain untested genetically (Appendix Table 3; MTFWP, *in litt.* 1998). Among the total 696 miles of stream occupied by WCT stocks, 193 of the stream miles have stocks that are considered abundant; stocks in the remaining 503 miles of stream are considered rare. Of the total linear amount of stream habitat known to be occupied by WCT in the Big Hole River

watershed, 53.6 % lies on lands administered by federal agencies (Appendix Table 4; MTFWP, *in litt.* 1999).

The Jefferson River watershed encompasses 1.340 square miles (857,600 acres) (MTFWP, *in litt.* 1999). Land ownership in the Jefferson watershed is 27.9 % U.S. Forest Service, 8.5 % U.S. Bureau of Land Management, 5.6 % State of Montana, and 58.0 % private and other public entities (Appendix Table 4; MTFWP, *in litt.* 1999). In the watershed, stocks of genetically pure WCT occupy 22 miles (two stream reaches); stocks that are 99.9 to 90.0 % pure occupy 12 miles; stocks that are < 90.0 % pure occupy six miles; and stocks in 19 miles of stream (eight stream reaches) remain untested genetically (Appendix Table 3; MTFWP, *in litt.* 1998). Among the total 59 miles of stream occupied by WCT stocks, 17 of the stream miles have stocks that are considered abundant; stocks in the remaining 42 miles of stream are considered rare. Of the total linear amount of stream habitat known to be occupied by WCT in the Jefferson River watershed, 50.5 % lies on lands administered by federal agencies (Appendix Table 4; MTFWP, *in litt.* 1999).

The Boulder River watershed encompasses 754 square miles (482,560 acres) (MTFWP, *in litt.* 1999). Land ownership in the Boulder watershed is 50.8 % U.S. Forest Service, 9.0 % U.S. Bureau of Land Management, 3.3 % State of Montana, and 36.9 % private and other public entities (Appendix Table 4; MTFWP, *in litt.* 1999). In the watershed, stocks of genetically pure WCT occupy 21 miles (one stream reach) and stocks in 29 miles of stream (six stream reaches) remain untested genetically (Appendix Table 3; MTFWP, *in litt.* 1998). Among the total 50 miles of stream occupied by WCT stocks, two of the stream miles have stocks that are considered abundant; stocks in the remaining 48 miles of stream are considered rare. Of the total linear amount of stream habitat known to be occupied by WCT in the Boulder River watershed, 76.6 % lies on lands administered by federal agencies (Appendix Table 4; MTFWP, *in litt.* 1999).

The Madison River watershed encompasses 2,559 square miles (1,637,530 acres) (MTFWP, *in litt.* 1999). Land ownership in the Madison watershed is 48.4 % U.S. Forest Service, 3.4 % U.S. Bureau of Land Management, 3.0 % National Park Service, 4.7 % State of Montana, and 40.4 % private and other public entities (Appendix Table 4; MTFWP, *in litt.* 1999). In the watershed, stocks of genetically pure WCT occupy 12 miles (2 stream reaches); stocks that are 99.9 to 90.0 % pure occupy 19 miles; stocks that are < 90.0 % pure occupy 44 miles; and stocks in 235 miles of stream (47 stream reaches) remain untested genetically (Appendix Table 3; MTFWP, *in litt.* 1998). Among the total 310 miles of stream occupied by WCT stocks, 93 of the stream miles have stocks that are considered abundant; stocks in the remaining 217 miles of stream are considered rare. Of the total linear amount of stream habitat known to be occupied by WCT in the Madison River watershed, 60.5 % lies on lands administered by federal agencies (Appendix Table 4; MTFWP, *in litt.* 1999). In that portion of the watershed that lies in Yellowstone National Park (and principally in Wyoming), genetically pure WCT may no longer occur, although the genetic characteristics of one stock, in Cougar Creek, are about 94 % WCT (USFWS 1994; Finley, *in litt.* 1998).

The Gallatin River watershed encompasses 1,813 square miles (1,160,245 acres) (MTFWP, *in litt.* 1999). Land ownership in the watershed is 39.3 % U.S. Forest Service, 0.2 % U.S. Bureau of Land Management, 4.1 % National Park Service, 3.2 % State of Montana, and 53.2 % private and other public entities (Appendix Table 4; MTFWP, *in litt.* 1999). In the Gallatin River watershed, stocks of WCT that are 99.9 to 90.0 % genetically pure occupy 21 miles; stocks that are < 90.0 % pure occupy 39 miles; and stocks in 149 miles of stream (51 stream reaches) remain untested genetically (Appendix Table 3; MTFWP, *in litt.* 1998). Among the total 209 miles of stream occupied by WCT stocks, 62 of the stream miles have stocks that are considered abundant; stocks in the remaining 147 miles of stream are considered rare. Of the total linear amount of stream habitat known to be occupied by WCT in the Gallatin River watershed, 32.8 % lies on lands administered by federal agencies (Appendix Table 4; MTFWP, *in litt.* 1999). In that portion of the watershed that lies in Yellowstone National Park (and principally in Wyoming), genetically pure WCT are known to occur in only one stream (Finley, *in litt.* 1998).

In summary, WCT in the Missouri River Headwaters drainage occur in about 340 tributaries or stream reaches that collectively encompass 2,279 linear miles of stream habitat, distributed among 8 watersheds (Appendix Table 2). Of the total linear amount of stream habitat known to be occupied by WCT in the drainage, 52.9 % lies on lands administered by federal agencies (Appendix Table 4).

Lower Missouri River Drainage

Status and Distribution

The Lower Missouri River drainage encompasses 24,041 square miles (15,386,486 acres) in central Montana (MTFWP, *in litt.* 1998). Principal tributaries of the Lower Missouri River are the upper Missouri, upper Missouri-Dearborn, Smith, Sun, Two Medicine, Teton, Judith, and Upper Musselshell rivers and Belt, Arrow, Flat Willow, and Box Elder creeks. Land ownership in the drainage is 16.2 % U.S. Forest Service, 2.6 % U.S. Bureau of Land Management, 0.4 % National Park Service, 2.8 % tribal, 6.6 % State of Montana, and 71.4 % private and other public entities (Appendix Table 4; MTFWP, *in litt.* 1999).

Montana Fish, Wildlife and Parks provided information on the distribution, abundance and other characteristics of WCT in the watersheds (i.e. 4th-field HUCs; see **II. Introduction and Approach**) that constitute the Lower Missouri River drainage (MTFWP, *in litt.* 1998). Accordingly, the information on WCT provided in this status review document is presented by watershed.

Westslope cutthroat trout are believed to have historically occupied all of the streams and lakes to which they had access in the Lower Missouri River drainage (MTFWP, *in litt.* 1998). In the drainage, however, only 9,787 miles (34 %) of the estimated 29,027 miles of historic stream habitat have been surveyed for WCT. Thus, WCT could occupy additional stream miles that have not yet been surveyed. Among those 9,787 surveyed stream miles, WCT have been documented in 1,791 miles of stream (18 %). Those WCT stocks have various degrees of genetic purity or have not yet been tested genetically. Of the total linear amount of stream habitat known to be occupied by WCT in the Lower Missouri River drainage, 19.2 % lies on lands administered by federal agencies (Appendix Table 4; MTFWP, *in litt.* 1999).

Among the 9,787 miles of stream surveyed, stocks of genetically pure WCT occupy 217 miles (49 stream reaches); stocks that are 99.9 to 90.0 % pure occupy 116 miles; and stocks that are < 90.0 % pure occupy 135 miles (MTFWP, *in litt.* 1998). Westslope cutthroat trout stocks inhabiting 1,323 miles of stream (568 stream reaches) remain untested genetically (Appendix Table 3). Among the 1,791 miles of stream occupied by WCT stocks, 138 of the stream miles have stocks that are genetically pure and considered abundant; genetically pure stocks in the remaining 79 miles of stream are considered rare. Of the 333 stream miles with WCT stocks that have genetic purity of $\geq$ 90 %, fish in 216 miles of stream are considered abundant.

<u>The Upper Missouri River watershed</u> encompasses 3,344 square miles (2,140,246 acres) (MTFWP, *in litt.* 1998). Land ownership in the Upper Missouri watershed is 24.7 % U.S. Forest Service, 7.0 % U.S. Bureau of Land Management, 5.5 % State of Montana, and 62.8 % private and other public entities (Appendix Table 4; MTFWP, *in litt.* 1999). In the watershed, stocks of genetically pure WCT occupy 64 miles (eight stream reaches); stocks that are 99.9 to 90.0 % pure occupy five miles; stocks that are < 90.0 % pure occupy 46 miles; and stocks in 157 miles of stream (58 stream reaches) remain untested genetically (Appendix Table 3; MTFWP, *in litt.*

1998). Among the total 272 miles of stream occupied by WCT stocks, 127 of the stream miles have stocks that are considered abundant; stocks in the remaining 145 miles of stream are considered rare. Of the total linear amount of stream habitat known to be occupied by WCT in the Upper Missouri River watershed, 25.0 % lies on lands administered by federal agencies (Appendix Table 4; MTFWP, *in litt.* 1999).

The Upper Missouri-Dearborn watershed encompasses 2,680 square miles (1,715,200 acres) (MTFWP, *in litt.* 1998). Land ownership in the Upper Missouri-Dearborn watershed is 5.8 % U.S. Forest Service, 1.8 % U.S. Bureau of Land Management, 0.4 % National Park Service, 6.7 % State of Montana, and 85.3 % private and other public entities (Appendix Table 4; MTFWP, *in litt.* 1999). In the watershed, stocks of WCT that are < 90.0 % genetically pure occupy 20 miles and stocks in 93 miles of stream (20 stream reaches) remain untested genetically (Appendix Table 3; MTFWP, *in litt.* 1998). Among the total 113 miles of stream occupied by WCT stocks, 53 of the stream miles have stocks that are considered abundant; stocks in the remaining 60 miles of stream are considered rare. Of the total linear amount of stream habitat known to be occupied by WCT in the Upper Missouri-Dearborn watershed, 24.7 % lies on lands administered by federal agencies (Appendix Table 4; MTFWP, *in litt.* 1999).

The Smith River watershed encompasses 2,020 square miles (1,292,800 acres) (MTFWP, *in litt.* 1998). Land ownership in the Smith watershed is 24.9 % U.S. Forest Service, 0.9 % U.S. Bureau of Land Management, 6.0 % State of Montana, and 68.3 % private and other public entities (Appendix Table 4; MTFWP, *in litt.* 1999). In the watershed, stocks of genetically pure WCT occupy 27 miles (nine stream reaches); stocks that are 99.9 to 90.0 % pure occupy 12 miles; stocks that are < 90.0 % pure occupy 23 miles; and stocks in 408 miles of stream (109 stream reaches) remain untested genetically (Appendix Table 3; MTFWP, *in litt.* 1998). Among the total 470 miles of stream occupied by WCT stocks, 140 of the stream miles have stocks that are considered abundant; stocks in the remaining 330 miles of stream are considered rare. Of the total linear amount of stream habitat known to be occupied by WCT in the Smith River watershed, 35.2 % lies on lands administered by federal agencies (Appendix Table 4; MTFWP, *in litt.* 1999).

The Sun River watershed encompasses 2,000 square miles (1,280,000 acres) (MTFWP, *in litt.* 1998). Land ownership in the Sun watershed is 34.1 % U.S. Forest Service, 2.0 % U.S. Bureau of Land Management, 0.1 % National Park Service, 9.0 % State of Montana, and 54.9 % private and other public entities (Appendix Table 4; MTFWP, *in litt.* 1999). In the watershed, stocks of genetically pure WCT occupy one stream mile (one stream reach); stocks that are 99.9 to 90.0 % pure occupy 14 miles; and stocks in 145 miles of stream (270 stream reaches) remain untested genetically (Appendix Table 3; MTFWP, *in litt.* 1998). Among the total 161 miles of stream occupied by WCT stocks, 42 of the stream miles have stocks that are considered abundant; stocks in the remaining 119 miles of stream are considered rare. Of the total linear amount of stream habitat known to be occupied by WCT in the Sun River watershed, 71.8 % lies on lands administered by federal agencies (Appendix Table 4; MTFWP, *in litt.* 1999).

The Belt Creek watershed encompasses 806 square miles (515,840 acres) (MTFWP, *in litt.* 1998). Land ownership in the Belt watershed is 35.8 % U.S. Forest Service, 0.7 % U.S. Bureau of Land Management, 2.3 % State of Montana, and 61.2 % private and other public entities (Appendix Table 4; MTFWP, *in litt.* 1999). In the watershed, stocks of genetically pure WCT occupy 40 miles (five stream reaches); stocks that are 99.9 to 90.0 % pure occupy 17 miles; and stocks in 127 miles of stream (35 stream reaches) remain untested genetically (Appendix Table 3; MTFWP, *in litt.* 1998). Among the total 184 miles of stream occupied by WCT stocks, 78 of the stream miles have stocks that are considered abundant; stocks in the remaining 106 miles of stream are considered rare. Of the total linear amount of stream habitat known to be occupied by WCT in the Belt Creek watershed, 64.2 % lies on lands administered by federal agencies (Appendix Table 4; MTFWP, *in litt.* 1999).

The Two Medicine River watershed encompasses 1,320 square miles (844,800 acres) (MTFWP, *in litt.* 1998). Land ownership in the Two Medicine watershed is 21.7 % U.S. Forest Service, 0.1 % U.S. Bureau of Land Management, 6.2 % National Park Service, 36.6 % Blackfeet Tribe, 2.1 % State of Montana, and 33.2 % private and other public entities (Appendix Table 4; MTFWP, *in litt.* 1999). In the watershed, stocks of genetically pure WCT occupy 28 miles (12 stream reaches); stocks that are 99.9 to 90.0 % pure occupy 36 miles; stocks that are < 90.0 % pure occupy 42 miles; and stocks in 110 miles of stream (28 stream reaches) remain untested genetically (Appendix Table 3; MTFWP, *in litt.* 1998). Among the total 216 miles of stream occupied by WCT stocks, 113 of the stream miles have stocks that are considered abundant; stocks in the remaining 103 miles of stream are considered rare. Of the total linear amount of stream habitat known to be occupied by WCT in the Two Medicine River watershed, 59.4 % lies on lands administered by federal agencies (Appendix Table 4; MTFWP, *in litt.* 1999).

The Teton River watershed encompasses 1,960 square miles (1,254,400 acres) (MTFWP, *in litt.* 1998). Land ownership in the Teton watershed is 1.7 % U.S. Bureau of Land Management, 7.8 % Blackfeet Tribe, 8.7 % State of Montana, and 81.8 % private and other public entities (Appendix Table 4; MTFWP, *in litt.* 1999). In the watershed, stocks of genetically pure WCT occupy 30 miles (seven stream reaches); stocks that are 99.9 to 90.0 % pure occupy 10 miles; and stocks in 70 miles of stream (15 stream reaches) remain untested genetically (Appendix Table 3; MTFWP, *in litt.* 1998). Among the total 110 miles of stream occupied by WCT stocks, 29 of the stream miles have stocks that are considered abundant; stocks in the remaining 81 miles of stream are considered rare. Of the total linear amount of stream habitat known to be occupied by WCT in the Teton River watershed, 56.1 % lies on lands administered by federal agencies (Appendix Table 4; MTFWP, *in litt.* 1999).

The Arrow Creek watershed encompasses 1,220 square miles (780,800 acres) (MTFWP, *in litt.* 1998). Land ownership in the Arrow watershed is 3.5 % U.S. Forest Service, 6.8 % U.S. Bureau of Land Management, 0.2 % National Park Service, 14.3 % State of Montana, and 75.2 % private and other public entities (Appendix Table 4; MTFWP, *in litt.* 1999). In the watershed, stocks of WCT occupying 13 miles of stream remain untested genetically (Appendix Table 3; MTFWP, *in litt.* 1998). Among the total 13 miles of stream occupied by WCT stocks, two of the stream miles have stocks that are considered abundant; stocks in the remaining 11 miles of stream are considered rare. Of the total linear amount of stream habitat known to be occupied by WCT in the Arrow Creek watershed, 8.9 % lies on lands administered by federal agencies (Appendix Table 4; MTFWP, *in litt.* 1999).

<u>The Judith River watershed</u> encompasses 2,780 square miles (1,779,200 acres) (MTFWP, *in litt.* 1998). Land ownership in the Judith watershed is 16.9 % U.S. Forest Service, 2.5 % U.S. Bureau of Land Management, 5.0 % State of Montana, and 75.5 % private and other public entities (Appendix Table 4; MTFWP, *in litt.* 1999). In the watershed, stocks of genetically pure WCT occupy 12 miles (five stream reaches); stocks that are 99.9 to 90.0 % pure occupy 22 miles; stocks that are < 90.0 % pure occupy four miles; and stocks in 154 miles of stream (29 stream reaches) remain untested genetically (Appendix Table 3; MTFWP, *in litt.* 1998). Among the total 192 miles of stream occupied by WCT stocks, 70 of the stream miles have stocks that are considered abundant; stocks in the remaining 122 miles of stream are considered rare. Of the total linear amount of stream habitat known to be occupied by WCT in the Judith River watershed, 59.4 % lies on lands administered by federal agencies (Appendix Table 4; MTFWP, *in litt.* 1999).

<u>The Upper Musselshell River watershed</u> encompasses 4,050 square miles (2,592,000 acres) (MTFWP, *in litt.* 1998). Land ownership in the Upper Musselshell watershed is 10.6 % U.S. Forest Service, 0.6 % U.S. Bureau of Land Management, 6.9 % State of Montana, and 81.8 % private and other public entities (Appendix Table 4; MTFWP, *in litt.* 1999). In the watershed, stocks of WCT occupying 46 miles of stream (three stream reaches) remain untested genetically (Appendix Table 3; MTFWP, *in litt.* 1998). Among the total 46 miles of stream occupied by WCT stocks, 15 of the stream miles have stocks that are considered abundant; stocks in the remaining 31 miles of stream are considered rare. Of the total linear amount of stream habitat known to be occupied by WCT in the Upper Musselshell River watershed, 21.4 % lies on lands administered by federal agencies (Appendix Table 4; MTFWP, *in litt.* 1999).

<u>The Flat Willow Creek watershed</u> encompasses 692 square miles (442,880 acres) (MTFWP, *in litt.* 1998). Land ownership in the Flatwillow watershed is 4.3 % U.S. Forest Service, 5.9 % U.S. Bureau of Land Management, 0.3 % National Park Service, 5.8 % State of Montana, and 83.6 % private and other public entities (Appendix Table 4; MTFWP, *in litt.* 1999). In the watershed, stocks of genetically pure WCT occupy eight miles of stream (Appendix Table 3) (MTFWP, *in litt.* 1998). Among the eight miles of stream occupied by WCT stocks, all miles have stocks that are considered abundant. Of the total linear amount of stream habitat known to be occupied by WCT in the Flatwillow Creek watershed, 67.6 % lies on lands administered by federal agencies (Appendix Table 4; MTFWP, *in litt.* 1999).

<u>The Box Elder Creek watershed</u> encompasses 1,169 square miles (748,320 acres) (MTFWP, *in litt.* 1998). Land ownership in the Box Elder watershed is 14.9 % U.S. Bureau of Land Management, 0.2 % National Park Service, 6.2 % State of Montana, and 78.8 % private and other public entities (Appendix Table 4; MTFWP, *in litt.* 1999). In the watershed, stocks of genetically pure WCT occupy six miles of stream (one stream reach) (Appendix Table 3) (MTFWP, *in litt.* 1998). Within the six miles of stream occupied by WCT stocks, the stocks are

considered abundant. Of the total linear amount of stream habitat known to be occupied by WCT in the Box Elder Creek watershed, 54.5 % lies on lands administered by federal agencies (Appendix Table 4; MTFWP, *in litt.* 1999).

In summary, WCT in the Lower Missouri River drainage occur in about 617 tributaries or stream reaches that collectively encompass 1,791 linear miles of stream habitat, distributed among 12 watersheds (Appendix Table 2). Of the total linear amount of stream habitat known to be occupied by WCT in the drainage, 19.2 % lies on lands administered by federal agencies (Appendix Table 4).

Kootenai River Drainage, Montana

Status and Distribution

The Kootenai River is a major tributary to the Columbia River. The Kootenai River drainage encompasses 4,815 square miles (3,081,440 acres) in northwest Montana (MTFWP, *in litt.* 1999). Principal tributaries of the Kootenai River are the Upper Kootenai, Fisher, Yaak, Lower Kootenai, and Moyie rivers. Land ownership in the drainage is 74.2 % U.S. Forest Service, 1.5 % State of Montana, and 24.3 % private and other public entities (Appendix Table 4; MTFWP, *in litt.* 1999).

Montana Fish, Wildlife and Parks provided information on the distribution, abundance and other characteristics of WCT in the watersheds (i.e. 4th-field HUCs; see **II. Introduction and Approach**) that constitute the Kootenai River drainage (MTFWP, *in litt.* 1998). Accordingly, the information on WCT provided in this status review document is presented by watershed. In addition, data on the known or predicted status of WCT in the HUCs within each watershed, provided by the Interior Columbia Basin Ecosystem Management Project (ICBEMP; see **II. Introduction and Approach**), are presented (Appendix Table 2) and analyzed.

Westslope cutthroat trout are believed to have historically occupied all of the streams and lakes to which they had access in the Kootenai River drainage (MTFWP, *in litt.* 1998). In the drainage, however, only 1,615 miles (39.2 %) of the estimated 4,119 miles of historic stream habitat have been surveyed for WCT. Thus, WCT could occupy additional stream miles that have not yet been surveyed. Among those 1,615 surveyed stream miles, WCT have been documented in 1,051 miles of stream (65.1 %). Those WCT stocks have various degrees of genetic purity or have not yet been tested genetically. Of the total linear amount of stream habitat known to be occupied by WCT in the Kootenai River drainage, 74.2 % lies on lands administered by federal agencies (Appendix Table 4; MTFWP, *in litt.* 1999).

Among the 1,615 miles of stream surveyed, stocks of genetically pure WCT occupy 138 miles (31 stream reaches); stocks that are 99.9 to 90.0 % pure occupy 32 miles; and stocks that are < 90.0 % pure occupy 309 miles (MTFWP, *in litt.* 1998). Westslope cutthroat trout stocks inhabiting 572 miles of stream (196 stream reaches) remain untested genetically (Appendix Table 3). Among the 1,051 miles of stream occupied by WCT stocks, 104 of the stream miles have stocks that are genetically pure and considered abundant; genetically pure stocks in the remaining 34 miles of stream are considered rare. Of the 170 stream miles with WCT stocks that have genetic purity of ≥ 90 %, fish in 125 miles of stream are considered abundant.

Data from the ICBEMP (Appendix Table 2) indicate WCT stocks are strong or predicted strong in 15 HUCs, depressed or predicted depressed in 159 HUCs, and absent or predicted absent in the remaining 11 HUCs that collectively constitute the Kootenai River drainage. Correlation analysis performed among watersheds in the drainage revealed a significant, positive relation between the number of stream miles occupied by WCT (MTFWP, *in litt.* 1998) and the number

of HUCs that the ICBEMP indicated were known or predicted to have WCT (Appendix Table 2).

<u>The Upper Kootenai River watershed</u> encompasses 2,290 square miles (1,465,600 acres) (MTFWP, *in litt.* 1999). Land ownership in the Upper Kootenai watershed is 78.5 % U.S. Forest Service, 1.7 % State of Montana, and 19.8 private and other public entities (Appendix Table 4; MTFWP, *in litt.* 1999). In the watershed, stocks of genetically pure WCT occupy 43 miles (7 stream reaches); stocks that are 99.9 to 90.0 % pure occupy 26 miles; stocks that are < 90.0 % pure occupy 250 miles; and stocks in 355 miles of stream (115 stream reaches) remain untested genetically (Appendix Table 3; MTFWP, *in litt.* 1998). Among the total 674 miles of stream occupied by WCT stocks, 512 of the stream miles have stocks that are considered abundant; stocks in the remaining 162 miles of stream are considered rare. Of the total linear amount of stream habitat known to be occupied by WCT in the Upper Kootenai River watershed, 47.2 % lies on lands administered by federal agencies (Appendix Table 4; MTFWP, *in litt.* 1999). Data from the ICBEMP (Appendix Table 2) indicate WCT stocks are strong or predicted strong in 15 HUCs; depressed or predicted depressed in 159 HUCs; and absent or predicted absent in the remaining 18 HUCs that collectively constitute the Upper Kootenai River watershed.

<u>The Fisher River watershed</u> encompasses 817 square miles (522,880 acres) (MTFWP, *in litt.* 1999). Land ownership in the Fisher watershed is 36.5 % U.S. Forest Service, 4.1 % State of Montana, and 59.4 % private and other public entities (Appendix Table 4; MTFWP, *in litt.* 1999). In the watershed, stocks of genetically pure WCT occupy 9 miles (5 stream reaches); stocks that are 99.9 to 90.0 % pure occupy 2 miles; stocks that are < 90.0 % pure occupy 20 miles; and stocks in 142 miles of stream (43 stream reaches) remain untested genetically (Appendix Table 3; MTFWP, *in litt.* 1998). Among the total 173 miles of stream occupied by WCT stocks, 97 of the stream miles have stocks that are considered abundant; stocks in the remaining 76 miles of stream are considered rare. Of the total linear amount of stream habitat known to be occupied by WCT in the Fisher River watershed, 18.2 % lies on lands administered by federal agencies (Appendix Table 4; MTFWP, *in litt.* 1999). Data from the ICBEMP (Appendix Table 2) indicate WCT stocks are strong or predicted strong in none of the HUCs; depressed or predicted depressed in 29 HUCs; and absent or predicted absent in the remaining four HUCs that collectively constitute the Fisher River watershed.

<u>The Yaak River watershed</u> encompasses 611 square miles (391,040 acres) (MTFWP, *in litt.* 1999). Land ownership in the Yaak watershed is 96.4 % U.S. Forest Service and 3.6 % private and other public entities (Appendix Table 4; MTFWP, *in litt.* 1999). In the watershed, stocks of genetically pure WCT occupy 86 miles (18 stream reaches); stocks that are 99.9 to 90.0 % pure occupy 4 miles; stocks that are <90.0 % pure occupy 39 miles; and stocks in 75 miles of stream (35 stream reaches) remain untested genetically (Appendix Table 3; MTFWP, *in litt.* 1998). Among the total 204 miles of stream occupied by WCT stocks, 125 of the stream miles have stocks that are considered abundant; stocks in the remaining 79 miles of stream are considered rare. Of the total linear amount of stream habitat known to be occupied by WCT in the Yaak River watershed, 81.1 % lies on lands administered by federal agencies (Appendix Table 4; MTFWP, *in litt.* 1999). Data from the ICBEMP (Appendix Table 2) indicate WCT stocks are strong or predicted strong in five HUCs; depressed or predicted depressed in 15 HUCs; and

absent or predicted absent in the remaining two HUCs that collectively constitute the Yaak River watershed.

The Lower Kootenai River watershed encompasses 889 square miles (568,800 acres) (MTFWP, *in litt.* 1999). Land ownership in the Lower Kootenai watershed is 76.7 % U.S. Forest Service and 23.3 % private and other public entities (Appendix Table 4; MTFWP, *in litt.* 1999). In the watershed, stocks of WCT are known to occur in three stream reaches but remain untested genetically (Appendix Table 3; MTFWP, *in litt.* 1998). Data from the ICBEMP (Appendix Table 2) indicate WCT stocks are strong or predicted strong in two HUCs and depressed or predicted depressed in the remaining 31 HUCs that collectively constitute the Lower Kootenai River watershed.

The Moyie River watershed encompasses 208 square miles (133,120 acres) (MTFWP, *in litt.* 1999). Land ownership in the Moyie watershed is 99.7 % U.S. Forest Service and 0.3 % private and other public entities (Appendix Table 4; MTFWP, *in litt.* 1999). Data from the ICBEMP (Appendix Table 2) indicate WCT stocks are strong or predicted strong in two HUCs and depressed or predicted depressed in the remaining six HUCs that collectively constitute the Moyie River watershed.

In summary, WCT in the Kootenai River drainage, Montana occur in about 227 tributaries or stream reaches that collectively encompass 1,051 linear miles of stream habitat, distributed among 5 watersheds (Appendix Table 2). Of the total linear amount of stream habitat known to be occupied by WCT in the drainage, 74.2 % lies on lands administered by federal agencies (Appendix Table 4).

Clark Fork River Drainage

Status and Distribution

The Clark Fork River is a major tributary to the Columbia River. The Clark Fork River drainage encompasses 13,188 square miles (8,440,320 acres) in west-central Montana (MTFWP, *in litt.* 1998). Principal tributaries of the Clark Fork River are Flint-Rock Creek, and the upper Clark Fork, Blackfoot, Middle Clark Fork, Bitterroot, and lower Clark Fork rivers. Land ownership in the drainage is 55.8 % U.S. Forest Service, 1.7 % U.S. Bureau of Land Management, < 0.1 % tribal, 4.7 % State of Montana, and 37.8 % private and other public entities (Appendix Table 4; MTFWP, *in litt.* 1999).

Montana Fish, Wildlife and Parks provided information on the distribution, abundance and other characteristics of WCT in the watersheds (i.e. 4th-field HUCs; see **II. Introduction and Approach**) that constitute the Clark Fork River drainage (MTFWP, *in litt.* 1998). Accordingly, the information on WCT provided in this status review document is presented by watershed. In addition, data on the known or predicted status of WCT in the HUCs within each watershed, provided by the Interior Columbia Basin Ecosystem Management Project (ICBEMP; see **II. Introduction and Approach**), are presented (Appendix Table 2) and analyzed.

Westslope cutthroat trout are believed to have historically occupied all of the streams and lakes to which they had access in the Clark Fork River drainage (MTFWP, *in litt.* 1998). In the drainage, however, only 5,847 miles (35.1 %) of the estimated 16,667 miles of historic stream habitat have been surveyed for WCT. Thus, WCT could occupy additional stream miles that have not yet been surveyed. Among those 5,847 surveyed stream miles, WCT have been documented in 5,166 miles of stream (88.4 %). Those WCT stocks have various degrees of genetic purity or have not yet been tested genetically. Of the total linear amount of stream habitat known to be occupied by WCT in the Clark Fork River drainage, 57.5 % lies on lands administered by federal agencies (Appendix Table 4; MTFWP, *in litt.* 1999).

Among the 5,847 miles of stream surveyed, stocks of genetically pure WCT occupy 1,330 miles (316 stream reaches); stocks that are 99.9 to 90.0 % pure occupy 227 miles; and stocks that are < 90.0 % pure occupy 208 miles (MTFWP, *in litt.* 1998). Westslope cutthroat trout stocks inhabiting 3,401 miles of stream (975 stream reaches) remain untested genetically (Appendix Table 3). Among the 5,166 miles of stream occupied by WCT stocks, 1,099 of the stream miles have stocks that are genetically pure and considered abundant; genetically pure stocks in the remaining 231 miles of stream are considered rare. Of the1,557 stream miles with WCT stocks that have genetic purity of $\geq$ 90 %, fish in 1,262 miles of stream are considered abundant.

Data from the ICBEMP (Appendix Table 2) indicate WCT stocks are strong or predicted strong in 79 HUCs, depressed or predicted depressed in 353 HUCs, and absent or predicted absent in the remaining 42 HUCs that collectively constitute the Clark Fork River drainage. Correlation analysis performed among watersheds in the drainage revealed a significant, positive relation between the number of stream miles occupied by WCT (MTFWP, *in litt.* 1998) and the number

of HUCs that the ICBEMP indicated were known or predicted to have WCT (Appendix Table 2).

The Upper Clark Fork River watershed encompasses 2,320 square miles (1,484,800 acres) (MTFWP, *in litt.* 1998). Land ownership in the Upper Clark Fork watershed is 29.5 % U.S. Forest Service, 1.2 % U.S. Bureau of Land Management, 9.0 % State of Montana, and 60.2 % private and other public entities (Appendix Table 4; MTFWP, *in litt.* 1999). In the watershed, stocks of genetically pure WCT occupy 224 miles (39 stream reaches); stocks that are 99.9 to 90.0 % pure occupy 26 miles; stocks that are < 90.0 % pure occupy 39 miles; and stocks in 290 miles of stream (84 stream reaches) remain untested genetically (Appendix Table 3; MTFWP, *in litt.* 1998). Among the total 579 miles of stream occupied by WCT stocks, 542 of the stream miles have stocks that are considered abundant; stocks in the remaining 37 miles of stream are considered rare. Of the total linear amount of stream habitat known to be occupied by WCT in the Upper Clark Fork River watershed, 28.8 % lies on lands administered by federal agencies (Appendix Table 4; MTFWP, *in litt.* 1999). Data from the ICBEMP (Appendix Table 2) indicate WCT stocks are strong or predicted strong in 10 HUCs; depressed or predicted depressed in 39 HUCs; and absent or predicted absent in the remaining 18 HUCs that collectively constitute the Upper Clark Fork River watershed.

The Flint-Rock Creek watershed encompasses 1,378 square miles (881,920 acres) (MTFWP, *in litt.* 1998). Land ownership in the Flint-Rock Creek watershed is 57.0 % U.S. Forest Service, 4.1 % U.S. Bureau of Land Management, 2.4 % State of Montana, and 36.0 % private and other public entities (Appendix Table 4; MTFWP, *in litt.* 1999). In the watershed, stocks of genetically pure WCT occupy 144 miles (23 stream reaches); stocks that are 99.9 to 90.0 % pure occupy 30 miles; stocks that are < 90.0 % pure occupy 6 miles; and stocks in 449 miles of stream (125 stream reaches) remain untested genetically (Appendix Table 3; MTFWP, *in litt.* 1998). Among the total 629 miles of stream occupied by WCT stocks, 489 of the stream miles have stocks that are considered abundant; stocks in the remaining 140 miles of stream are considered rare. Of the total linear amount of stream habitat known to be occupied by WCT in the Flint-Rock Creek watershed, 57.9 % lies on lands administered by federal agencies (Appendix Table 4; MTFWP, *in litt.* 1999). Data from the ICBEMP (Appendix Table 2) indicate WCT stocks are strong or predicted strong in 28 HUCs; depressed or predicted depressed in 13 HUCs; and absent or predicted absent in the remaining 8 HUCs that collectively constitute the Flint-Rock Creek River watershed.

The Blackfoot River watershed encompasses 2,345 square miles (1,500,800 acres) (MTFWP, *in litt.* 1998). Land ownership in the Blackfoot watershed is 41.6 % U.S. Forest Service, 5.7 % U.S. Bureau of Land Management, 0.1 % National Park Service, 0.2 % tribal, 7.3 % State of Montana, and 45.0 % private and other public entities (Appendix Table 4; MTFWP, *in litt.* 1999). In the watershed, stocks of genetically pure WCT occupy 255 miles (60 stream reaches); stocks that are 99.9 to 90.0 % pure occupy 59 miles; stocks that are <90.0 % pure occupy39 miles; and stocks in 666 miles of stream (170 stream reaches) remain untested genetically (Appendix Table 3; MTFWP, *in litt.* 1998). Among the total 1,019 miles of stream occupied by WCT stocks, 638 of the stream miles have stocks that are considered abundant; stocks in the remaining 381 miles of stream are considered rare. Of the total linear amount of stream habitat known to be occupied by

WCT in the Blackfoot River watershed, 41.1 % lies on lands administered by federal agencies (Appendix Table 4; MTFWP, *in litt.* 1999). Data from the ICBEMP (Appendix Table 2) indicate WCT stocks are strong or predicted strong in five HUCs; depressed or predicted depressed in 77 HUCs; and absent or predicted absent in the remaining 10 HUCs that collectively constitute the Blackfoot River watershed.

<u>The Middle Clark Fork River watershed</u> encompasses 1,970 square miles (1,260,800 acres) (MTFWP, *in litt.* 1998). Land ownership in the Middle Clark Fork watershed is 72.4 % U.S. Forest Service, 2.6 % State of Montana, and 25.0 % private and other public entities (Appendix Table 4; MTFWP, *in litt.* 1999). In the watershed, stocks of genetically pure WCT occupy 105 miles (21 stream reaches); stocks that are 99.9 to 90.0 % pure occupy 28 miles; stocks that are < 90.0 % pure occupy 32 miles; and stocks in 702 miles of stream (201 stream reaches) remain untested genetically (Appendix Table 3; MTFWP, *in litt.* 1998). Among the total 867 miles of stream occupied by WCT stocks, 479 of the stream miles have stocks that are considered abundant; stocks in the remaining 388 miles of stream are considered rare. Of the total linear amount of stream habitat known to be occupied by WCT in the Middle Clark Fork River watershed, 56.2 % lies on lands administered by federal agencies (Appendix Table 4; MTFWP, *in litt.* 1999). Data from the ICBEMP (Appendix Table 2) indicate WCT stocks are strong or predicted strong in 11 HUCs; depressed or predicted depressed in 55 HUCs; and absent or predicted absent in the remaining one HUC that collectively constitute the Middle Clark Fork River watershed.

<u>The Bitterroot River watershed</u> encompasses 2,860 square miles (1,830,400 acres) (MTFWP, *in litt.* 1998). Land ownership in the Bitterroot watershed is 68.4 % U.S. Forest Service, 0.1 % National Park Service, 2.6 % State of Montana, and 28.8 % private and other public entities (Appendix Table 4; MTFWP, *in litt.* 1999). In the watershed, stocks of genetically pure WCT occupy 353 miles (115 stream reaches); stocks that are 99.9 to 90.0 % pure occupy 53 miles; stocks that are < 90.0 % pure occupy 73 miles; and stocks in 886 miles of stream (284 stream reaches) remain untested genetically (Appendix Table 3; MTFWP, *in litt.* 1998). Among the total 1,365 miles of stream occupied by WCT stocks, 1,109 of the stream miles have stocks that are considered abundant; stocks in the remaining 256 miles of stream are considered rare. Of the total linear amount of stream habitat known to be occupied by WCT in the Bitterroot River watershed, 67.7 % lies on lands administered by federal agencies (Appendix Table 4; MTFWP, *in litt.* 1999). Data from the ICBEMP (Appendix Table 2) indicate WCT stocks are strong or predicted strong in 10 HUCs; depressed or predicted depressed in 86 HUCs; and absent or predicted absent in the remaining two HUCs that collectively constitute the Bitterroot River watershed.

<u>The Lower Clark Fork River watershed</u> encompasses 2,315 square miles (1,481,600 acres) (MTFWP, *in litt.* 1998). Land ownership in the Lower Clark Fork watershed is 66.0 % U.S. Forest Service, 3.3 % State of Montana, and 30.6 % private and other public entities (Appendix Table 4; MTFWP, *in litt.* 1999). In the watershed, stocks of genetically pure WCT occupy 249 miles (58 stream reaches); stocks that are 99.9 to 90.0 % pure occupy 31 miles; stocks that are < 90.0 % pure occupy 19 miles; and stocks in 408 miles of stream (111 stream reaches) remain

untested genetically (Appendix Table 3; MTFWP, *in litt.* 1998). Among the total 707 miles of stream occupied by WCT stocks, 474 of the stream miles have stocks that are considered abundant; stocks in the remaining 233 miles of stream are considered rare. Of the total linear amount of stream habitat known to be occupied by WCT in the Lower Clark Fork River watershed, 56.3 % lies on lands administered by federal agencies (Appendix Table 4; MTFWP, *in litt.* 1999). Data from the ICBEMP (Appendix Table 2) indicate WCT stocks are strong or predicted strong in 15 HUCs; depressed or predicted depressed in 83 HUCs; and absent or predicted absent in the remaining three HUCs that collectively constitute the Lower Clark Fork River watershed.

In summary, WCT in the Clark Fork River drainage occur in about 1,291 tributaries or stream reaches that collectively encompass 5,166 linear miles of stream habitat, distributed among 6 watersheds (Appendix Table 2). Of the total linear amount of stream habitat known to be occupied by WCT in the drainage, 57.5 % lies on lands administered by federal agencies (Appendix Table 4).

Flathead River Drainage

Status and Distribution

The Flathead River is a major tributary of the Columbia River. The Flathead River drainage encompasses 8,436 square miles (5,399,040 acres) in northwest Montana (MTFWP, *in litt.* 1998). Principal tributaries of the Flathead River are the North Fork Flathead, Middle Fork Flathead, South Fork Flathead, Stillwater, Swan, and Lower Flathead rivers, and Flathead Lake. Land ownership in the drainage is 44.2 % U.S. Forest Service, 11.7 % National Park Service, 11.9 % tribal, 4.4 % State of Montana, and 27.8 % private and other public entities (Appendix Table 4; MTFWP, *in litt.* 1999).

Montana Fish, Wildlife and Parks provided information on the distribution, abundance and other characteristics of WCT in the watersheds (i.e. 4th-field HUCs; see **II. Introduction and Approach**) that constitute the Flathead River drainage (MTFWP, *in litt.* 1998). Accordingly, the information on WCT provided in this status review document is presented by watershed. In addition, data on the known or predicted status of WCT in the HUCs within each watershed, provided by the Interior Columbia Basin Ecosystem Management Project (ICBEMP; see **II. Introduction and Approach**), are presented (Appendix Table 2) and analyzed.

Westslope cutthroat trout are believed to have historically occupied all of the streams and lakes to which they had access in the Flathead River drainage (MTFWP, *in litt.* 1998). In the drainage, however, only 3489 miles (33.9 %) of the estimated 10,288 miles of historic stream habitat have been surveyed for WCT. Thus, WCT could occupy additional stream miles that have not yet been surveyed. Among those 3,489 surveyed stream miles, WCT have been documented in 2,609 miles of stream (74.8 %). Those WCT stocks have various degrees of genetic purity or have not yet been tested genetically. Of the total linear amount of stream habitat known to be occupied by WCT in the Flathead River drainage, 55.9 % lies on lands administered by federal agencies (Appendix Table 4; MTFWP, *in litt.* 1999).

Among the 3,489 miles of stream surveyed, stocks of genetically pure WCT occupy 564 miles (148 stream reaches); stocks that are 99.9 to 90.0 % pure occupy 87 miles; and stocks that are < 90.0 % pure occupy 54 miles (MTFWP, *in litt.* 1998). Westslope cutthroat trout stocks inhabiting 1,904 miles of stream (528 stream reaches) remain untested genetically (Appendix Table 3). Among the 2,609 miles of stream occupied by WCT stocks, 500 of the stream miles have stocks that are genetically pure and considered abundant; genetically pure stocks in the remaining 64 miles of stream are considered rare. Of the 651 stream miles with WCT stocks that have genetic purity of $\geq$ 90 %, fish in 577 miles of stream are considered abundant.

Data from the ICBEMP (Appendix Table 2) indicate WCT stocks are strong or predicted strong in 55 HUCs, depressed or predicted depressed in 220 HUCs, and absent or predicted absent in the remaining 37 HUCs that collectively constitute the Flathead River drainage. Correlation analysis performed among watersheds in the drainage revealed a significant, positive relation between the number of stream miles occupied by WCT (MTFWP, *in litt.* 1998) and the number

of HUCs that the ICBEMP indicated were known or predicted to have WCT (Appendix Table 2).

The North Fork Flathead River watershed encompasses 952 square miles (609,280 acres) (MTFWP, *in litt.* 1998). Land ownership in the North Fork Flathead watershed is 47.1 % U.S. Forest Service, 44.6 % National Park Service, 3.1 % State of Montana, and 5.2 % private and other public entities (Appendix Table 4; MTFWP, *in litt.* 1999). In the watershed, stocks of genetically pure WCT occupy 67 miles (27 stream reaches); stocks that are 99.9 to 90.0 % pure occupy 27 miles; stocks that are < 90.0 % pure occupy 6 miles; and stocks in 344 miles of stream (84 stream reaches) remain untested genetically (Appendix Table 3; MTFWP, *in litt.* 1998). Among the total 444 miles of stream occupied by WCT stocks, 266 of the stream miles have stocks that are considered abundant; stocks in the remaining 178 miles of stream are considered rare. Of the total linear amount of stream habitat known to be occupied by WCT in the North Fork Flathead River watershed, 81.9 % lies on lands administered by federal agencies (Appendix Table 4; MTFWP, *in litt.* 1999). Data from the ICBEMP (Appendix Table 2) indicate WCT stocks are strong or predicted strong in four HUCs; depressed or predicted depressed in 31 HUCs; and absent or predicted absent in the remaining one HUC that collectively constitute the North Fork Flathead River watershed. Within that portion of the watershed that lies in Glacier National Park, genetically pure WCT naturally inhabit 10 lakes that have a total surface area of 2,407 acres (Marnell 1988).

The Middle Fork Flathead River watershed encompasses 1,137 square miles (727,680 acres) (MTFWP, *in litt.* 1998). Land ownership in the Middle Fork Flathead watershed is 51.1 % U.S. Forest Service, 46.0 % National Park Service, and 2.8 % private and other public entities (Appendix Table 4; MTFWP, *in litt.* 1999). In the watershed, stocks of genetically pure WCT occupy 19 miles (4 stream reaches) and stocks in 452 miles of stream (131 stream reaches) remain untested genetically (Appendix Table 3; MTFWP, *in litt.* 1998). Among the total 471 miles of stream occupied by WCT stocks, 246 of the stream miles have stocks that are considered abundant; stocks in the remaining 225 miles of stream are considered rare. Of the total linear amount of stream habitat known to be occupied by WCT in the Middle Fork Flathead River watershed, 94.1 % lies on lands administered by federal agencies (Appendix Table 4; MTFWP, *in litt.* 1999). Data from the ICBEMP (Appendix Table 2) indicate WCT stocks are depressed or predicted depressed in 41 HUCs and absent or predicted absent in the remaining one HUC that collectively constitute the Middle Fork Flathead River watershed. Within that portion of the watershed that lies in Glacier National Park, genetically pure WCT naturally inhabit 10 lakes that have a total surface area of 2,940 acres (Marnell 1988).

The Flathead Lake watershed encompasses 1,144 square miles (732,680 acres) (MTFWP, *in litt.* 1998). Land ownership in the Flathead Lake watershed is 17.4 % U.S. Forest Service, 0.4 % National Park Service, 7.6 % tribal, 3.4 % State of Montana, and 71.2 % private and other public entities (Appendix Table 4; MTFWP, *in litt.* 1999). In the watershed, stocks of genetically pure WCT occupy 66 miles (9 stream reaches); stocks that are < 90.0 % pure occupy 2 miles; and stocks in 69 miles of stream (10 stream reaches) remain untested genetically (Appendix Table 3; MTFWP, *in litt.* 1998). Among the total 137 miles of stream occupied by WCT stocks, 70 of the stream miles have stocks that are considered abundant; stocks in the remaining 67 miles of stream are considered rare. Of the total linear amount of stream habitat known to be occupied by WCT in the Flathead Lake watershed, 7.2 % lies on lands administered by federal agencies (Appendix Table 4; MTFWP, *in litt.* 1999). Data from the ICBEMP (Appendix Table 2) indicate WCT stocks are depressed or predicted depressed in 19 HUCs and absent or predicted absent in the remaining 14 HUCs that collectively constitute the Flathead Lake watershed.

<u>The South Fork Flathead River watershed</u> encompasses 1,680 square miles (1,077,760 acres) (MTFWP, *in litt.* 1998). Land ownership in the South Fork Flathead watershed is 97.5 % U.S. forest Service and 2.5 % private and other public entities (Appendix Table 4; MTFWP, *in litt.* 1999). The upper two-thirds of the South Fork Flathead drainage lies entirely within the Bob Marshall Wilderness Area. In the watershed, stocks of genetically pure WCT occupy 289 miles (89 stream reaches); stocks that are 99.9 to 90.0 % pure occupy 44 miles; stocks that are < 90.0 % pure occupy 32 miles; and stocks in 244 miles of stream (29 stream reaches) remain untested genetically (Appendix Table 3; MTFWP, *in litt.* 1998). Among the total 609 miles of stream occupied by WCT stocks, 559 of the stream miles have stocks that are considered abundant; stocks in the remaining 50 miles of stream are considered rare. Of the total linear amount of stream habitat known to be occupied by WCT in the South Fork Flathead River watershed, 97.4 % lies on lands administered by federal agencies (Appendix Table 4; MTFWP, *in litt.* 1999). Data from the ICBEMP (Appendix Table 2) indicate WCT stocks are strong or predicted strong in 51 HUCs and depressed or predicted depressed in the remaining 22 HUCs that collectively constitute the South Fork Flathead River watershed.

<u>The Stillwater River watershed</u> encompasses 811 square miles (519,040 acres) (MTFWP, *in litt.* 1998). Land ownership in the Stillwater watershed is 48.6 % U.S. Forest Service, 20.2 % State of Montana, and 31.2 % private and other public entities (Appendix Table 4; MTFWP, *in litt.* 1999). In the watershed, stocks of genetically pure WCT occupy 12 miles (3 stream reaches); stocks that are 99.9 to 90.0 % pure occupy 9 miles; and stocks in 425 miles of stream (132 stream reaches) remain untested genetically (Appendix Table 3; MTFWP, *in litt.* 1998). Among the total 446 miles of stream occupied by WCT stocks, 261 of the stream miles have stocks that are considered abundant; stocks in the remaining 185 miles of stream are considered rare. Of the total linear amount of stream habitat known to be occupied by WCT in the Stillwater River watershed, 42.8 % lies on lands administered by federal agencies (Appendix Table 4; MTFWP, *in litt.* 1999). Data from the ICBEMP (Appendix Table 2) indicate WCT stocks are depressed or predicted depressed in 29 HUCs and absent or predicted absent in the remaining three HUCs that collectively constitute the Stillwater River watershed.

<u>The Swan River watershed</u> encompasses 730 square miles (467,200 acres) (MTFWP, *in litt.* 1998). Land ownership in the Swan watershed is 59.2 % U.S. Forest Service, 0.3 % National Park Service, 0.1 % tribal, 9.7 % State of Montana, and 30.7 % private and other public entities (Appendix Table 4; MTFWP, *in litt.* 1999). In the watershed, stocks of genetically pure WCT occupy 23 miles (7 stream reaches); stocks that are 99.9 to 90.0 % pure occupy 7 miles; stocks that are < 90.0 % pure occupy 4 miles; and stocks in 271 miles of stream (96 stream reaches) remain untested genetically (Appendix Table 3; MTFWP, *in litt.* 1998). Among the total 305 miles of stream occupied by WCT stocks, 126 of the stream miles have stocks that are considered

abundant; stocks in the remaining 179 miles of stream are considered rare. Of the total linear amount of stream habitat known to be occupied by WCT in the Swan River watershed, 47.1 % lies on lands administered by federal agencies (Appendix Table 4; MTFWP, *in litt.* 1999). Data from the ICBEMP (Appendix Table 2) indicate WCT stocks are depressed or predicted depressed in the 29 HUCs that constitute the Swan River watershed.

The Lower Flathead River watershed encompasses 1,978 square miles (1,265,920 acres) (MTFWP, *in litt.* 1998). Land ownership in the Lower Flathead watershed is 1.6 % U.S. Forest Service, 1.7 % National Park Service, 46.2 % tribal, 3.7 % State of Montana, and 46.9 % private and other public entities (Appendix Table 4; MTFWP, *in litt.* 1999). In the watershed, stocks of genetically pure WCT occupy 88 miles (9 stream reaches); stocks that are < 90.0 % pure occupy 10 miles; and stocks in 99 miles of stream (16 stream reaches) remain untested genetically (Appendix Table 3; MTFWP, *in litt.* 1998). Among the total 197 miles of stream occupied by WCT stocks, 185 of the stream miles have stocks that are considered abundant; stocks in the remaining 12 miles of stream are considered rare. Of the total linear amount of stream habitat known to be occupied by WCT in the Lower Flathead River watershed, 42.9 % lies on lands administered by federal agencies (Appendix Table 4; MTFWP, *in litt.* 1999). Data from the ICBEMP (Appendix Table 2) indicate WCT stocks are depressed or predicted depressed in 49 HUCs and absent or predicted absent in the remaining 18 HUCs that collectively constitute the Lower Flathead River watershed.

In summary, WCT in the Flathead River drainage occur in about 676 tributaries or stream reaches that collectively encompass 2,609 linear miles of stream habitat, distributed among 7 watersheds (Appendix Table 2). Of the total linear amount of stream habitat known to be occupied by WCT in the drainage, 55.9 % lies on lands administered by federal agencies (Appendix Table 4). In addition, WCT are known to occur naturally in at least 20 lakes that total 5,347 surface acres in Glacier National Park.

Pend Oreille Drainage, Idaho

Status and Distribution

The Pend Oreille drainage is in northern Idaho and for these analyses incorporates the Clark Fork River below Cabinet Gorge Reservoir (EPA drainage 17010213), Pend Oreille Lake and the Pend Oreille River to Albeni Falls Dam (EPA drainage 17010214), and Priest Lake, Upper Priest Lake, and Priest River (EPA drainage 17010215). Approximately 60 % of the Pend Oreille Lake and River watershed is public land managed mostly by the U.S. Forest Service and the State of Idaho with a small portion managed by the U.S. Bureau of Land Management. Several small areas of ownership are managed by private timber companies. More than 90 % of the Priest Lake watershed is public land managed by the U.S. Forest Service and Idaho Department of Lands (IDL) with a small portion managed by the U.S. Bureau of Land management. Several small areas of ownership are managed by private timber companies.

Westslope cutthroat trout are native to this drainage with resident, fluvial, and adfluvial life forms present (C. Corsi, IDFG, *pers. comm.* 1998; Pratt 1984b). Westslope cutthroat trout are now physically isolated between Albeni Falls Dam, Idaho, and Cabinet Gorge Dam, near the Montana border, since no upstream passage facilities exist at these facilities.

<u>The Pend Oreille Lake watershed</u> consists of Pend Oreille Lake (~ 94,200 surface acres) and the Clark Fork River below Cabinet Gorge Dam, and all associated tributaries. Westslope cutthroat trout as recent as 1955 were the most common trout (as documented in angler harvest) in Pend Oreille Lake, but by 1985 were severely depressed (Jeppson 1955 in Mauser *et al*. 1988; Mauser *et al.* 1988; Pratt 1984b). The decline of WCT has been attributed to the construction of Cabinet Gorge and other dams on the Clark Fork River, competition and hybridization with nonnative species, habitat loss and degradation, and over-exploitation (Hoelscher and Bjornn 1989; Mauser *et al.*1988; Hoelscher 1993; Bowles *et al.* 1987 in Hoelscher 1993).

Idaho Department of Fish and Game (*in litt.* 1998a) reported that 315.2 stream miles of native WCT are available in the Pend Oreille Lake watershed of which WCT, WCT hybrids, or both are present in 250.3 miles. When determining the number of stream miles documented or suspected to have WCT present, IDFG included the entire stream length (based on 1:250,000 maps) if WCT were present in any portion of the stream (IDFG, *in litt.* 1998a). However, quantification of densities within tributary streams was not included and through assessment of reports and personal communication, the Service found that numerous streams have unsuitable or degraded habitat, and invasion, replacement, displacement, and hybridization with nonnative species, causing WCT to have depressed densities.

Westslope cutthroat trout are the most widely distributed trout in the watershed but were found to be less abundant than nonnative rainbow trout (Hoelscher and Bjornn 1989; Pratt 1984b). Westslope cutthroat trout were most abundant in headwater areas when rainbow trout were absent and were the only trout species found above barrier falls. Rainbow and brook trout were encountered in higher densities and more frequently in the lower reaches (Hoelscher and Bjornn

1989; Pratt 1984b). When rainbow trout were absent, WCT were found to occupy the entire stream length (Hoelscher and Bjornn 1989). Pratt (1984b) observed WCT in 32 of 38 streams, rainbow trout in 27 of 38 streams, and brook trout in 18 of 38 streams, while Hoelscher and Bjornn (1989) observed WCT in 10 of 11 streams, rainbow trout in 9 of 11 streams, and brook trout in 7 of 11 streams.

In 1983 and 1984, relative abundance for trout species was determined at 114 sites in 38 tributary streams to Pend Oreille Lake (Pratt 1985). Westslope cutthroat trout were observed at 79 sites for which the relative abundance was determined to be less than 5 fish/100 m^2 at 55 of the sites, and greater than 20 fish/100 m^2 at only 6 of the sites, with the highest density of 55.6 fish/100 m^2 in Gold Creek. Westslope cutthroat trout at the six sites were observed at these levels only in the absence of rainbow trout and brook trout. Rainbow trout were observed at 77 sites, with relative abundance greater than 5 fish/100 m^2 at 44 sites, greater than 20 fish/100 m^2 at 25 sites, and with densities greater than 100 fish/100 m^2 observed at 6 sites. At the 44 sites that the relative abundance of rainbow trout was greater than 5 fish/100 m^2, the relative abundance of WCT was less than 5 fish/100 m^2 or absent at 41 sites, and only occurred in greater relative abundance on one occasion.

In the tributary streams accessible to adfluvial WCT, Pratt (1985) found the mean density to be less than 5 fish/100 m^2, while Hoelscher and Bjornn (1989) found mean densities of only 0.8 fish/100 m^2 with the range of 0.0 to 4.5 fish/100 m^2. However, in stream reaches above barriers, resident WCT were found at densities as high as 55 fish/100 m^2 (Pratt 1985).

Recreational fishing for WCT in the 1950s produced around 6,000 fish annually with a maximum of 8,200 fish caught in 1953 (Ellis and Bowler 1981 in Hoelscher 1993). Sport fishing harvest levels began to decline by the late 1950s and remain low today with the mean number harvested in the 1970s less than 1000, and only roughly 766 fish harvested in 1991 (Pratt 1984b; N. Horner, IDFG, *pers. comm.* 1999). Although sport fishing harvest levels have not been determined since 1991, it is believed that harvest levels today are similar to 1991 (Horner, IDFG, *pers. comm.* 1999). While angler effort has declined over this time by roughly 40 %, the decline is harvest is much greater with a roughly 6 fold or 85 % decrease (Hoelscher 1993). It was estimated that at the turn of the century (1900), approximately 30,000 to 50,000 WCT were caught annually from Pend Oreille Lake (Jeppson 1955 in Mauser *et al.* 1988).

Hybridization of WCT with rainbow trout is known to occur in this watershed but the extent is indeterminate (Pratt 1984b; Hoelscher 1993). Based on the extent (and overlap with WCT) of rainbow trout distribution in this drainage, hybridization may be extensive, as seen in the Kootenai River Drainage (73 %). Hybridization between WCT and rainbow trout was confirmed during electrophoretic analysis of rainbow trout from Pend Oreille Lake (Leary *et al.* 1984a). Electrophoretic analysis from the Fish Lake and Clark Fork Hatchery WCT brood stocks indicates that both samples came from slightly introgressed populations of WCT and rainbow trout (Leary, *in litt.* 1986). Westslope cutthroat trout from these brood stocks have been planted in the Pend Oreille Lake watershed (Horner, IDFG, *pers. comm.* 1999).

Using data generated by ICBEMP for the Pend Oreille Lake watershed, 51 HUCs compose the watershed. Westslope cutthroat trout were determined present in a HUC if the HUC was known or predicted to have spawning and rearing occurring, or if it was a migratory corridor. When determining the status of WCT in a HUC, a strong or depressed status is only conferred to a HUC if spawning and rearing occurs. Hence, in HUCs that are determined to be utilized by WCT only as migratory corridors, the status is absent. Therefore, in the Pend Oreille Lake watershed, WCT presence is known or predicted in 49 HUCs and absent in two. Westslope cutthroat trout status is known absent in two HUCs, known or predicted depressed in 46 and known strong in three.

<u>The Priest Lake watershed</u> consists of Priest Lake (23,300 surface acres), Upper Priest Lake (1,340 surface acres), Upper Priest River, and the Priest River and all tributaries. The Priest River enters the Pend Oreille River near the Idaho-Washington border. Westslope cutthroat trout are native to the Priest Lake watershed with resident, fluvial, and adfluvial life history forms present (Corsi, IDFG, *pers. comm.* 1998). Westslope cutthroat trout in Priest Lake to a greater extent have been isolated from WCT in the lower Priest River since the construction of the Outlet Dam at the outlet of Priest Lake in 1951 (Horner, IDFG, *pers. comm.* 1998). The dam acts as a migration barrier most of the year when the gates are closed but may allow passage when the gates are pulled (Corsi, IDFG, *pers. comm.* 1999).

Westslope cutthroat trout were once the most abundant fish in Priest Lake but with the introduction of competing nonnative species, increased harvest, and loss of tributary habitat, WCT population were reduced to remnant levels by late 1960s (Mauser *et al.* 1988). The successful establishment of opossum shrimp <u>Mysis</u> <u>relicta</u> in 1965 resulted in a dramatic increase in lake trout which in turn eliminated much of the popular WCT fishery (Mauser *et al.*1988). Limited tributary access and the low productivity of the watershed may make WCT in this watershed less resilient to habitat alterations, harvest, and introductions of nonnative species (Mauser *et al.* 1988).

Idaho Department of Fish and Game (*in litt.* 1998a) reported that of 307.7 stream miles available to native WCT in the Priest Lake watershed, WCT, WCT hybrids or both are present in 211.6 miles. When determining the number of stream miles documented or suspected to have WCT present, IDFG included the entire stream length (based on 1:250,000 maps) if WCT were present in any portion of the stream (IDFG, *in litt.* 1998a). However, quantification of densities within tributary streams was not included and through assessment of reports and personal communication, the Service found that numerous streams or stream sections have unsuitable or degraded habitat, and invasion, replacement, displacement from exotics, and hybridization with nonnative species, and/or WCT are absent or have depressed densities.

It was estimated that at the turn of the century (1900), approximately 30,000 to 50,000 WCT were caught annually from Priest Lake (Bjornn 1957 in Mauser *et al.* 1988). By 1956, catch of WCT had declined to approximately 3,500 fish annually and by the mid 1980s, roughly 1,000 fish were being caught annually (Bjornn 1957 in Mauser *et al.* 1988; Mauser *et al.* 1988). Results of creel census surveys from May 9 to July 17, 1987, estimated that 903 angler hours were spent fishing for WCT in Priest Lake. Eleven WCT were caught (none harvested) during this time resulting in a catch rate of 0.01 WCT/hour (Mauser *et al.* 1988). These declines were attributed to lake trout predation, and the failure of WCT enhancement efforts, prompted the closure of the consumptive fishery in 1988 (Mauser *et al.* 1988). The introduction of brook trout initiated prior to 1920 also was a factor in the decline of WCT with replacement by brook trout in as much as 50 % of WCT rearing habitat (Bjornn 1957 in Mauser *et al.* 1988).

Estimates of mean density of trout in five tributary streams to Priest Lake from 1983 to 1994 indicate that WCT mean densities have increased in two streams and decreased in three (Nelson *et al.* 1995). A change in fishing regulations in 1982 closed the major tributaries that WCT used for rearing, and in 1988, the WCT consumptive fishery was closed in the entire drainage (Mauser *et al.* 1988). In Lion Creek, WCT mean densities increased from 0.8 fish/100 m^2 in 1983 to 12.6 fish/100 m^2 1994, with no brook trout observed during any of the surveys. In Two Mouth Creek, WCT mean densities increased from 0.4 fish/100 m^2 in 1983 to 15.3 fish/100 m^2 in 1994, with very low brook trout mean densities reported in all survey years (0.0 to 0.4 fish/100 m^2). However, in Indian Creek, WCT mean densities declined from 22.6 fish/100 m^2 in 1983 to 7.0 fish/100 m^2 in 1994. While brook trout mean densities (0.0 to 4.7 fish/100 m^2) are relatively low in this stream, their presence may be contributing to the decline of WCT. An increase in WCT mean density was documented in the S.F. Granite Creek from 1983 to 1984 with 1.4 fish/100 m^2 and 7.2 fish/100 m^2, respectively. However, densities have declined with no WCT observed in 1986 and 1994, brook trout are present in low densities (0.0 to 6.9 fish/100 m^2). The mean density of WCT observed in Granite Creek was low in all years with 0.8 fish/100 m^2 observed in 1983 and none observed in 1994, very few brook trout were observed (Nelson *et al.* 1995). Lion, Indian and Two Mouth Creeks were found to have considerable holding and rearing areas, but lacked spawning habitat. The habitat components of Granite and S.F. Granite Creeks appear to be less suitable for WCT inhabitancy than the other three streams.

During surveys in 1998, IDFG determined that the mean density of WCT over 200 mm in length in 4 sections of the Upper Priest River to be 0.22 fish/100 m^2, with a range of 0.04 to 0.52 fish/100 m^2 (Davis *et al*. 1999). The total length of these 4 sections was 14,560 meters.

In 1986 and 1987, IDFG collected habitat quality and quantity data, and fish density estimates in 14 of the 20 tributary streams to the Lower Priest River. In general, the lower reaches of tributary streams to the Lower Priest River were habitat limited with spawning and overwintering habitat limited or absent (Horner *et al.* 1987; Horner *et al.* 1988). The quality and quantity of pool habitat and instream cover increased in the upper reaches of the streams. During surveys in 1986, brook trout (mean density of 9.2 fish/100 m^2 for all sections) were the most abundant fish species in Priest River tributaries and were observed in all 8 tributaries and in 19 of 22 sections surveyed (Horner *et al.* 1987). Westslope cutthroat trout (mean density of 4.3 fish/100 m^2 for all sections) were the second most abundant fish species and were observed in 6 of 8 tributaries and 11 of 22 sections surveyed. Brown trout were also observed in 7 of 22 sections while rainbow trout had limited distribution in only 1 section (Horner *et al.* 1987). Overall, nonnative species (brook, brown, and rainbow trout) accounted for 69.2 % of all fish observed in 1986, while WCT accounted for 26.4 % (Horner *et al.* 1987). The fish surveys in 1987, found that WCT were only present in 1 of the 6 streams (1.5 WCT/100 m^2), and brook trout were present in 5 of 6 streams with densities ranging from 0.3-56.8 fish/100 m^2 (Horner *et al.* 1988).

In 1997, single-pass electrofishing efforts at three Priest Lake tributaries found that WCT were absent in the surveyed reach on Lion and Bugle Creeks, and were present in Two Mouth Creek with 2.3 WCT/100 m^2 (IDL, *in litt.* 1997). No other fish species were sampled during these surveys. In 1998, the Middle Fork East River and Keokee Creek, located in the upper portion of the East River drainage, a Priest River tributary were sampled using a single-pass electrofishing effort. Densities of 12.4, 17.5, and 3.6 WCT/100 m^2 were recorded for the three Middle Fork East River reaches (IDL, *in litt.* 1998). The reach where fewer WCT (3.6 WCT/100 m^2) were reported, was the lowest reach sampled, also had brook trout (1.2 fish/100 m^2) and bull trout (1.2 fish/100 m^2) present. The two reaches in Keokee Creek resulted in WCT densities of 18.9 and 17.5 WCT/100 m^2 (IDL, *in litt.* 1998). No other fish species were sampled in Keokee Creek.

Using data generated by ICBEMP, 36 HUCs compose the watershed. Westslope cutthroat trout were determined present in a HUC if the HUC was known or predicted to have spawning and rearing occurring, or if it was a migratory corridor. When determining the status of WCT in a HUC, a strong or depressed status is only conferred to a HUC if spawning and rearing occurs. Hence, in HUCs that are determined to be utilized by WCT only as migratory corridors, the status is absent. Therefore, in the Priest Lake watershed, WCT presence is known or predicted in 35 HUCs and absent in one. Westslope cutthroat trout status is known or predicted strong in five HUCs, known or predicted depressed in 30 HUCs, and absent in one HUC.

<u>The Pend Oreille River watershed</u> includes the Pend Oreille River above Albeni Falls Dam and all associated tributaries downstream of Pend Oreille Lake, excluding the Priest River. Idaho Department of Fish and Game (*in litt.* 1998) reported that 100.01 stream miles of native WCT habitat are available in the Pend Oreille River watershed of which WCT are present in 93.23 miles. When determining the number of stream miles documented or suspected to have WCT present, IDFG included the entire stream length (based on 1:250,000 maps) if WCT were present in any portion of the stream (IDFG, *in litt.* 1998). However, quantification of densities within the river and tributary streams was not included and through assessments of reports and file documents, the Service found that densities of WCT are limited or absent in numerous stream reaches. It was also determined that two tributary streams (Brickel Creek and Spirit Creek) totaling 10.37 miles, that were identified as having WCT present by IDFG, are not tributaries to the Pend Oreille River, but to nearby Spirit Lake, without surface water connection.

In 1986, IDFG used gill nets (4 sinking sets and 3 floating sets) to determine fish species composition and relative abundance at two locations of the Pend Oreille River (Horner *et al.* 1987). Within section 1, twelve species were collected totaling 340 fish, of which none were WCT and only ten were salmonids (rainbow trout and whitefish). At section 2, eleven species totaling 189 fish were collected, of which none were WCT and three were rainbow trout.

In 1991 and 1992, more than 50,000 fish representing 24 species were sampled in the Pend Oreille River of which only 174 (<0.4 %) were WCT (Bennett and DuPont 1993). Prior to 1952

(Completion of Albeni Falls Dam), the Pend Oreille River was considered a good cutthroat trout fishery (Horner 1989 in Bennett and DuPont 1993). The river channel prior too dam completion consisted of deep holes and runs with cobble and gravel substrate that provided spawning habitat for salmonids, and numerous springs and creeks provided coolwater refugia during warm months (J. Coil *pers. comm*. in Bennett and DuPont 1993). Now, the river has primarily silt and sand substrates, and water temperatures reaching 24.5 ^{o}C during summer months (Bennett and DuPont 1993). The Pend Oreille River was found to lack quality habitat for salmonids and is likely better suited for spiny-rayed predators. In 1986, it was determined that over half of the Pend Oreille River shoreline had been developed or consisted of grass banks (Horner *et al.* 1987).

A limited amount of information is available with regards to tributary streams of the Pend Oreille River. File documents from electrofishing and snorkeling surveys were obtained from IDFG (*in litt*. 1983, 1987 and 1992) and DuPont (*in litt.* 1991 and 1992). DuPont (*in litt.* 1991) did not collect any WCT in Cocolalla Creek between Round Lake and Cocolalla Slough, however, rainbow trout (5) and brown trout (9) were collected. Water temperatures were measured at 22 ^{o}C at this site. Snorkeling surveys at five sections (16 pools) throughout the Cocolalla Creek drainage yielded no WCT, 894 brook trout, and 10 rainbow trout (IDFG, *in litt*. 1987). Densities of brook trout for these sections ranged from 12.8-3,272.3 fish/100 m^2 (Horner *et al.* 1988). Surveys in Hoodoo Creek documented WCT presence, but in low densities compared to nonnative rainbow, brook, and brown trout. In 1991, DuPont collected 35 trout of which 4 were WCT, 13 were rainbow trout, 17 were brown trout, and 1 was a brook trout. In 1983 (IDFG, *in litt*. 1983), 175 trout were collected of which only eight were WCT, 59 were rainbow trout, 39 were brook trout, six were brown trout, and 63 were rainbow/WCT hybrids. DuPont (*in litt.* 1991 and 1992) also electrofished seven other streams to the Pend Oreille River in which WCT and brown trout were observed in five and seven of them, respectively. In three of the five streams where they occurred together, brown trout were more abundant.

Pend Oreille Drainage, Washington

Status and Distribution

The Pend Oreille drainage, Washington (EPA drainage 17010216), is in the northeast corner of Washington State and for these analyses includes the Pend Oreille River and all tributaries below Albeni Falls Dam downstream to the Canada-USA border. The drainage encompasses 1080 square miles of which approximately 60 % is public land managed by the U.S. Forest Service (Streamnet web site). The Salmo-Priest wilderness area encompasses approximately 30,600 (4 %) acres within this drainage.

There has been some speculation as to whether or not the historic range of WCT included the Pend Oreille River below Albeni Falls Dam. Behnke (1992) did not include the Pend Oreille River downstream of the falls near the Idaho-Washington border as part of their original distribution. However, accounts from Gilbert and Evermann (1895) report (based on description) that WCT were collected between the town of Newport, Washington, (just below Albeni Falls) downstream to the mouth of the Salmo River in British Columbia, supporting their historic distribution within this river drainage (WDFW, *in litt.* 1998a; T. Shuhda USFS, *pers. comm.* 1999). Prior to 1938, the Kalispel Tribe operated weirs near the mouths of Slate, Ruby, LeClerc, Cusick, Tacoma, Ce Ce Ah, and Calispell Creeks. Westslope cutthroat trout were harvested annually from these sites where little evidence of migratory fish can be found today (Smith, *in litt.* 1936-1938).

Both fluvial and resident WCT life forms were believed to be present as part of the historic distribution in this portion of the Pend Oreille River. However, significant changes have occurred to the Pend Oreille River this century. Most notably and with the greatest impact were the construction of Albeni Falls, Box Canyon, and Boundary Dams. Since the construction of these dams, the Pend Oreille River has changed from a free flowing cold water system that supported predominately salmonids, to a slow moving warm water system that supports primarily introduced centrarchids (KNRD 1995; Ashe and Scholz 1992; Shuhda, USFS, *pers. comm.* 1999). Habitat alterations incurred by Albeni Falls Dam, Box Canyon Dam, and Boundary Dam has eliminated the fluvial form (WDFW, *in litt.* 1998a). It is not understood if an adfluvial form of WCT replaced the fluvial form and currently exist in the reservoirs. A limited number of WCT are caught in the reservoirs by anglers and captured during scientific studies, as well as in downstream traps in numerous tributaries (Shuhda, USFS, *pers. comm.* 1999; Maroney, KNRD, *pers. comm.* 1999; Ashe and Scholz 1992; Bennett and Liter 1991; FERC 1999). On June 25, 1998, a 440 mm WCT was captured in a downstream trap in Middle Creek, a resident WCT would not expected to reach this size (KNRD, *in litt.* 1999). Westslope cutthroat trout are presumed or known present in 38 of 40 HUCs of the Pend Oreille River drainage which currently support remnant or low densities of the resident form, with WCT abundant in only a few headwater tributaries (KNRD 1995; Bennett and Liter 1991; Ashe and Scholz 1992; ICBEMP 1996; R2 Resource Consultants, Inc. 1998; USFS, *in litt.* 1998a).

As late as 1957, the Pend Oreille River drainage was reported to support a “fine” native trout fishery. However, creel census data from 1946 to 1985 collected by WDW demonstrated declines in the trout fishery in the Pend Oreille River (Ashe and Scholz 1992). From 1989-91, electrofishing efforts yielded 47,415 fish consisting of 20 different species, of which only 34 were WCT (Barber *et al.* 1989 in Ashe and Scholz 1992; Barber *et al.* 1990 in Ashe and Scholz 1992; Ashe *et al.* 1991 in Ashe and Scholz 1992). In 1989 and 1990, electrofishing, gillnetting, and beach seining efforts in Box Canyon Reservoir yielded 29,213 fish representing 21 species, only 21 WCT were captured (Bennett and Liter 1991). Trout species are now more abundant in the tributaries than in the reservoir, although the distribution and abundance of nonnative species is greater than the native WCT (Ashe and Scholz 1992; Maroney KNRD, *in litt.* 1999).

The resident WCT appear to be well distributed in the tributaries to the Pend Oreille River below Albeni Falls Dam but occur in low densities. Washington Department of Fish and Wildlife (WDFW, *in litt*. 1998a) surmise the historic distribution for spawning and initial rearing to include 51 streams totaling 204.5 miles. However, there are some streams that today support only brook trout which may have replaced WCT in portions of their historic range and the historic distribution may be underestimated. In addition, streams reaches above what are natural passage barriers today, were not considered as part of the historic range and may as well underestimate historic distribution. Current WCT distribution is greater than the original distribution as a result of hatchery programs (broodstocks from Lake Chelan, WA, and Priest Lake, ID) initiated as early as1903 in high mountain lakes and tributary streams, and now include 61 streams totaling 249.9 miles (WDFW, *in litt.* 1998a). Historic distribution did not include any lakes in this drainage. Quantification of densities within tributary streams was not included in WDFW’s status review, and through analysis of reports, biological assessments, file documents, and personal communication with area biologists, the Service found that the abundance of WCT in many tributary streams is limited. Factors influencing reduced densities are: unsuitable or degraded habitat, and invasion, replacement, displacement from competing nonnatives, and hybridization with nonnative species (USFS, *in litt.* 1996a; USFS, *in litt.* 1997a; USFS, *in litt*. 1998a; Ashe and Scholz 1992).

In 1997, snorkeling surveys conducted in five tributary streams (Slate, Sullivan, Flume, Sweet, and Sand Creeks) to Boundary Reservoir identified that nonnative species (rainbow, brook and brown trout) were most abundant comprising 74 % of the fish observed (R2 Resource Consultants, Inc. 1998). Westslope cutthroat trout accounted for only 16 % of the fish observed and WCT x rainbow trout hybrids accounted for another 5 %. Of the nonnative species present rainbow trout were the most abundant comprising 60 % of all fish observed.

Snorkeling surveys in 1995 found that brook trout were more abundant in six of seven tributary streams (Mineral, Mill, Cee Cee Ah, Whiteman, Indian, and Cedar creeks). In Fourth of July Creek, where habitat is of higher quality, WCT are most abundant with 40.1 fish/100 m^2, and brook trout are limited with only 1.1 fish/100 m^2. Within Mineral Creek, densities of brook trout (16.5 fish/100 m^2) and WCT (13.2 fish/100 m^2) are similar with brook trout having slightly higher densities. Within Mill, Cee Cee Ah, Whiteman, Indian, and Cedar Creeks, nonnative salmonid populations outnumbered the native salmonids 98.3 fish/100 m^2 to 10.5 fish/100 m^2, respectively (KNRD and WDFW 1995).

In 1989 and 1990, fish densities (at 4 reaches in each stream) were determined in LeClerc, Ruby, Cee Cee Ah, Tacoma, and Skookum creeks (Barber *et al.* 1990 in Ashe and Scholz 1992; Ashe and Scholz 1992). Brook trout were observed at all 20 reaches, WCT at 13 reaches, and brown trout at 12 reaches. The mean density of WCT in 1989 and 1990 for all reaches was 1.7 fish/100 m^2 (0-13.2 fish/100 m^2) and 0.7 fish/100 m^2 (0-6.1 fish/100 m^2), respectively. Densities of brook trout were far greater in 1989 and 1990 with mean densities of 19.8 fish/100 m^2 (0-102.2 fish/100 m^2) and 9.3 fish/100 m^2 (0.2-45.1 fish/100 m^2), respectively. In 1989 and 1990, the mean density of brown trout was 9.1 fish/100 m^2 (0-80.9 fish/100 m^2) and 1.4 fish/100 m^2 (0-12.2 fish/100 m^2), respectively.

Bennett and Liter (1991) found in 13 tributary streams to Box Canyon Reservoir, WCT had limited distribution and only occurred in two reaches, brown trout (8 of 13 streams sampled) and brook trout (12 of 13 streams sampled) are the most widely distributed and abundant trout species in these tributaries. Brown trout were found to be the most abundant in downstream reaches and brook trout were highest in upstream reaches (Ashe and Scholz 1992;).

Using data generated by ICBEMP, 40 HUCs compose the drainage. Westslope cutthroat trout were determined present in a HUC if the HUC was known or predicted to have spawning and rearing occurring, or if it was a migratory corridor. When determining the status of WCT in a HUC, a strong or depressed status is only conferred to a HUC if spawning and rearing occurs. Hence, in HUCs that are determined to be utilized by WCT only as migratory corridors, the status is absent. Therefore, in the Pend Oreille River drainage, WCT presence is known or predicted in 38 HUCs and absent in two. Westslope cutthroat trout status is known or predicted depressed in all 38 HUCs.

In summary, WCT in the Pend Oreille River drainage, Idaho and Washington, occur in about 119 tributaries or stream reaches that collectively encompass 806 linear miles of stream habitat, distributed among 3 watersheds (Appendix Table 2). In addition, WCT are known to occur in Priest Lake (23,300 surface acres), Upper Priest Lake (1,340 acres), and Pend Oreille Lake (94,200 acres).

Spokane River Drainage

Status and Distribution

The Spokane River drainage is located in northern Idaho with a small portion in Washington and for these analyses includes Coeur d'Alene Lake, the Coeur d'Alene River, the St. Joe River, and the Spokane River above Spokane Falls and all tributaries to them (EPA drainages 17010301 through 17010305). These watersheds encompasses 4334 square miles (Streamnet web site). Approximately 70 % of this drainage is in public ownership managed primarily by the U.S. Forest Service, the U.S. Bureau of Land Management, the State of Idaho, and the Coeur d'Alene Tribe. Plum Creek and Potlatch Timber Companies have large areas of ownership in the lower St. Joe watershed and St. Maries Rivers sub-drainage.

Westslope cutthroat trout are native to the Spokane River drainage with resident, fluvial, and adfluvial life history forms present. Westslope cutthroat trout above Spokane Falls have been geographically isolated to upstream migration from other WCT since the last discharge of glacial Lake Missoula 12,000 to 15,000 years ago (Behnke 1992; IDFG, *in litt.* 1998a). Geographic isolation is supported by the absence of historical accounts of anadromous salmonids in the drainage above Spokane Falls (McDonald 1894).

Historically, WCT were considered abundant in the Spokane River drainage, however, the effects of logging activities, road construction, and mineral extraction have degraded habitat, and increased access, over fishing, and the introduction of nonnative fish species have combined to reduce the distribution, number of larger fish, and overall abundance of WCT within the drainage (Hunt and Bjornn 1995, Dunnigan and Bennett 1995; Mauser *et al.* 1988; Lider, *in litt*. 1985). Declines have occurred to all life history forms from tributary streams, mainstem rivers, and the lake (Mauser *et al.* 1988; Behnke 1992).

The adfluvial form once abundant in Coeur d'Alene Lake (~ 31,450 surface acres) are now present in low densities (Behnke 1992; Mauser *et al.*1988). The fluvial form was also once very abundant in the Coeur d'Alene and St. Joe Rivers as well as larger tributaries to them, have declined as well (Lider, USFS, *pers. comm.* 1998; M. Owen, USFS, *pers. comm.* 1999). The resident form generally found in headwater streams and upper reaches of large river drainages have experienced declines but may have some of the more stable densities in drainage and may be the least likely to have experienced some level of introgression from nonnative species (McIntyre and Rieman 1995; Owen, USFS, *pers. comm.* 1998).

Using data generated by ICBEMP, 166 HUCs collectively compose the drainage. Westslope Cutthroat trout were determined present in a HUC if the HUC was known or predicted to have spawning and rearing occurring, or if it was a migratory corridor. When determining the status of WCT in a HUC, a strong or depressed status is only conferred to a HUC if spawning and rearing occurs. Hence, in HUCs that are determined to be utilized by WCT only as migratory corridors, the status is absent. Therefore, in the Spokane River drainage, WCT presence is known or predicted in 166 HUCs and absent in none. Westslope cutthroat trout status is known or predicted strong in 13 HUCs and known or predicted depressed in 153 HUCs.

The Coeur d'Alene watershed includes the entire Coeur d'Alene River and lake drainage and the Spokane River drainage downstream of Coeur d'Alene Lake to Spokane Falls, and excludes the St. Joe River watershed. The IDFG (*in litt.* 1998a) reported that 854.53 stream miles of native WCT habitat are available in the Coeur d'Alene River watershed of which WCT are present in 790.05 miles. When determining the number of stream miles documented or suspected to have WCT present, IDFG included the entire stream length (based on 1:250,000 maps) if WCT were present in any portion of the stream (IDFG, *in litt.* 1998a). However, quantification of densities within tributary streams was not included and through assessment of reports and personal communication, the Service found that numerous streams or stream sections have unsuitable or degraded habitat, and invasion, replacement, displacement from exotics, hybridization with nonnative species, and/or WCT are absent or have depressed densities.

The adfluvial WCT of Coeur d'Alene Lake were the most abundant fish species in the lake at the turn of the century and likely produced catches of 30,000 to 50,000 WCT annually (Mallet 1968 in Mauser *et al.* 1988). Historically, WCT attained large size, nevertheless, the introduction of competing species, increased harvest, and loss of tributary habitat cumulatively reduced the abundance of adfluvial WCT to remnant levels and by the late 1960s were providing relatively minor portions of the fishing opportunity relative to introduced kokanee (Mauser *et al.* 1988). Kokanee were introduced from Pend Oreille Lake in 1940s and supplemental stockings occurred through the early 1970s until they became self-sustaining and eventually overpopulated Coeur d'Alene Lake. Coeur d'Alene Lake had relatively good recruitment of juvenile WCT as several hundred miles of tributary streams are available for spawning and rearing, yet, the overabundance of kokanee suppressed WCT growth and limited the fishery (Mauser *et al.* 1988). Chinook salmon, introduced in 1982 to the lake as a predator species to control kokanee populations and northern pike, illegally introduced are now flourishing throughout the lake, are known to be predators to WCT (Rieman and Apperson 1989; Mauser *et al.* 1988). Predation can be a destabilizing force when overexploitation by anglers and habitat loss in the system is experienced, and may make recovery extremely difficult or impossible (Rieman and Apperson 1989).

Purse seining conducted on Coeur d'Alene Lake in 1987 yielded a total of 14,304 fish, of which 328 (2.3 %) were wild WCT and 13,934 (97.4 %) were kokanee. Westslope cutthroat trout over 250 mm were marked with Floy tags and returned to the fishery to determine short-term exploitation and approximate abundance in the lake. Angler recovery indicated that WCT move throughout the lake and are quite vulnerable to harvest during the early summer. Mauser *et al.* (1988) determined the short-term exploitation of WCT to be 35 %. While tag recoveries were insufficient for reliable population estimates, roughly 2,618 to 3,928 WCT over 250 mm with only 290 to 580 larger than 300 mm were believed to be present in Coeur d'Alene Lake (Mauser *et al.* 1988).

Fluvial WCT densities and size have declined overtime and are in many rivers sections and streams only remnants of what they were historically (Rieman and Apperson 1989; Hunt and Bjornn 1995; Davis *et al.*1997 in draft). Hunt and Bjornn (1995) collected fish density information in 1991 from the North Fork and Little North Fork of the Coeur d'Alene River for comparison with survey data from 1973, 1980, and 1981. Prior to 1973, 15 trout of any species with no size limit could be harvested in the Little North Fork Coeur d'Alene River. In 1977, harvest was reduced to ten trout of any species, from 1977-1987, harvest was reduced to 6 fish (any species), starting in 1988, regulations allowed for harvest of only one WCT over 14 inches (6 fish total), and the section from Laverne Creek upstream became catch-and-release only, which prior to 1988, had a 3-trout limit over 13 inches (Hunt and Bjornn 1995). In the North Fork Coeur d'Alene River, harvest regulations were similar to those in the Little North Fork with the exception that the catch-and-release section (upstream of Yellowdog Creek) was established in 1985, prior to that 3 fish over 13 inches could be harvested.

In 1973, surveys in the Little North Fork Coeur d'Alene River found the mean number of WCT (in 3 river sections) to be 5.6 per transect. The mean number of WCT per transect increased slightly in 1980 (5.9 fish) and 1981 (7.5 fish) after special regulations were established. However, in 1991, the mean number of WCT per transect had declined to 3.9 fish (Hunt and Bjornn 1995). Snorkeling surveys in 1996 by IDFG documented 3.6 WCT per transects confirming an overall declining trend (Davis *et al.* 1997 in draft). While density information was not available for the surveys conducted in 1973, 1980, and 1981, the mean WCT densities in the Little North Fork Coeur d'Alene River ranged between 0.0-0.74 fish/100 m^2 for all habitats surveyed in 1991 and 0.0-1.9 fish/100 m^2 in 1996 (Hunt and Bjornn 1995; Davis *et al.* 1997 in draft). Snorkel surveys in the catch-and-release and catch-and-keep sections in 1997 found WCT densities to be 0.0 and 0.23 WCT/100 m^2, respectively (Davis *et al.* 1999 in draft). These declines occurred after catch-and-release (above Laverne Creek) and one WCT harvest regulations were established in 1988 and can be attributed to habitat degradation (Davis *et al.* 1997 in draft).

Survey results in three river sections in the upper North Fork Coeur d'Alene River above Tepee Creek indicate that a similar trend (to that in the Little North Fork Coeur d'Alene River) occurred. In 1973, the mean number of WCT per transect was 6.0, however, after special regulations were established, the mean number of WCT per transect has declined in all survey years. The mean number of WCT per transect observed in 1980 and 1981 was 5.8 and 5.4, respectively, while only 1.1 WCT was observed per transect in 1991 (Hunt and Bjornn 1995). The mean density of WCT in this section ranged from 0.14-0.76 fish/100 m^2 for all habitats surveyed. These declines were also experienced after special regulations were established.

With exception to the reach of the North Fork Coeur d'Alene River below Tepee Creek, WCT abundance and number of larger fish decreased throughout the drainage from 1980 to 1991. The decline of larger fish in the Coeur d'Alene River has slowed or leveled out since 1991, but remain in very low densities today with only 0.08 WCT/100 m^2 greater than 300 mm in length observed during snorkeling surveys (Davis, IDFG, *pers. comm.* 1999; E. Lider, USFS, *pers. comm.* 1999).

While some river sections have experienced increases in WCT densities, WCT (as described above) have not responded to restrictive angling regulations as other rivers have with similar regulations. In the upper St. Joe River and Kelley Creek (Clearwater River Drainage), where special regulations were also implemented, increased catch rates and an increase in abundance for all age classes was experienced in the first three years (Johnson and Bjornn 1978 in Hunt and Bjornn 1995). In addition, where densities of WCT have increased in the North Fork Coeur d'Alene River, they are only about half that of WCT densities in the nearby St. Joe River since 1990 (Davis *et al.* 1997). Poor habitat conditions may be a reason why WCT densities have not responded to restrictive regulations and declined in some sections while experiencing decelerated increases in other sections of the Coeur d'Alene River (Hunt and Bjornn 1995; Davis *et al.* 1997).

The resident form is generally found in headwater streams and upper reaches of large river drainages have experienced declines but may represent some of the more stable populations in drainage. Dunnigan (1997) conducted electrofishing surveys on 73 streams within the North Fork Coeur d'Alene River (54) and Little North Fork Coeur d'Alene River drainages (19) to determine population estimates of WCT. The mean density of WCT in the North Fork Coeur d'Alene River was higher than that in the Little North Fork Coeur d'Alene River with 9.0 WCT/100 m^2 and 2.8 WCT/100 m^2, respectively. This difference can be attributed to anthropogenic influences, as Dunnigan (1997) determined that watersheds of the Little North Fork Coeur d'Alene River had significantly higher road densities and watershed clearcut area than the North Fork Coeur d'Alene River. Within the 73 streams that were surveyed, in most cases, three reaches of equal length were sampled for which it was determined that WCT densities were generally highest in the upper reaches. This situation may be attributed to habitat conditions within each reach as increased gradient and changes in channel morphology in the upper reaches influenced habitat stability and fish densities (Dunnigan 1997).

During the winter of 1994/1995, a 10-year flow event occurred in the North Fork Coeur d'Alene River and Little North Fork Coeur d'Alene River drainage. Dunnigan (1997) randomly selected 30 streams (15 in each drainage) that were sampled in 1994 to be sampled in 1995 to determine if peak flows during the ten year flow event affected resident WCT densities. While no local extinctions were found during the sampling, the 15 streams in the North Fork Coeur d'Alene River exhibited a significant decline (44 %) in WCT abundance, a 7.6 WCT/100 m^2 decrease from 1994 to 1995. These declines suggest that headwater (resident) WCT are probably subject to stochastic extinctions if perturbations are of sufficient magnitude (Dunnigan 1997). However, there was insufficient evidence to suggest that a significant decline of WCT densities in the Little North Fork Coeur d'Alene River was experienced from 1994 to 1995, possibly because nine sites per stream was not sufficient in detecting changes in streams with low densities (Dunnigan 1997). During February of 1996, the Coeur d'Alene watershed experienced a flood event on the magnitude of slightly less than a 100 year episode (USGS, *in litt.* 1996; Kasun, USFS, pers comm. 1999). Flood events of this magnitude, as indicated by Dunnigan (1997) have the potential to cause stochastic extinctions of resident WCT in headwater streams.

Fishing pressure in the Coeur d'Alene River has increased significantly in recent years from approximately 17,147 hours in 1992 to approximately 32,994 hours in 1996, roughly 90 % (Davis *et al.* 1997). Yet, during this time, the estimated number of fish caught has not increased proportionately with approximately 12,462 fish caught in 1992 and 18,286 caught in 1996, a roughly 45 % increase. While these numbers represent all fish species caught, the change is likely representative of the rate of change of WCT being caught as well. This is supported by catch rates which were determined to be 1.25 fish/hour in 1992 and 0.77 fish/hour in 1996 for the catch-and-release section, a 40 % decline in catch rate. While these catch rates are for all fish species, the number of rainbow trout in the catch-and-release section is limited and these rates are likely representative of the decline in catch rate for WCT in this section. A similar catch rate was found in the catch-and-keep section with 0.54 fish/hour caught in 1992 and 0.65 fish/hour in 1996 (Davis *et al.* 1997). Handling stress related mortality from angling may be as high as 5 % (Schill 1983, 1991, 1995; Schill *et al.* 1986; Wydoski 1977 all in Davis et. al 1997). When catch levels of 12,000 to 18,000 fish as seen in the Coeur d'Alene River are experienced, handling mortality will be considerable.

A limited number of genetic studies have been completed in the Spokane River drainage. Electrophoretic analyses from 12 tributary streams (collected in 1994 and 1997) of the North Fork and Little North Fork Coeur d'Alene River resulted in 8 streams with pure WCT, 2 streams with hybrids (with rainbow trout) detected in the samples but may still contain some pure WCT, and two stream where hybridization appears to have occurred over a long time and it is unlikely there are any pure WCT remaining (Leary, *in litt.* 1995; Kanda and Leary, *in litt.* 1998). In 1989, electrophoretic analyses on WCT from Wolf Lodge Creek indicated that hybridization is occurring with rainbow trout but the tributary still contained some pure WCT as well as pure rainbow trout (Leary, *in litt*. 1989a).

In 1998, the Coeur d'Alene Tribe collected WCT from 16 sites on seven streams in the Spokane drainage within the boundaries of the Coeur d'Alene Reservation. Thirteen of these sites were within the Coeur d'Alene River watershed and preliminary analyses found that nine of the 13 sites had hybridization occurring within the stream. However, at these 9 sites, the level of hybridization appears very low with some portion of the samples containing pure WCT, indicating that hybridization events likely occur episodically, not continually (Spruell *et al., in litt.* 1999; R. Peters, Coeur d'Alene Tribe, *pers. comm.* 1998).

<u>The St. Joe River watershed</u> includes the St. Joe River and tributaries upstream of Coeur d'Alene Lake. The IDFG (*in litt.*1998a) reported that 742.85 stream miles of native WCT habitat are available in the St. Joe River watershed of which WCT, WCT hybrids, or both are present in all miles. When determining the number of stream miles documented or suspected to have WCT present, IDFG included the entire stream length (based on 1:250,000 maps) if WCT were present in any portion of the stream (IDFG, *in litt.* 1998a). However, quantification of densities within tributary streams was not included and through assessment of reports and personal communication, the Service found that numerous streams or stream sections have unsuitable or degraded habitat, and invasion, replacement, displacement from exotics, hybridization with nonnative species, and/or WCT are absent or have depressed densities.

When assessing the status and distribution of WCT in this watershed, three areas were distinguished: the upper St. Joe River and tributaries within the catch-and-release section above Prospector Creek, the lower St. Joe River and tributaries within the catch-and-keep section below Prospector Creek, and the St. Maries River and tributaries which is also a catch-and-keep section (Owen, USFS, *pers. comm.* 1998; Davis *et al.* 1997).

Within the St. Joe River watershed, streams and river sections that have protective angling regulations in place to reduce the rate of mortality, WCT densities have increased, however, densities of WCT in sections that allow harvest are significantly less (Davis *et al.* 1997). Snorkeling surveys (35 transects) on the St. Joe River in 1996 by IDFG estimated that WCT densities in the catch-and-release and catch-and-keep sections were 252 fish/ha and 19 fish/ha, respectively. The IDFG also conducted electrofishing surveys in 1996 for which densities in the catch-and-release section were 13 times higher than in the catch-and-keep section with mean estimates of 1,249 fish/km and 97 fish/km. It was also found during these surveys that more rainbow trout and WCT x rainbow trout hybrids were in the catch-and-keep section. Within the 35 snorkeling transects on the St. Joe River, WCT densities ranged from 0.0 to 7.67 fish/100 m^2. Densities of WCT in seven tributary streams were also estimated in 1996 by IDFG. Density of WCT in Big Creek was 0.20 fish/100 m^2, Quartz Creek - 3.2 fish/100 m^2, Bird Creek - 10.6 fish/100 m^2, Gold Creek - 6.3 fish/100 m^2, Simmons Creek - 5.4 fish/100 m^2, Indian Creek - 9.5 fish/100 m^2, and Skookum Creek - 4.1 fish/100 m^2.

Westslope cutthroat trout in the upper St. Joe River have responded well to the restrictive fishing regulations and support a stable number of fish (Owen, USFS, pers comm. 1998; Johnson and Bjornn 1978 in Hunt and Bjornn 1995; Davis *et al.* 1997). However, in 1997 and 1998 densities of WCT in the upper St. Joe River appear to be down according to angler reports and snorkeling surveys (Owen, USFS, *pers. comm.* 1998; Horner, IDFG, *pers. comm.* 1998). Decreased densities were attributed to events surrounding high, prolonged flows from the winter 1996-1997 floods. Data from Davis *et al.* (1997 and 1999) indicated that this downward trend in the mean number of WCT observed per transect in the catch-and-release section began prior to the 1996-1997 floods. Declining densities of WCT in the St. Joe River since 1990 were attributed to habitat degradation associated with the floods and increased fishing pressure. Within the catch-and-release section from Prospector Creek to Spruce Tree Campground, the mean number of WCT counted per transect has decreased since 1990 when 52.8 WCT were counted, to 23.9 WCT per transect in 1998 (Davis *et al.* 1999). Declines were also observed in the catch-and-release section from Spruce Tree Campground to Ruby Creek with 49.0 WCT observed per transect in 1990, and a decline to 18.2 per transect in 1998. The number of WCT per transect in the catch-and-keep section from Avery to Prospector Creek has also declined with 12.0 counted in 1990 and 3.3 counted in 1998 (Davis *et al.* 1999).

While density and trend data for the St. Maries River and tributaries was not found, WCT throughout this drainage are depressed because of anthropogenic influences with WCT in some tributaries in real trouble (Owen, USFS, pers comm. 1998).

Fishing pressure in the St. Joe River has increased significantly in recent years from approximately 19,600 hours in 1990 to approximately 28,700 hours in 1996, roughly 50 % (Davis *et al.* 1997). Yet, during this time, the estimated number of fish caught has reduced by over half from roughly 54,000 fish to roughly 25,600 fish. These numbers represent all fish species caught, but the decline is likely representative of the rate of decline in WCT being caught as well. This is supported by WCT catch rates which were determined to be 3.9 fish/ hour in 1990 and 1.4 fish/hour in 1996 for the catch-and-release section, a 65 % decline in catch rate. A similar decline was found in the catch-and-keep section with 1.6 fish/hour caught in 1990, declining to 0.6 fish/hour in 1996 (Davis *et al.* 1997). Handling stress related mortality from angling may be as high as 5 % (Schill 1983, 1991, 1995; Schill *et al.* 1986; Wydoski 1977 all in Davis et. al 1997). When catch levels of 25,000 to 50,000 fish, as seen in the St. Joe River are experienced, handling mortality will be considerable.

Electrophoretic analyses (1989) of WCT in the upper St. Joe River found these fish to be genetically pure (Leary, *in litt.* 1989b). In 1998, the Coeur d'Alene Tribe collected WCT from 16 sites on seven streams in the Spokane drainage within the boundaries of the Coeur d'Alene Reservation. Three of these sites were in the St. Joe River watershed and preliminary analyses found that one of the three streams (Cherry Creek) had hybridization occurring within the stream. The other two streams (Hells Gulch and Alder Creeks) contained samples of WCT with no evidence of hybridization (Spruell *et al., in litt.* 1999; Peters, Coeur d'Alene Tribe, *pers. comm.* 1998).

In summary, WCT in the Spokane River drainage occur in about 183 tributaries or stream reaches that collectively encompass 1,533 linear miles of stream habitat, distributed between 2 watersheds (Appendix Table 2). In addition, WCT are known to occur in Coeur d'Alene Lake (31,450 surface acres).

Kootenai River Drainage, Idaho

Status and Distribution

The Kootenai River drainage for these analyses includes the Kootenai and Moyie rivers and all tributaries in Idaho (EPA drainages 17010104 and 17010105) which encompasses approximately 1,150 square miles (Knudson 1994; Streamnet, *in litt*. 1998). Roughly 70 % of the surface area is public land managed by the U.S. Forest Service. The U.S. Bureau of Land Management, U.S. Fish and Wildlife Service, and the State of Idaho also manage small sections of public land in this drainage. Crown Pacific Timber Company has numerous areas of ownership within this area. The Kootenai River drainage is an international watershed that encompasses portions of northern Idaho, Montana, and the province of British Columbia (Knudson 1994). Approximately two-thirds of the watershed is within British Columbia, with smaller portions in Montana and Idaho. The Kootenai River has headwater origin in British Columbia, flows into Montana, Idaho, and then back into British Columbia.

Westslope cutthroat trout (WCT) are native to the Kootenai River drainage with resident and fluvial life history forms present (Corsi, IDFG, *pers. comm.* 1998). In the 1950s, WCT as well as burbot were in large abundance with whitefish and nonnative rainbow trout occurring in lower densities. Since that time, there has been a shift in fish densities; rainbow trout and whitefish have increased while WCT and burbot have decreased significantly (USFS, *in litt.* 1998b). Habitat degradation from mining, timber harvest, road development, dam construction, water diversions, and cattle grazing dating back to the 1880s have attributed to the decline of WCT trout habitat (USFS, *in litt.* 1998b; Knudson 1994; Partridge 1983; Paragamian 1995). The introduction of nonnative species such as brook trout, rainbow trout, and Yellowstone cutthroat trout have also contributed to the decline and dilution of WCT throughout the drainage. Rainbow trout and Yellowstone cutthroat trout are known to hybridize with WCT, and brook trout have replaced/displaced or occur in higher densities in many streams (Behnke 1992; Leary, *in litt.* 1997; Sage, *in litt.* 1995; Paragamian 1995; D. Perkinson, USFS, *pers. comm.* 1998).

Interior redband trout are also native to the Kootenai River and add to the complexity of determining the distribution and status of WCT in the drainage. Similar visual (i.e. phenotypic) and meristic characteristics of WCT and interior redband trout make correct identification difficult, which is furthermore complicated when hybridization between the two species occurs (Perkinson, *in litt.* 1993; Perkinson, USFS, *pers. comm.* 1998). Behnke (1992) indicated that the redband trout of the Columbia River drainages share cutthroat trout-like characteristics. Perkinson (USFS, *pers. comm.* 1998) and Behnke (1992) both indicated that the interior form of redband trout have a light cutthroat mark, which may cause people to call redbands WCT.

Idaho Department of Fish and Game (IDFG) (*in litt.* 1998a) reported that 437.0 stream miles of native WCT are available in the Kootenai River drainage of which WCT (and/or WCT hybrids) are present in 389.11 miles. When determining the number of stream miles documented or suspected to have WCT present, IDFG included the entire stream length (based on 1:250,000 maps) if WCT were present in any portion of the stream (IDFG, *in litt.* 1998a). However, WCT have been shown to be absent in numerous streams and stream reaches below barriers within this drainage (J. Fredericks, IDFG *pers. comm.* 1999; Fredericks and Hendericks 1997; Downs, IDFG, *pers. comm.* 1998; Downs 1997). Quantification of densities within tributary streams (by IDFG) was not included and through assessment of reports, file documents, and personal communication, the Service found that numerous streams have unsuitable or degraded habitat, and invasion, replacement, displacement from exotics, hybridization with nonnative species, and/or WCT are absent or have depressed densities.

Electrophoretic analysis on fish specimens from 25 locations in the Kootenai River drainage has been completed to date, of which only 4 locations (American, Cannuck, Keno, and Spruce Creeks) were shown to have genetically pure WCT (Sage, *in litt.* 1993; Sage, *in litt.* 1995; Leary, *in litt.* 1997). Thirteen additional locations were shown to have WCT allele characteristics as well as allele characteristics typical of interior redband trout, coastal rainbow trout, and/or Yellowstone cutthroat trout. In eight of these 13 locations, WCT contribute a larger portion of the genes present, of which only 5 locations (Ball, Copper, Skin, Snow, and Trout Creeks) have WCT contributing >95 % of the genes present. In 5 locations, rainbow trout contribute a larger proportion of the genes present. Eight of the 25 locations did not have any WCT genes identified and genetic information indicates they are pure interior redband trout, pure rainbow trout likely derived from introductions of coastal rainbow trout, and hybrids with large proportions of rainbow genes present (Sage, *in litt.* 1993; Sage, *in litt.* 1995; Leary, *in litt.* 1997). Roughly 73 % of the streams sections that have had genetic analyses completed on them have experienced some level of hybridization from nonnative species.

The 4 streams that have been identified as genetically pure are all headwater streams to the Moyie River. Spruce Lake, located in the uppermost part of the Spruce Creek watershed and feeds Spruce Creek, has had Yellowstone cutthroat trout, cutthroat trout (unspecified stock), and several stocks of kamloops (rainbow) trout introduced to it in the last 30 years (IDFG, *in litt.* 1998b). It is unknown if a barrier exists between the lake and stream to prevent these nonnative species from moving into Spruce Creek and hybridizing with WCT, but the stocking of high-mountain lakes in the Kootenai River drainage invariably poses a threat of hybridization through downstream migration (Horner, IDFG, *pers. comm.* 1999; Perkinson, USFS, *pers. comm.* 1998).

The fluvial life-history form of WCT in the Kootenai River is severely depressed, with low numbers harvested by anglers annually and few captured during scientific investigations (Horner, IDFG, *pers. comm.* 1998; Paragamian 1993; Paragamian 1995; Partridge 1983). Estimated harvest in the Kootenai River by anglers from March 1, 1993, to February 28, 1994, was 0.01 WCT/hour (156 fish) and 0.005 WCT/hour (45 fish) in 1982 (Paragamian 1995; Partridge 1983).

The following tributary stream density information collected during electrofishing surveys in 1993, 1994, and 1995 was obtained from tables provided by the U.S. Forest Service (*in litt.* 1998c):

> Ball Creek - WCT at 0.27/100 m^2, rainbow trout at 0.31/100 m^2, brook trout at 0.06/100 m^2.

Boulder Creek - WCT at 20.2/100 m^2, brook trout at 15.1/100 m^2, rainbow trout at 0.9/100 m^2.
Canuck Creek - WCT at 13.3/100 m^2.
Caribou Creek - WCT at 0.4/100 m^2, brook trout at 1.1/100 m^2, rainbow trout at 0.4/100 m^2, and hybrids at 14.2/100 m^2.
Cow Creek - WCT at 0.1/100 m^2, brook trout at 5.9/100 m^2.
Deer Creek - WCT at 2.1/100 m^2, hybrids at 8.4/100 m^2, brook trout at 3.7/100 m^2.
Grass Creek - WCT at 0.18/100 m^2, rainbow trout at 14.8/100 m^2 and 0.25/100 m^2.
Mission Creek - WCT at 9.1/100 m^2, brook trout at 32.6/100 m^2.
Parker Creek - WCT at 7.8/100 m^2, rainbow trout at 1.0/100 m^2.
Snow Creek - WCT at 9.8/100 m^2 and 0.11/100 m^2, brook trout at 9.5/100 m^2 and 0.02/100 m^2.
Trout Creek - WCT at 4.5/100 m^2, brook trout at 5.0/100 m^2, hybrids at 9.1/100 m^2, rainbow trout at 0.9/100 m^2.

Within these tributary streams, WCT X rainbow trout hybrids were observed in: Ball Creek (1994), Boulder Creek (1994 and 1995), Caribou Creek (1994 and 1995), Deer Creek (1994), Parker Creek (1994), and Trout Creek (1994). In addition to these tributary streams, hybrids were observed in Boundary Creek (1995), Cascade Creek (1993), Deep Creek (1995), Fisher Creek (1994), Long Canyon Creek (1994), Ruby Creek (1994), and Smith Creek (1995). While the density of WCT in Boulder Creek appears to be relatively high, it should be noted that genetic analysis of fish from four separate sites in the Boulder Creek watershed has indicated that introduced rainbow trout have significantly influenced the genetic characteristics within the watershed. Rainbow trout contribute 81 % (lower Boulder Creek), 100 % coastal rainbow trout and interior redband trout (E.F. Boulder Creek), 23 % (M.F. Boulder Creek, and 9 % (upper Boulder Creek) (Leary, *in litt.* 1997; Sage, *in litt.* 1993).

Using the same USFS table, it was determined that rainbow trout/interior redband trout were observed in 25 of the 30 tributary streams, and brook trout were present in 24 of the 30 tributary streams identified by IDFG as having WCT present (USFS, *in litt.* 1998c; IDFG, *in litt.* 1998a). Westslope cutthroat trout were not found in five of the tributary streams identified by IDFG (*in litt.* 1998a) as having WCT present; Dodge Creek (1981 and 1994), E. F. Boulder Creek (1995), Curley Creek (1981), Myrtle Creek (1981, 1993, and 1994), and Twentymile Creek (1981, 1994, and 1995). These streams total 44.41 miles. Several electrofishing surveys by IDFG support the absence of WCT in these streams or at least in sections of these streams. Partridge (1983) did not document WCT in Dodge Creek, Curley Creek, Myrtle Creek, and Twentymile Creek from 1980-82, and Paragamian (1993) did not document WCT in Myrtle Creek in 1993, or in Dodge Creek and Twentymile Creek in 1994; however, he did document their presence in Curley Creek (1.2/100 m^2) in 1994.

Using data generated by ICBEMP for the Kootenai River drainage, 43 HUCs compose the drainage within Idaho. Westslope cutthroat trout were determined present in a HUC if the HUC was known or predicted to have spawning and rearing occurring, or if it was a migratory corridor. When determining the status of WCT in a HUC, a strong or depressed status is only conferred to a HUC if spawning and rearing occurs. Hence, in HUCs that are determined to be utilized by WCT only as migratory corridors, the status is absent. Therefore, in the Kootenai River drainage, WCT presence is known or predicted in 41 HUCs and absent in two. Westslope cutthroat trout status is known or predicted strong in four and known or predicted depressed in 37 HUCs.

In summary, WCT in the Kootenai River drainage, Idaho, occur in about 33 tributaries or stream reaches that collectively encompass 389 linear miles of stream habitat, distributed between 2 watersheds (Appendix Table 2).

Upper Columbia River Drainage, Washington

Status and Distribution

The Methow River watershed (EPA drainage 17020008) in north-central Washington borders Canada and lies to the east of the Cascade Range crest. The Methow River is a tributary to the upper Columbia River. The watershed encompasses 1,904 square miles, of which roughly 82 % is within U.S. Forest Service boundaries (Baer, *in litt.* 1998). The Pasayten and Lake Chelan - Sawtooth Wilderness areas encompass approximately 315,285 acres (26 %) within the watershed.

Historically, WCT spawning and early rearing habitat in the Methow River watershed was not believed to be abundant or widespread. Washington Department of Fish and Wildlife (WDFW, *in litt*. 1998a) reported the abundance of habitat which commonly supported spawning and early rearing WCT included only seven streams totaling 30.7 miles prior to hatchery propagation. However, WCT have been replaced by brook trout in roughly eight miles of this historic range (Eightmile Creek). Westslope cutthroat trout may have been distributed throughout the 90-mile length of the Methow River in limited amounts but documentation is limited because they were overshadowed by other fish species such as steelhead and salmon (K. Williams, WDFW, *pers. comm.* 1999). The current distribution of spawning and early rearing area has increased (through hatchery stocking) with WCT found in 60 streams totaling 201.6 miles and 43 lakes totaling 311.9 acres (WDFW, *in litt.* 1998a). It is not believed that any lakes within the Methow River watershed were historically occupied by WCT.

An alternative argument to the above assumption that WCT were limited to only a few headwater streams and occurred only below barriers is that they were widespread and occurred above barriers as well. Since bull trout are known to occur naturally above barriers in this drainage, it would seem reasonable to assume, upstream passage barriers today, were not barriers historically. Proebstel *et al.* (1997) determined through mitochondrial DNA analyses, that pure WCT exist in numerous streams in this watershed; however, WCT do not occur in the areas reported as historic range by WDFW. Historic documentation of resident fish presence or absence is limited in this drainage and further review and analyses of records is necessary. Genetic testing that may give insight to the origin of the WCT in this drainage (i.e. do these fish have the same genetic makeup of broodstock fish from Priest Lake or Lake Chelan, or are there important differences?) is also necessary. The Service believes that is likely that WCT could have occupied a much broader range historically in this watershed, but because information is not available at this time, only the seven streams as described above are considered in this analyses.

Resident and fluvial life-history forms of WCT are present in this drainage (WDFW, *in litt.* 1998a). Although the distribution of WCT expanded with ongoing stocking programs, the resident fish have been pushed into the extreme upper habitats as a result of nonnative fish introductions and possibly because of temperature requirements (J. Molesworth, USFS, *pers. comm.* 1999). The fluvial form occurs in very low numbers in the mainstem Methow River and is believed to have been decimated in the past because of multi-species fisheries (WDFW, *in litt.*

1998a; Molesworth, USFS, *pers. comm.* 1999). In recent years, angler interviews indicate that fluvial WCT have shown a positive response in waters where regulations have restricted fishing for bull trout and steelhead (Williams, WDFW, *pers. comm.* 1999).

A study initiated in 1992 to obtain baseline information on native salmonid species in tributary streams and rivers of the Mid Columbia River drainage (Methow, Entiat, and Wenatchee rivers) resulted in the collection of fish specimens for classic taxonomic and genetic (mitochondrial DNA) analyses in the Methow River watershed (Proebstel *et al.* 1997). For our analyses, only the seven streams (West Fork Methow and Lost Rivers, Foggy Dew, Eightmile, Wolf, Goat, and Cedar creeks) that WCT were believed to have historically occupied for spawning and early wintering (as reported by WDFW, *in litt*. 1998a) were considered. None of the fish in these streams had mitochondrial DNA analyses completed on them and all of the following conclusions are based on taxonomic classification. Purity ratings for the taxonomic analyses are as follows: pure - genetically pure based on this analysis; essentially pure - one or more of the diagnostic criteria was outside the expected range of the species; good - the specimens are phenotypically representative of species but are not considered pure; and hybrids which are specimens that are considered introgressed with rainbow trout (Proebstel *et al.* 1997).

Fish were collected from two sites on Foggy Dew Creek that had phenotypic characteristics typical of WCT. Fish collected from the lower site in the stream had some excellent examples of WCT, while others were obvious hybrids with rainbow trout. At the upper site, phenotypic characteristics indicated that these fish were essentially pure with some historic gene flow with rainbow trout (Proebstel *et al*. 1997).

Fish were collected from two sites on Eightmile Creek for which none were WCT. Nonnative coastal rainbow trout were collected at the lower site, while nonnative brook trout were collected at the upper site (Proebstel *et al*. 1997).

Fish collected at three sites below the barrier falls on Wolf Creek have experienced various degrees of hybridization. Fish specimens at the lowest site are rainbow trout from multiple sources with some degree of hybridization with WCT. Fish collected at the middle site are predominately WCT with some hybridization with nonnative rainbow trout, while the fish at the upper-most site below the barrier falls are good examples of WCT but are not pure with some gene flow from rainbow trout (Proebstel *et al*. 1997).

Fish specimens that were collected at five sites on Goat Creek had phenotypic characteristics typical of WCT at the upper four sites. Only the upper-most site had specimens that were good examples (not pure) of WCT. The other three sites showed varying degrees of redband rainbow X WCT hybridization with some excellent examples of WCT. Westslope cutthroat trout were reported to have been stocked in this stream in the early 1980s and likely are the result of the aberration in spotting patterns (two distinctly different patterns of size and shape) from hybrid interaction observed at one of the sites (Proebstel *et al*. 1997).

Fish specimens were collected at three sites on Cedar Creek, but only one was below the barrier falls that WDFW (*in litt.* 1998a) reported to be within the historic range. Only one fish was collected below the falls and it was determined to be nonnative rainbow trout X WCT hybrid.

Fish were collected at two sites on the Lost River of which neither was within the range that WDFW reported to be within the historic range of WCT. At both sites nonnative coastal rainbow trout were collected (Proebstel *et al*. 1997). No fish specimens were collected on the West Fork Methow River. In addition, while the mainstem Methow River was not identified as having historic spawning and early wintering habitat by WDFW, fluvial WCT were believed to occupy the mainstem river. Fish specimens were collected at four sites on the mainstem Methow River. The fish at the lowest two sites had taxonomic characteristics typical of nonnative rainbow trout. Fish specimens collected in the upper Methow River (river km 125.5 and 130.8) show indications of hybridization between WCT and nonnative coastal rainbow trout. The fish specimens collected at the upper-most site were collected from above a barrier falls (river km 134.9) show slight signs of hybridization with nonnative rainbow trout and are considered good examples of WCT (Proebstel *et al*. 1997). In summary, while some good to essentially pure specimens of WCT were found in these streams, hybridization was observed at all sites based on taxonomic characteristics. Pure WCT were identified in the Methow River watershed during this study (taxonomic and genetic analysis), but none were within the historic range as identified by WDFW.

Using data generated by ICBEMP, 61 HUCs compose the drainage. Westslope cutthroat trout were determined present in a HUC if the HUC was known or predicted to have spawning and rearing occurring, or if it was a migratory corridor. When determining the status of WCT in a HUC, a strong or depressed status is only conferred to a HUC if spawning and rearing occurs. Hence, in HUCs that are determined to be utilized by WCT only as migratory corridors, the status is absent. Therefore, in the Methow River watershed, WCT presence is known or predicted in 43 HUCs and known absent in 18. Westslope cutthroat trout status is known or predicted strong in 27 HUCs and known or predicted depressed in two. However, most of the WCT in these HUCs (roughly 20) have been introduced and are believed to exist outside their historic range.

<u>The Lake Chelan watershed</u> (EPA drainage17020009), located in north central Washington, lies east of the Cascades and drains into the upper Columbia River. Approximately 90 % of the drainage is public land managed primarily by the U.S. Forest Service and National Park Service. The Lake Chelan-Sawtooth and Glacier Peak Wilderness areas (combined) encompass approximately 235,000 acres (39 %), and the North Cascades National Park and Lake Chelan National Recreation Area includes 73,482 acres and 62,830 acres of this drainage, respectively (USFS, *in litt.* 1999a).

Westslope cutthroat trout are native to this drainage, with resident and adfluvial life forms present historically and today. The WCT of Lake Chelan (33,104 surface acres) are reproductively isolated and in long-term decline (Brown 1984 in USFS, *in litt.* 1999b). The adfluvial form, which in the late 1800s and early 1900s provided a high-quality fishery, has significantly declined and is now at high risk of replacement by introduced species (USFS*, in litt.* 1998d, WDFW*, in litt.* 1998a; Williams, WDFW*, pers. comm.* 1998; Brown 1984). The severe decline of adfluvial WCT is attributed to over-fishing, excessive trapping and removal of spawners, introduction of nonnative fishes, loss of spawning habitat, and the construction of Chelan Power Dam (USFS*, in litt.* 1998d; WDFW*, in litt.* 1998a; Brown 1984). In 1981 and 1982, creel census surveys on Lake Chelan estimated that anglers harvested 352 (0.026 fish/hour) and 334 (0.014 fish/hour) WCT, respectively. However, the effort in 1982 was almost double that in 1981. The WCT harvested in both years consisted primarily of females, with 43 of 54 (that were sexed) being females (Brown 1984). In 1981, WCT accounted for 15 % of the harvest and in 1982 accounted for only 4 % of the fish harvested, while nonnatives accounted for the remainder of the fish harvested (Brown 1984).

Washington Department of Fish and Wildlife (WDFW, *in litt*. 1998a) reported that WCT were historically distributed in 43 streams covering 85.9 miles and in two lakes. Through the hatchery stocking program initiated in 1903, the current distribution of naturally reproducing WCT has increased to 150.36 miles within 43 streams and are now naturally reproducing in 26 lakes (WDFW*, in litt.* 1998a). However, anecdotal glacial and geomorphological evidence indicates that WCT may have been able to access headwater sections above barriers in the north shore tributaries (USFS, *in litt*. 1998d; P. Archibald, USFS*, pers. comm.* 1999). Lacustrine deposits above barriers on north-shore tributary streams indicate that lake levels were at one time above the falls, allowing WCT to access headwater reaches (Archibald, USFS*, pers. comm.* 1999). While vast stocking of WCT has occurred in this drainage, high-mountain lakes with good trail systems were preferred sites for these introductions, which in turn allowed for downstream distribution of fish into many tributary streams. However, most if not all north-shore tributaries do not have headwater lakes and the stocking of WCT above barriers may not have been prevalent (Archibald, USFS*, pers. comm.* 1999).

A barrier at approximately river mile 14 on the Stehekin River currently prevents upstream passage of migratory WCT. There is some speculation that WCT that are found in the upper Stehekin River and tributaries are the product of fish that were moved above the falls by humans (Williams, WDFW*, pers. comm.* 1999). However, WCT specimens collected from Flat Creek and the Stehekin River (above the falls) in 1982, were examined by Dr. Robert Behnke, Colorado State University. Morphologic and meristic characteristics of all these specimens indicated that the fish were pure WCT (Brown 1984). Behnke determined there were no differences between the Flat Creek and Stehekin River specimens. However, when Behnke compared the fish to specimens from Twin Lakes (WCT broodstock derived from Lake Chelan), he found differences. He concluded that the WCT in Flat Creek and upper Stehekin River have been residents for thousands of years and have had little, if any, gene-flow with Lake Chelan WCT, thereby allowing for these differences to accumulate through time (Behnke 1982 in Brown 1984).

There has been a loss in number of streams historically occupied by adfluvial WCT, with rainbow trout replacing adfluvial WCT in the lower Stehekin River (roughly 14 miles) and in many (10 of 23) Lake Chelan tributary streams . Subsequently, there has been an increase in the number of streams occupied by resident WCT through hatchery stocking (Williams WDFW, *pers. comm.* 1998). Quantification of densities within tributary streams was not included in WDFW's status review, and through analysis of reports, biological assessments, and file documents, the Service found that the abundance of WCT in many tributary streams is low. Factors influencing reduced densities include unsuitable or degraded habitat; invasion, replacement, displacement from competing nonnatives; and hybridization with nonnative species.

The Stehekin River, which is considered the most important water for Lake Chelan adfluvial WCT, has experienced a shift in species present in the lower 14.5 mile section upstream to the mouth of Bridge Creek. Westslope cutthroat trout have been replaced by rainbow trout in this lower section, but remain allopathic throughout the upper Stehekin River drainage as well as in the Flat and Bridge Creek drainages (WDFW, *in litt.* 1998a). In addition, 23 tributary streams to Lake Chelan (excluding the Stehekin River), totaling at least 6.2 miles, were identified as likely occupied by adfluvial WCT and available for spawning and rearing. However, with the introduction of rainbow trout, adfluvial WCT have declined and become secondary to rainbow trout in these tributaries. In 1982, all but one tributary (Castle Creek) were predominantly utilized by rainbow trout; WCT were absent in 10 of 23 streams and young of the year (YOY) WCT absent in 16 of 23 streams (WDFW, *in litt.* 1998a; Brown 1984). Brown (1984) observed sporadic spawning success with year-classes missing and meager juvenile densities in streams that were surveyed.

Within the 13 Lake Chelan tributary streams that WCT occupied in 1982, the density of nonnative rainbow trout per kilometer was far greater than that of WCT in most streams. The following numbers represent the estimated densities of adult and YOY rainbow trout and WCT per kilometer for the 13 streams (Brown 1984):

Safety Harbor Creek - 5760 RBT/km, 40 WCT/km, no YOY WCT
Little Big Creek - 102 RBT/km, 76 WCT/km, no YOY WCT
Big Creek - 5248 RBT/km, 43 WCT/km, no YOY WCT
Prince Creek - 4780 RBT/km, 880 WCT/km
Cascade Creek - 4820 RBT/km, 820 WCT/km
Fish Creek - 1978 RBT/km, 764 WCT/km
4-Mile Creek - 2533 RBT/km, 236 WCT/km
Pyramid Creek - 2880 RBT/km, 40 WCT/km, no YOY WCT
Bear Creek - 672 RBT/km, 71 WCT/km, no YOY WCT
Railroad Creek - 462 RBT/km, 196 WCT/km
Lightning Creek - 535 RBT/km, 64 WCT/km, no YOY WCT
Riddle Creek - 948 RBT/km, 902 WCT/km
Castle Creek - 0 RBT/km, 260 WCT/km

The nonnative rainbow trout and WCT are sympatric in these adfluvial tributary streams below barriers and it can be assumed the threat of hybridization between the two is highly likely.

Using data generated by ICBEMP, 32 HUCs compose the watershed. Westslope cutthroat trout were determined present in a HUC if the HUC was known or predicted to have spawning and rearing occurring, or if it was a migratory corridor. When determining the status of WCT in a HUC, a strong or depressed status is only conferred to a HUC if spawning and rearing occurs. Hence, in HUCs that are determined to be utilized by WCT only as migratory corridors, the status is absent. Therefore, in the Lake Chelan watershed, WCT presence is known or predicted in 31 HUCs and absent in one. Westslope cutthroat trout status is known or predicted strong in 15 HUCs, and known or predicted depressed in nine HUCs. Status was not determined for one HUC.

In summary, WCT in the Upper Columbia River drainage occur in about 103 tributaries or stream reaches that collectively encompass 352 linear miles of stream habitat, distributed between 2 watersheds (Appendix Table 2). In addition, WCT are known to occur in the 33,104-acre Lake Chelan.

Clearwater River Drainage

Status and Distribution

The Clearwater River is a tributary to the Snake River and encompasses a large area in north-central Idaho. The drainage consists of 9,420 square miles (6,028,800 acres) (Streamnet–available data for accounting unit: 170603). Major tributaries in the Clearwater River drainage include the North Fork Clearwater, South Fork Clearwater, Selway, and Lochsa rivers.

A large portion of the drainage is within the Clearwater National Forest (CNF) and the Nez Perce National Forest (NPNF). The CNF lies north of the mainstem and Middle Fork Clearwater River and consists of 1,837,116 acres, including portions of the Selway-Bitterroot Wilderness Area (259,165 acres) and the Middle Fork-Lochsa Recreational River (25,540 acres) (CNF 1987). These two areas make up about 15 % of the entire CNF and 52 % of the CNF is distributed in 16 roadless areas (CNF 1987).

The NPNF lies south of the mainstem and Middle Fork Clearwater River and consists of 2,218,040 acres, including portions of the Selway-Bitterroot Wilderness (560,088 acres), Frank Church-River of No Return Wilderness (105,736 acres), and Hells Canyon Wilderness (59,900 acres) and Gospel-Hump Wilderness (200,464 acres) (NPNF 1987). A total 35,061 acres are corridors for five wild or recreational rivers and 503,162 acres are distributed in 16 roadless areas (NPNF 1987). Overall, about 42 % of the NPNF is in designated wilderness and 23 % in roadless areas. However, the NPNF includes areas within the Salmon River and Snake River drainages.

Westslope cutthroat trout are widely distributed in the Clearwater River drainage and groups of fish are thought to be connected and genetic mixing may occur (Idaho Department of Fish and Game [IDFG], *in litt.* 1998a). However, Dworshak Dam eliminated access to the North Fork Clearwater River by anadromous fish (Moffitt and Bjornn 1984) and has blocked migration of resident fish (Weigel 1998). Both resident and migratory fish occur in the Clearwater River drainage (Johnson 1992; D. Mayes, USFS, *pers. comm.* 1998). Based on existing information and queries to personnel, the IDFG estimated that 265 tributaries (3,735 total miles for entire tributaries where cutthroat are found in some portion) within the Clearwater River drainage contain WCT (IDFG, *in litt.* 1998a). Although the genetic composition of cutthroat trout in the drainage is not known, two studies have been initiated to evaluate potential interspecific and conspecific introgression (Weigel 1997, 1998; Mayes, *pers. comm.* 1998).

The IDFG identified 13 key watersheds to summarize distribution and abundance information for WCT in the Clearwater River drainage (IDFG, *in litt.* 1998a). This organization is maintained in the following review of fish status. Additional information was used from reports, letters, data files, and personal communications. Data generated by the Interior Columbia Basin Ecosystem Management Project (ICBEMP) for current status of salmonids (key salmonid current-status database [i.e. CRBFISH6]) were used to describe known and predicted presence and status of

WCT for HUCs (i.e. subwatersheds) in each key watershed. Known and predicted status was identified for subwatersheds containing spawning and rearing habitats, whereas status was considered "absent" for subwatersheds where fish or spawning and rearing habitats do not occur. Criteria for status determination are described in Lee *et al.* (1997a). The 1986-1996 General Parr Monitoring data file (IDFG, *in litt.* 1998e) contains fish-abundance information for numerous transects at which snorkel surveys are conducted to monitor abundance of juvenile anadromous fish. Information on habitat and resident fish species are also collected. The Service identified individual transects with at least seven years of survey data and WCT observed in at least five of the years in the period of record. A Spearman Rank Correlation Coefficient was then calculated between WCT density (fish/m^2) and year to describe potential trends in fish abundance.

Lower Clearwater River Watershed

Lower Clearwater key watershed.--The key watershed consists of the Clearwater River downstream from the North Fork Clearwater River watershed (IDFG, *in litt.* 1998a). The IDFG estimated that WCT are present in 4 tributaries, totaling 83 miles for the entire length of all tributaries in which cutthroat trout were estimated to be present in some portion, and absent or unknown in 38 (480 miles). Mean density of cutthroat trout was estimated at 24 fish/mile based on 22 sampling bouts conducted at transects during 1986-1993 (IDFG, *in litt.* 1998a). Using data generated by ICBEMP, the Service estimated that 63 subwatersheds compose the key watershed. Cutthroat trout presence is known in one subwatershed and known absent in 62. Cutthroat trout status is known absent in 44 subwatersheds and predicted in 18, and predicted strong in one.

Lower Middle Fork Clearwater key watershed.--The key watershed consists of the Clearwater River upstream from the North Fork Clearwater River watershed to the confluence of the Lochsa and Selway rivers (IDFG, *in litt.* 1998a). The IDFG estimated that WCT are present in 21 tributaries, totaling 275 miles for the entire length of all tributaries in which cutthroat trout were estimated to be present in some portion, and absent or unknown in 8 (120 miles). Mean density of cutthroat trout was estimated at 17 fish/mile based on 192 sampling bouts conducted at transects during 1986-1993 (IDFG, *in litt.* 1998a). Using data generated by ICBEMP, the Service estimated that 59 subwatersheds compose the key watershed. Cutthroat trout presence is known in 18 subwatersheds and predicted in four; and know absent in 35 and predicted in two. Cutthroat trout status is known absent in 30 and predicted in 19, known depressed in five, and known strong in one and predicted in four.

North Fork Clearwater River Watershed

Dworshak key watershed.--The key watershed consists of tributaries to Dworshak Reservoir, excluding the North Fork Clearwater River (IDFG, *in litt.* 1998a). The IDFG estimated that WCT are present in 15 tributaries, totaling 196 miles for the entire length of all tributaries in which cutthroat trout were estimated to be present in some portion. Using data generated by ICBEMP, the Service estimated that 27 subwatersheds compose the key watershed. Cutthroat trout presence is known in 19 subwatersheds and predicted in 6; and absence is known in 2.

Cutthroat trout status is known absent in 2, known depressed in 2 and predicted in 22, and predicted strong in 1.

Little North Fork Clearwater key watershed.--The key watershed consists of the entire Little North Fork Clearwater River drainage, including Dworshak Reservoir at full pool (IDFG, *in litt.* 1998a). The IDFG estimated that WCT are present in 12 tributaries, totaling 142 miles for the entire length of all tributaries in which cutthroat trout were estimated to be present in some portion. Mean density of cutthroat trout was estimated at 109 fish/mile based on 33 sampling bouts conducted at stream transects during 1986-1993 (IDFG, *in litt.* 1998a). Using data generated by ICBEMP, the Service estimated that 18 subwatersheds compose the key watershed. Cutthroat trout presence is known in 18 subwatersheds and status is known depressed in 18.

North Fork Clearwater key watershed.--The key watershed consists of the North Fork Clearwater River watershed upstream from Dworshak Reservoir, excluding the Kelly Creek and Weitas Creek drainages (IDFG, *in litt.* 1998a). The IDFG estimated that WCT are present in 18 tributaries, totaling 196 miles for the entire length of all tributaries in which cutthroat trout were estimated to be present in some portion, and absent or unknown in 1 tributary (5 miles). Mean density of cutthroat trout was estimated at 127 fish/mile based on 37 sampling bouts conducted at stream transects during 1986-1993 (IDFG, *in litt.* 1998a). Johnson (1992) cites studies for which estimated density of age 1+ and 2+ WCT was 0.1-32.7 fish/100 m^2. The Service was unable to determine whether these values included sites located in other key watersheds within the North Fork Clearwater River watershed. Using data generated by ICBEMP, the Service estimated that 18 subwatersheds compose the key watershed. Cutthroat trout presence is known in 18 subwatersheds and status is known depressed in 3 and predicted in 6, and known strong in 5 and predicted in 4.

Weitas key watershed.--The key watershed consists of the entire Weitas Creek drainage (IDFG, *in litt.* 1998a). The IDFG estimated that WCT are present in 5 tributaries, totaling 74 miles for the entire length of all tributaries in which cutthroat trout were estimated to be present in some portion. Mean density of cutthroat trout was estimated at 110 fish/mile based on 4 sampling bouts conducted at stream transects during 1986-1993 (IDFG, *in litt.* 1998a). Using data generated by ICBEMP, the Service estimated that 10 subwatersheds compose the key watershed. Cutthroat trout presence is known for 10; and status is known depressed in 2 and predicted in 2, and known strong in 2 and predicted in 4.

Kelly Forks key watershed.--The key watershed consists of the entire North Fork Clearwater River watershed upstream and including the Kelly Creek watershed (IDFG, *in litt.* 1998a). The IDFG estimated that WCT are present in 16 tributaries, totaling 205 miles for the entire length of all tributaries in which cutthroat trout were estimated to be present in some portion. Mean density of cutthroat trout was estimated at 16 fish/mile based on a single sampling bout conducted at a transect during 1986-1993 (IDFG, *in litt.* 1998a). Using data generated by ICBEMP, the Service estimated that 25 subwatersheds compose the key watershed. Cutthroat trout presence is known in 23 subwatersheds and predicted in 2. Cutthroat trout status is known depressed in 5 and predicted in 3, and known strong in 11 and predicted in 6.

South Fork Clearwater River Watershed

South Fork Clearwater key watershed.--The key watershed consists of the entire South Fork Clearwater River watershed (IDFG, *in litt.* 1998a). The IDFG estimated that WCT are present in 63 tributaries, totaling 561 miles for the entire length of all tributaries in which cutthroat trout were estimated to be present in some portion, and absent or unknown in 2 (8 miles). Mean density of cutthroat trout was estimated at 152 fish/mile based on 503 sampling bouts conducted at transects during 1986-1993 (IDFG, *in litt.* 1998a). Using data generated by ICBEMP, the Service estimated that 61 subwatersheds compose the key watershed. Cutthroat trout presence is known in 55 subwatersheds and predicted in 1, and predicted absent in 5. Cutthroat trout status is known absent in 6 and predicted in 14, known depressed in 35 and predicted in 3, and known strong in 2 and predicted in 1. The Service identified records from 27 transects within the key watershed (IDFG, *in litt.* 1998b) with data considered sufficient to evaluate trends in abundance of WCT (i.e. at least 7 years of data and cutthroat trout observed in a minimum of 5 years for each transect). Spearman rank correlation coefficients were significant for 5 of the 27 transects ($P < 0.05$), with coefficients positive for 3 and negative for 2 of the 5 transects. Among transects, the data set consisted of a mean 9.3 years for the period of record and a mean of 2.2 years for which cutthroat trout were not observed.

Comparisons of the status of WCT depicted in maps for the South Fork Clearwater River for ICBEMP (data acquired up to 1995) to that in the Inland West Assessment (data collected up to 1998) indicated that the number of subwatersheds with WCT status classified as strong increased based on the more-recent data (Russell, *in litt.* 1999). Overall, WCT in Red River of the South Fork Clearwater River are widespread but have a patchy distribution and are associated with undeveloped areas (CBBTTAT 1998c).

Lochsa River Watershed

Lochsa key watershed.--The key watershed consists of the entire Lochsa River watershed (IDFG, *in litt.* 1998a). The IDFG estimated that WCT are present in 48 tributaries, totaling 477 miles for the entire length of all tributaries in which cutthroat trout were estimated to be present in some portion, and absent or unknown in 3 (17 miles). Mean density of cutthroat trout was estimated at 207 fish/mile based on 299 sampling bouts conducted at transects during 1986-1993 (IDFG, *in litt.* 1998a). Using data generated by ICBEMP, the Service estimated that 49 subwatersheds compose the key watershed. Cutthroat trout presence is known in 47 subwatersheds and predicted in 2. Cutthroat trout status is predicted absent in 1, known depressed in 10 and predicted in 5, and known strong in 27 and predicted in 6. The Service identified records from 17 transects within the key watershed with data considered sufficient to evaluate trends in abundance of cutthroat trout (IDFG, *in litt.* 1998b). Spearman rank correlation coefficients were significant for 2 of the 17 transects ($P < 0.05$), with coefficients positive for both transects. Among transects, the data set consisted of a mean 8.8 years for the period of record and a mean of 1.6 years for which cutthroat trout were not observed.

Selway River Watershed

Middle Selway key watershed.--The key watershed consists of the Selway River watershed upstream to below the Running Creek drainage, excluding the Meadow Creek and Moose Creek drainages (IDFG, *in litt.* 1998a). The IDFG estimated that WCT are present in 13 tributaries, totaling 166 miles for the entire length of all tributaries in which cutthroat trout were estimated to be present in some portion, and absent or unknown in 8 (52 miles). Mean density of cutthroat trout was estimated at 218 fish/mile based on 10 sampling bouts conducted at transects during 1986-1993 (IDFG, *in litt.* 1998a). Using data generated by ICBEMP, the Service estimated that 21 subwatersheds compose the key watershed. Cutthroat trout presence is known in 19 subwatersheds and predicted in 1, and known absent in 1. Cutthroat trout status is known absent in 3 and predicted in 3, predicted depressed in 2, and predicted strong in 12. The Service identified records from 4 transects within the key watershed with data considered sufficient to evaluate trends in abundance of cutthroat trout (IDFG, *in litt.* 1998b). Spearman rank correlation coefficients were significant for 1 of the 4 transects ($P < 0.05$), with the coefficient positive for the significant transect. Among transects, the data set consisted of a mean 9.8 years for the period of record and a mean of 2.5 years for which cutthroat trout were not observed.

Meadow Creek key watershed.--The key watershed consists of the Selway River watershed upstream from the Lochsa River and including the Meadow Creek drainage (IDFG, *in litt.* 1998a). The IDFG estimated that WCT are present in 16 tributaries, totaling 167 miles for the entire length of all tributaries in which cutthroat trout were estimated to be present in some portion, and absent or unknown in 8 (45 miles). Mean density of cutthroat trout was estimated at 35 fish/mile based on 36 sampling bouts conducted at transects during 1986-1993 (IDFG, *in litt.* 1998a). Using data generated by ICBEMP, the Service estimated that 22 subwatersheds compose the key watershed. Cutthroat trout presence is known in 19 subwatersheds and predicted in 1, and known absent in 2. Cutthroat status is known absent in 5 and predicted in 2, known depressed in 3 and predicted in 7, and predicted strong in 5. The Service identified records from 2 transects within the key watershed with data considered sufficient to evaluate trends in abundance of cutthroat trout (IDFG, *in litt.* 1998b). Spearman rank correlation coefficients were not significant for the transects ($P > 0.05$). Among transects, the data set consisted of a mean 8.5 years for the period of record and a mean of 2.0 years for which cutthroat trout were not observed.

Moose Creek key watershed.--The key watershed consists of the entire Moose Creek drainage (IDFG, *in litt.* 1998a). The IDFG estimated that WCT are present in 17 tributaries, totaling 144 miles for the entire length of all tributaries in which cutthroat trout were estimated to be present in some portion, and absent or unknown in 2 (18 miles). Mean density of cutthroat trout was estimated at 248 fish/mile based on 17 sampling bouts conducted at transects during 1986-1993 (IDFG, *in litt.* 1998a). Using data generated by ICBEMP, the Service estimated that 16 subwatersheds compose the key watershed. Cutthroat trout presence is known in 11 subwatersheds and predicted in 4, and known absent in 1. Cutthroat trout status is known absent in 1, predicted depressed in 3, and predicted strong in 12. The Service identified records from 4 transects within the key watershed with data considered sufficient to evaluate trends in abundance of cutthroat trout (IDFG, *in litt.* 1998b). Spearman rank correlation coefficients were not significant for all transects ($P > 0.05$). Among transects, the data set consisted of a mean 8.8 years for the period of record and a mean of 2.8 years for which cutthroat trout were not observed.

Upper Selway key watershed.--The key watershed consists of the Selway River watershed upstream from and including the Running Creek drainage (IDFG, *in litt.* 1998a). The IDFG estimated that WCT are present in 17 tributaries, totaling 217 miles for the entire length of all tributaries in which cutthroat trout were estimated to be present in some portion, and absent or unknown in 17 (88 miles). Mean density of cutthroat trout was estimated at 259 fish/mile based on 124 sampling bouts conducted at transects during 1986-1993 (IDFG, *in litt.* 1998a). Using data generated by ICBEMP, the Service estimated that 21 subwatersheds compose the key watershed. Cutthroat trout presence is known in 20 subwatersheds and predicted in 1. Cutthroat trout status is know absence in 1 subwatershed and predicted in 1, known depressed in 1 and predicted in 1, and known strong in 16 and predicted in 1. The Service identified records from 10 transects within the key watershed with data considered sufficient to evaluate trends in abundance of cutthroat trout (IDFG, *in litt.* 1998b). Spearman rank correlation coefficient were significant for two transects ($P < 0.05$), with the coefficients positive for both transects. Among transects, the data set consisted of a mean 10.5 years for the period of record and a mean of 0.9 years for which cutthroat trout were not observed.

In summary, WCT in the Clearwater River drainage occur in about 265 tributaries or stream reaches that collectively encompass 2,903 linear miles of stream habitat, distributed among 5 watersheds (Appendix Table 2). The drainage includes 410 subwatersheds, for which WCT presence is either known or predicted in 283 and known or predicted absent in 110 subwatersheds. For subwatersheds identified with spawning and rearing habitat, status is known or predicted depressed for 138 and strong for 121. The Service identified 60 transects in 5 key watersheds with data considered sufficient to evaluate trends in WCT abundance. Spearman rank correlation coefficients were significant for 10 transects (8 with positive and 2 with negative coefficients). Although the Service did not further analyze data for the remaining 50 transects with nonsignificant coefficients, tests conducted on individual transects likely possess low statistical power (inferred from the mean number of years for which data are available in each key watershed, range 8.8-10.5, and mean number of years WCT were not observed, range 0.9-2.5). Therefore, no conclusions were based on these transects.

Salmon River Drainage

Status and Distribution

The Salmon River is a tributary to the Snake River and encompasses a large area in central Idaho. The drainage consists of 14,000 square miles (8,960,000 acres) (Streamnet–available data for accounting unit: 170602). Major tributaries in the Salmon River drainage include the Little Salmon River, South Fork Salmon River, Middle Fork Salmon River, and upper mainstem Salmon River including the Stanley basin.

The drainage encompasses portions of six National Forests: the Nez Perce National Forest (2,218,040 total acres for the forest), Bitterroot National Forest (464,108 acres in Idaho), Payette National Forest (2,323,226 total acres for the forest), Salmon-Challis National Forest (4,236,638 total acres for the forest), and the Boise National Forest (2,619,366 total acres for the forest). The Frank Church-River of No Return Wilderness Area, the largest designated wilderness in the continental U.S. encompasses 2,300,000 acres in the Salmon River drainage. The Sawtooth National Wilderness Area and portions of the Selway-Bitterroot National Wilderness Area are also in the drainage.

Westslope cutthroat trout are widely distributed in the Salmon River drainage and groups of fish are thought to be connected and genetic mixing may occur (IDFG, *in litt.* 1998a). Both resident and migratory fish occur in the Salmon River drainage (R. Thurow, USFS, *pers. comm.* 1998). Based on existing information and queries to personnel, the IDFG estimated that 362 tributaries (3,981 total miles for entire tributaries where cutthroat are found in some portion) within the Salmon River drainage contain WCT (IDFG, *in litt.* 1998a). Although the genetic composition of cutthroat trout in the drainage is not known, a study has been initiated to evaluate potential interspecific and conspecific introgression (Mayes, *pers. comm.* 1998).

The IDFG identified 28 key watersheds to summarize distribution and abundance information for WCT in the Salmon River drainage (IDFG, *in litt.* 1998a). This organization is maintained in the following review of fish status. Additional information was used from reports, letters, data files, and personal communications. Data generated by the Interior Columbia Basin Ecosystem Management Project (ICBEMP) for current status of salmonids (key salmonid current-status database [i.e. CRBFISH6]) was used to describe known and predicted presence and status of WCT for HUCs (i.e. subwatersheds) in each key watershed. Known and predicted status was identified for subwatersheds containing spawning and rearing habitats, whereas status was considered “absent” for subwatersheds where fish or spawning and rearing habitats do not occur. Criteria for status determination are described in Lee *et al.* (1996). The 1986-1996 General Parr Monitoring data file (IDFG, *in litt.* 1998b) contains fish-abundance information for numerous transects at which snorkel surveys are conducted to monitor abundance of juvenile anadromous fish. Information on habitat and resident fish species are also collected. The Service identified individual transects with at least seven years of survey data and WCT observed in at least five of the years in the period of record. A Spearman Rank Correlation Coefficient was then calculated between WCT density (fish/m^2) and year to describe potential trends in fish abundance.

Lower Salmon River Watershed

Lower Salmon key watershed.–The key watershed consists of the Salmon River drainage upstream from the mouth to Whitebird Creek (IDFG, *in litt.* 1998a). The IDFG estimated that WCT are present in 3 tributaries, totaling 77 miles for the entire length of all tributaries in which cutthroat trout were estimated to be present in some portion, and absent or unknown in 14 (112 miles). Using data generated by ICBEMP, the Service estimated that 22 subwatersheds compose the key watershed. Cutthroat trout presence is known absent in 17 subwatersheds and predicted in 5. Cutthroat status is known absent in 17 and predicted in 5.

Whitebird-Slate-French key watershed.–The key watershed consists of the Salmon River drainage upstream from, and including, Whitebird Creek, to, but excluding, the Wind River (IDFG, *in litt.* 1998a). The IDFG estimated that WCT are present in 9 tributaries, totaling 123 miles for the entire length of all tributaries in which cutthroat trout were estimated to be present in some portion, and absent or unknown in 33 (227 miles). Mean density of cutthroat trout was estimated at 2 fish/mile based on 41 sampling bouts conducted at transects during 1986-1993 (IDFG, *in litt.* 1998a). Using data generated by ICBEMP, the Service estimated that 27 subwatersheds compose the key watershed. Cutthroat trout presence is known in 8 subwatersheds and predicted in 2, and known absent in 14 and predicted in 3. Cutthroat status is known absent in 14 subwatersheds and predicted in 4, predicted depressed in 8, and predicted strong in 1.

Wind River-Crooked Creek key watershed.–The key watershed consists of the Salmon River drainage upstream from, and including, Wind River to, but excluding, South Fork Salmon River (IDFG, *in litt.* 1998a). The IDFG estimated that WCT are present in 4 tributaries, totaling 74 miles for the entire length of all tributaries in which cutthroat trout were estimated to be present in some portion, and absent or unknown in 13 (108 miles). Mean density of cutthroat trout was estimated at 117 fish/mile based on 10 sampling bouts conducted at transects during 1986-1993 (IDFG, *in litt.* 1998a). Using data generated by ICBEMP, the Service estimated that 25 subwatersheds compose the key watershed. Cutthroat trout presence is known in 9 subwatersheds and predicted in 6, and known absent in 10. Cutthroat status is known absent in 12 subwatersheds and predicted in 2, known depressed in 1 and predicted depressed in 5, and predicted strong in 5. The Service identified records from one transect within the key watershed with data considered sufficient to evaluate trends in abundance of cutthroat trout. Spearman rank correlation coefficient was significant ($P < 0.05$), with the coefficient positive for the transect. The data set consisted of 8 years for the period of record and 2 years for which cutthroat trout were not observed.

Little Salmon River Watershed

Little Salmon key watershed.–The key watershed consists of the entire little Salmon River drainage (IDFG, *in litt.* 1998a). The IDFG estimated that WCT are present in 19 tributaries, totaling 214 miles for the entire length of all tributaries in which cutthroat trout were estimated to be present in some portion, and absent or unknown in 1 (35 miles). Mean density of cutthroat trout was estimated at 68 fish/mile based on 113 sampling bouts conducted at transects during 1986-1993 (IDFG, *in litt.* 1998a). Using data generated by ICBEMP, the Service estimated that 18 subwatersheds compose the key watershed. Cutthroat trout presence is known in 2 subwatersheds and predicted in 6, and known absent in 5 and predicted in 5. Cutthroat status is known absent in 5 subwatersheds and predicted in 4, and known depressed in 2 and predicted depressed in 7. The Service identified records from one transect within the key watershed with data considered sufficient to evaluate trends in abundance of cutthroat trout. Spearman rank correlation coefficient was not significant ($P > 0.05$). The data set consisted of 9 years for the period of record and 4 years for which cutthroat trout were not observed.

Middle Salmon River Watershed

Fivemile-Sabe key watershed.–The key watershed consists of the Salmon River drainage upstream from, and excluding, South Fork Salmon River to, but excluding, Chamberlain Creek (IDFG, *in litt.* 1998a). The IDFG estimated that WCT are present in 8 tributaries, totaling 112 miles for the entire length of all tributaries in which cutthroat trout were estimated to be present in some portion, and absent or unknown in 20 (125 miles). Using data generated by ICBEMP, the Service estimated that 31 subwatersheds compose the key watershed. Cutthroat trout presence is known in 19 subwatersheds and predicted in 8, and known absent in 4. Cutthroat status is known absent in 8 subwatersheds and predicted in 8, known depressed in 3 and predicted depressed in 3, and known strong in 5 and predicted in 4. The Service identified records from two transects within the key watershed with data considered sufficient to evaluate trends in abundance of cutthroat trout. Spearman rank correlation coefficients were significant ($P < 0.05$), with the coefficients positive for both transects. Among transects, the data set consisted of a mean 9.0 years for the period of record and a mean 2.0 years for which cutthroat trout were not observed.

Chamberlain key watershed.–The key watershed consists of the entire Chamberlain Creek drainage (IDFG, *in litt.* 1998a). The IDFG estimated that WCT are present in 2 tributaries, totaling 36 miles for the entire length of all tributaries in which cutthroat trout were estimated to be present in some portion, and absent or unknown in 20 (68 miles). Mean density of cutthroat trout was estimated at 23 fish/mile based on 57 sampling bouts conducted at transects during 1986-1993 (IDFG, *in litt.* 1998a). Using data generated by ICBEMP, the Service estimated that 10 subwatersheds compose the key watershed. Cutthroat trout presence is known in 2 subwatersheds, and known absent in 8. Cutthroat status is known absent in 4 subwatersheds and predicted in 4, and known depressed in 2. The Service identified records from two transects within the key watershed with data considered sufficient to evaluate trends in abundance of cutthroat trout. Spearman rank correlation coefficients were not significant for the transects ($P > 0.05$). Among transects, the data set consisted of a mean 8.0 years for the period of record and a mean 3.0 years for which cutthroat trout were not observed.

Horse Creek key watershed.–The key watershed consists of the Salmon River drainage upstream from, but excluding, the Chamberlain Creek drainage to the Owl Creek, but excluding Owl Creek and Middle Fork Salmon River watersheds (IDFG, *in litt.* 1998a). The IDFG estimated that WCT are present in 8 tributaries, totaling 82 miles for the entire length of all tributaries in which cutthroat trout were estimated to be present in some portion, and absent or unknown in 11 (76 miles). Mean density of cutthroat trout was estimated at 120 fish/mile based on 14 sampling bouts conducted at transects during 1986-1993 (IDFG, *in litt.* 1998a). Using data generated by ICBEMP, the Service estimated that 18 subwatersheds compose the key watershed. Cutthroat trout presence is known in 12 subwatersheds, and known absent in 6. Cutthroat status is known absent in 10 subwatersheds and predicted in 1, and known depressed in 6 and predicted in 1. The Service identified records from two transects within the key watershed with data considered sufficient to evaluate trends in abundance of cutthroat trout. Spearman rank correlation coefficients were not significant for the transects ($P > 0.05$). Among transects, the data set consisted of a mean 9.0 years for the period of record and a mean of 2.0 years for which cutthroat trout were not observed.

Owl Creek key watershed.–The key watershed consists of the Salmon River drainage upstream from, and including, the Owl Creek drainage to, but excluding, the North Fork Salmon River (IDFG, *in litt.* 1998a). The IDFG estimated that WCT are present in 11 tributaries, totaling 117 miles for the entire length of all tributaries in which cutthroat trout were estimated to be present in some portion, and absent or unknown in 2 (12 miles). Mean density of cutthroat trout was estimated at 381 fish/mile based on 7 sampling bouts conducted at transects during 1986-1993 (IDFG, *in litt.* 1998a). Using data generated by ICBEMP, the Service estimated that 15 subwatersheds compose the key watershed. Cutthroat trout presence is known in 11 subwatersheds and predicted in 4. Cutthroat status is predicted absent in 1 subwatershed, predicted depressed in 12, and predicted strong in 2.

Panther Creek key watershed.–The key watershed consists of the entire Panther Creek drainage (IDFG, *in litt.* 1998a). The IDFG estimated that WCT are present in 16 tributaries, totaling 188 miles for the entire length of all tributaries in which cutthroat trout were estimated to be present in some portion, and absent or unknown in 1 (5 miles). Mean density of cutthroat trout was estimated at 13 fish/mile based on 53 sampling bouts conducted at transects during 1986-1993 (IDFG, *in litt.* 1998a). Using data generated by ICBEMP, the Service estimated that 23 subwatersheds compose the key watershed. Cutthroat trout presence is known in 22 subwatersheds and predicted in 1. Cutthroat status is known depressed in 9 subwatersheds and predicted in 10, and predicted strong in 4.

North Fork Salmon key watershed.–The key watershed consists of the entire North Fork Salmon River drainage (IDFG, *in litt.* 1998a). The IDFG estimated that WCT are present in 9 tributaries, totaling 82 miles for the entire length of all tributaries in which cutthroat trout were estimated to be present in some portion, and absent or unknown in 1 (5 miles). Mean density of cutthroat trout was estimated at 43 fish/mile based on 12 sampling bouts conducted at transects during 1986-1993 (IDFG, *in litt.* 1998a). Using data generated by ICBEMP, the Service estimated that 10 subwatersheds compose the key watershed. Cutthroat trout presence is known in 10 subwatersheds. Cutthroat status is known depressed in 2 subwatersheds and predicted depressed in 7, and predicted strong in 1. The Service identified records from one transect within the key watershed with data considered sufficient to evaluate trends in abundance of cutthroat trout.

Spearman rank correlation coefficient was not significant for the transect ($P > 0.05$). The data set consisted of 11 years for the period of record and 1 year for which cutthroat trout were not observed.

Carmen Creek key watershed.–The key watershed consists of the Salmon River drainage upstream from, but excluding, the North Fork Salmon River to, but excluding, Williams Creek (IDFG, *in litt.* 1998a). The IDFG estimated that WCT are present in 5 tributaries, totaling 63 miles for the entire length of all tributaries in which cutthroat trout were estimated to be present in some portion, and absent or unknown in 3 (19 miles). Using data generated by ICBEMP, the Service estimated that 11 subwatersheds compose the key watershed. Cutthroat trout presence is known in 8 subwatersheds and predicted in 1, and known absent in 2. Cutthroat status is known absent in 2 subwatersheds, and known depressed in 1 and predicted in 8.

South Fork Salmon River Watershed

Lower South Fork Salmon key watershed.–The key watershed consists of the South Fork Salmon River watershed upstream, but excluding, East Fork South fork Salmon River, and excluding the Secesh River (IDFG, *in litt.* 1998a). The IDFG estimated that WCT are present in 11 tributaries, totaling 102 miles for the entire length of all tributaries in which cutthroat trout were estimated to be present in some portion, and absent or unknown in 5 (25 miles). Mean density of cutthroat trout was estimated at 11 fish/mile based on 17 sampling bouts conducted at transects during 1986-1993 (IDFG, *in litt.* 1998a). Using data generated by ICBEMP, the Service estimated that 12 subwatersheds compose the key watershed. Cutthroat trout presence is known in 11 subwatersheds and known absent in 1. Cutthroat status is known absent in 6 subwatersheds, known depressed in 3, and known strong in 1 and predicted in 2.

Secesh key watershed.–The key watershed consists of the entire Secesh River drainage (IDFG, *in litt.* 1998a). The IDFG estimated that WCT are present in 8 tributaries, totaling 76 miles for the entire length of all tributaries in which cutthroat trout were estimated to be present in some portion, and absent or unknown in 5 (20 miles). Mean density of cutthroat trout was estimated at 37 fish/mile based on 55 sampling bouts conducted at transects during 1986-1993 (IDFG, *in litt.* 1998a). Using data generated by ICBEMP, the Service estimated that 10 subwatersheds compose the key watershed. Cutthroat trout presence is known in 10 subwatersheds. Cutthroat status is known depressed in 8 subwatersheds and predicted in 1, and known strong in 1.

Johnson Creek key watershed.–The key watershed consists of the entire East Fork South Fork Salmon River drainage (IDFG, *in litt.* 1998a). The IDFG estimated that WCT are present in 15 tributaries, totaling 161 miles for the entire length of all tributaries in which cutthroat trout were estimated to be present in some portion, and absent or unknown in 5 (28 miles). Mean density of cutthroat trout was estimated at 27 fish/mile based on 112 sampling bouts conducted at transects during 1986-1993 (IDFG, *in litt.* 1998a). Using data generated by ICBEMP, the Service estimated that 19 subwatersheds compose the key watershed. Cutthroat trout presence is known in 10 subwatersheds and predicted in 4, and known absent in 5. Cutthroat status is known absent in 5 subwatersheds, and known depressed in 10 and predicted in 2. The Service identified records from two transects within the key watershed with data considered sufficient to evaluate trends in abundance of cutthroat trout. Spearman rank correlation coefficients were significant for one transect ($P < 0.05$), with the coefficient positive for the transect. Among transects, the data set consisted of a mean 11.0 years for the period of record and a mean 4.5 years for which cutthroat trout were not observed.

Upper South Fork Salmon key watershed.–The key watershed consists of the South Fork Salmon River watershed upstream from, but excluding, the East Fork South Fork Salmon River (IDFG, *in litt.* 1998a). The IDFG estimated that WCT are present in 14 tributaries, totaling 131 miles for the entire length of all tributaries in which cutthroat trout were estimated to be present in some portion, and absent or unknown in 9 (40 miles). Mean density of cutthroat trout was estimated at 49 fish/mile based on 64 sampling bouts conducted at transects during 1986-1993 (IDFG, *in litt.* 1998a). Using data generated by ICBEMP, the Service estimated that 17 subwatersheds compose the key watershed. Cutthroat trout presence is known in 13 subwatersheds and predicted in 4. Cutthroat status is known depressed in 12 subwatersheds and predicted in 3, and known strong in 1 and predicted in 1. The Service identified records from one transect within the key watershed with data considered sufficient to evaluate trends in abundance of cutthroat trout. Spearman rank correlation coefficient was not significant for the transect ($P > 0.05$). The data set consisted of 11 years for period of record and 4 years for which cutthroat trout were not observed.

Middle Fork Salmon River Watershed

Lower Middle Fork Salmon key watershed.–The key watershed consists of the Middle Fork Salmon River watershed upstream, but excluding, Loon Creek (IDFG, *in litt.* 1998a). The IDFG estimated that WCT are present in 21 tributaries, totaling 275 miles for the entire length of all tributaries in which cutthroat trout were estimated to be present in some portion, and absent or unknown in 13 (88 miles). Mean density of cutthroat trout was estimated at 92 fish/mile based on 105 sampling bouts conducted at transects during 1986-1993 (IDFG, *in litt.* 1998a). Using data generated by ICBEMP, the Service estimated that 37 subwatersheds compose the key watershed. Cutthroat trout presence is known in 23 subwatersheds and predicted in 13, and know absent in 1. Cutthroat status is known absent in 7 and predicted in 2, known depressed in 6 and predicted in 3, and known strong in 1 and predicted in 18. The Service identified records from three transects within the key watershed with data considered sufficient to evaluate trends in abundance of cutthroat trout. Spearman rank correlation coefficients were not significant for the transects ($P > 0.05$). Among transects, the data set consisted of a mean 9.0 years for the period of record and a mean 1.7 years for which cutthroat trout were not observed.

Big Creek key watershed.–The key watershed consists of the entire Big Creek drainage (IDFG, *in litt.* 1998a). The IDFG estimated that WCT are present in 12 tributaries, totaling 171 miles for the entire length of all tributaries in which cutthroat trout were estimated to be present in some portion, and absent or unknown in 12 (64 miles). Mean density of cutthroat trout was estimated at 227 fish/mile based on 84 sampling bouts conducted at transects during 1986-1993 (IDFG, *in litt.* 1998a). Using data generated by ICBEMP, the Service estimated that 24 subwatersheds compose the key watershed. Cutthroat trout presence is known in 22 subwatersheds and predicted in 2. Cutthroat status is predicted absent in 1 subwatershed, and known strong in 16 and predicted in 7. The Service identified records from six transects within the key watershed with data considered sufficient to evaluate trends in abundance of cutthroat trout. Spearman rank correlation coefficients were not significant for the transects ($P > 0.05$). Among transects, the data set consisted of a mean 8.3 years for the period of record and a mean 2.2 years for which cutthroat trout were not observed.

Loon Creek key watershed.–The key watershed consists of the entire Loon Creek drainage (IDFG, *in litt.* 1998a). The IDFG estimated that WCT are present in 9 tributaries, totaling 99 miles for the entire length of all tributaries in which cutthroat trout were estimated to be present in some portion, and absent or unknown in 6 (29 miles). Mean density of cutthroat trout was estimated at 188 fish/mile based on 24 sampling bouts conducted at transects during 1986-1993 (IDFG, *in litt.* 1998a). Using data generated by ICBEMP, the Service estimated that 17 subwatersheds compose the key watershed. Cutthroat trout presence is known in 17 subwatersheds. Cutthroat status is known depressed in 2, and known strong in 12 and predicted in 3. The Service identified records from four transects within the key watershed with data considered sufficient to evaluate trends in abundance of cutthroat trout. Spearman rank correlation coefficients were not significant for any transect ($P > 0.05$). Among transects, the data set consisted of a mean 8.3 years for the period of record and a mean 3.0 years for which cutthroat trout were not observed.

Marble Creek key watershed.–The key watershed consists of the entire Marble Creek drainage (IDFG, *in litt.* 1998a). The IDFG estimated that WCT are present in 11 tributaries, totaling 94 miles for the entire length of all tributaries in which cutthroat trout were estimated to be present in some portion. Mean density of cutthroat trout was estimated at 250 fish/mile based on 60 sampling bouts conducted at transects during 1986-1993 (IDFG, *in litt.* 1998a). Using data generated by ICBEMP, the Service estimated that 6 subwatersheds compose the key watershed. Cutthroat trout presence is known in 6 subwatersheds. Cutthroat status is known strong in 5 subwatersheds and predicted in 1. The Service identified records from two transects within the key watershed with data considered sufficient to evaluate trends in abundance of cutthroat trout. Spearman rank correlation coefficients were not significant for any transect ($P > 0.05$). Among transects, the data set consisted of a mean 10.0 years for the period of record and a mean 0.5 years for which cutthroat trout were not observed.

Upper Middle Fork Salmon key watershed.–The key watershed consists of the Middle Fork Salmon River watershed upstream from, and including, Indian Creek to, but excluding, Bear Valley Creek and Marsh Creek (IDFG, *in litt.* 1998a). The IDFG estimated that WCT are present in 27 tributaries, totaling 215 miles for the entire length of all tributaries in which cutthroat trout were estimated to be present in some portion, and absent or unknown in 1 (5 miles). Mean density of cutthroat trout was estimated at 180 fish/mile based on 68 sampling bouts conducted at transects during 1986-1993 (IDFG, *in litt.* 1998a). Using data generated by ICBEMP, the Service estimated that 28 subwatersheds compose the key watershed. Cutthroat trout presence is known in 27 subwatersheds and predicted in 1. Cutthroat status is known absent in 5 subwatersheds and predicted in 1, known depressed in 1, and known strong in 19 and predicted in 2. The Service identified records from four transects within the key watershed with data considered sufficient to evaluate trends in abundance of cutthroat trout. Spearman rank correlation coefficients were not significant for the transects ($P > 0.05$). Among transects, the data set consisted of a mean 7.0 years for the period of record and a mean 1.0 years for which cutthroat trout were not observed.

Bear Valley-Marsh key watershed.–The key watershed consists of the Middle Fork Salmon River watershed upstream to, and including, the Bear Valley Creek and Marsh Creek drainages (IDFG, *in litt.* 1998a). The IDFG estimated that WCT are present in 18 tributaries, totaling 163 miles for the entire length of all tributaries in which cutthroat trout were estimated to be present in some portion, and absent or unknown in 13 (56 miles). Mean density of cutthroat trout was estimated at 21 fish/mile based on 181 sampling bouts conducted at transects during 1986-1993 (IDFG, *in litt.* 1998a). Using data generated by ICBEMP, the Service estimated that 13 subwatersheds compose the key watershed. Cutthroat trout presence is known in 13 subwatersheds. Cutthroat status is known depressed in 7 subwatersheds and known strong in 6. The Service identified records from five transects within the key watershed with data considered sufficient to evaluate trends in abundance of cutthroat trout. Spearman rank correlation coefficients were significant for one transect ($P < 0.05$), with the coefficient negative for the transect. Among transects, the data set consisted of a mean 10.4 years for the period of record and a mean 2.0 years for which cutthroat trout were not observed.

Upper Salmon River Watershed

Hat-Iron key watershed.–The key watershed consists of the Salmon River drainage upstream from, but excluding, Williams Creek to, but excluding, Morgan Creek (IDFG, *in litt.* 1998a). The IDFG estimated that WCT are present in 11 tributaries, totaling 125 miles for the entire length of all tributaries in which cutthroat trout were estimated to be present in some portion, and absent or unknown in 5 (29 miles). Using data generated by ICBEMP, the Service estimated that 20 subwatersheds compose the key watershed. Cutthroat trout presence is known in 12 subwatersheds and predicted in 6, and known absent in 2. Cutthroat status is known absent in 2 subwatersheds, and known depressed in 1 and predicted depressed in 17.

Thompson-Bayhorse key watershed.–The key watershed consists of the Salmon River drainage upstream, and including, Morgan Creek to, but excluding, Yankee Fork Salmon River, and excluding the East Fork Salmon river and Warm Springs Creek drainages (IDFG, *in litt.* 1998a). The IDFG estimated that WCT are present in 23 tributaries, totaling 264 miles for the entire length of all tributaries in which cutthroat trout were estimated to be present in some portion, and absent or unknown in 5 (27 miles). Mean density of cutthroat trout was estimated at 1 fish/mile based on 33 sampling bouts conducted at transects during 1986-1993 (IDFG, *in litt.* 1998a). Using data generated by ICBEMP, the Service estimated that 37 subwatersheds compose the key watershed. Cutthroat trout presence is known in 34 subwatersheds and predicted in 3. Cutthroat status is known depressed in 14 subwatersheds and predicted in 15, and known strong in 8.

East Fork Salmon key watershed.–The key watershed consists of the entire East Fork Salmon River drainage (IDFG, *in litt.* 1998a). The IDFG estimated that WCT are present in 14 tributaries, totaling 135 miles for the entire length of all tributaries in which cutthroat trout were estimated to be present in some portion, and absent or unknown in 11 (85 miles). Mean density of cutthroat trout was estimated at 9 fish/mile based on 22 sampling bouts conducted at transects during 1986-1993 (IDFG, *in litt.* 1998a). Using data generated by ICBEMP, the Service estimated that 19 subwatersheds compose the key watershed. Cutthroat trout presence is known in 8 subwatersheds and predicted in 7, and known absent in 4. Cutthroat status is known absent in 4 subwatersheds, known depressed in 5 and predicted in 6, and predicted strong in 4.

Yankee Fork-Warm Springs key watershed.–The key watershed consists of the entire Yankee Fork and Warm Springs drainages (IDFG, *in litt.* 1998a). The IDFG estimated that WCT are present in 15 tributaries, totaling 124 miles for the entire length of all tributaries in which cutthroat trout were estimated to be present in some portion. Mean density of cutthroat trout was estimated at 0 fish/mile based on 1 sampling bout conducted at transects during 1986-1993 (IDFG, *in litt.* 1998a). Using data generated by ICBEMP, the Service estimated that 13 subwatersheds compose the key watershed. Cutthroat trout presence is known in 13 subwatersheds. Cutthroat status is predicted absent in 1 subwatershed, known depressed in 5 and predicted in 4, and predicted strong in 3.

Upper Salmon key watershed.–The key watershed consists of the entire Salmon River drainage upstream from, but excluding, the Yankee Fork drainage (IDFG, *in litt.* 1998a). The IDFG estimated that WCT are present in 34 tributaries, totaling 306 miles for the entire length of all tributaries in which cutthroat trout were estimated to be present in some portion, and absent or unknown in 2 (11 miles). Mean density of cutthroat trout was estimated at 7 fish/mile based on 358 sampling bouts conducted at transects during 1986-1993 (IDFG, *in litt.* 1998a). Using data generated by ICBEMP, the Service estimated that 26 subwatersheds compose the key watershed. Cutthroat trout presence is known in 18 subwatersheds and predicted in 3, and known absent in 5. Cutthroat status is known absent in 3 subwatersheds and predicted in 4, known depressed in 9 and predicted in 7, and known strong in 1 and predicted in 2.

Lemhi River Watershed

Lemhi key watershed.–The key watershed consists of the entire Lemhi River watershed (IDFG, *in litt.* 1998a). The IDFG estimated that WCT are present in 20 tributaries, totaling 265 miles for the entire length of all tributaries in which cutthroat trout were estimated to be present in some portion, and absent or unknown in 25 (202 miles). Mean density of cutthroat trout was estimated at 3 fish/mile based on 34 sampling bouts conducted at transects during 1986-1993 (IDFG, *in litt.* 1998a). Using data generated by ICBEMP, the Service estimated that 46 subwatersheds compose the key watershed. Cutthroat trout presence is known in 41 subwatersheds and predicted in 5. Cutthroat status is predicted absent in 8 subwatersheds, predicted depressed in 37, and predicted strong in 1.

Pahsimeroi River Watershed

Pahsimeroi key watershed.–The key watershed consists of the entire Pahsimeroi River watershed (IDFG, *in litt.* 1998a). The IDFG estimated that WCT are present in 13 tributaries, totaling 204 miles for the entire length of all tributaries in which cutthroat trout were estimated to be present in some portion, and absent or unknown in 10 (69 miles). Mean density of cutthroat trout was estimated at 26 fish/mile based on 12 sampling bouts conducted at transects during 1986-1993 (IDFG, *in litt.* 1998a). Using data generated by ICBEMP, the Service estimated that 26 subwatersheds compose the key watershed. Cutthroat trout presence is known in 18 subwatersheds and predicted in 5, and known absent in 3. Cutthroat status is known absent in 1 subwatershed, predicted depressed in 14, and known strong in 5 and predicted in 6.

In summary, WCT in the Salmon River drainage occur in about 370 tributaries or stream reaches that collectively encompass 4,078 linear miles of stream habitat, distributed among 8 watersheds (Appendix Table 2). The drainage includes 580 subwatersheds, for which WCT presence is either known or predicted in 480 and known or predicted absent in 100 subwatersheds. For subwatersheds identified with spawning and rearing habitat, status is known or predicted depressed for 266 and strong for 148. The Service identified 36 transects in 14 key watersheds with data considered sufficient to evaluate trends in WCT abundance. Spearman rank correlation coefficients were significant for 5 transects (4 with positive and 1 with negative coefficients). Although the Service did not further analyze data for the remaining 31 transects with nonsignificant coefficients, tests conducted on individual transects likely possess low statistical power (inferred from the mean number of years for which data are available in each key watershed, range 7.0-11.0 yr, and mean number of years WCT were not observed, range 0.5-4.5 yr). Therefore, no conclusions were based on these transects.

John Day River Drainage

Status and Distribution

The John Day River drainage encompasses 8,000 square miles of an extensive interior plateau lying between the Cascade Range and the Blue Mountains, north-central and north-eastern Oregon. The John Day drainage is the third-largest Oregon drainage east of the Cascade Range. Additionally, it is the largest undammed Columbia River tributary within Oregon. Elevations in the drainage range from about 200 feet at the John Day River's confluence with the Columbia River, to over 9,000 feet in headwaters within the Strawberry Mountains. The John Day River has four main branches, the South Fork, the mainstem, the Middle Fork, and the North Fork. Two branches, the North Fork and mainstem, contain WCT. The North Fork originates in the Elkhorn Mountains and flows 112 miles from its headwaters until it confluences with the mainstem at Kimberly. The mainstem originates in the Strawberry Mountains and flows 284 miles before it empties into the Columbia River at RM 218.

The upper portions of the mainstem and North Fork John Day rivers are dominated by forest and meadow habitat, while the lower river valleys are primarily pasture, rangeland, and hay meadows. The mainstem and North Fork valleys and foothills are generally privately owned, while the upper forested areas are a mix of Federal (Malheur and Umatilla National Forests and Prineville BLM district) and private ownerships. Primary land activities are livestock and timber production, on both public and private land; other activities include mining and recreation. The Strawberry Wilderness of the Malheur National Forest comprises 68,700 acres in the upper mainstem watershed.

Historic WCT distribution is anecdotal at best; no tributaries currently absent of WCT are known to have supported these fish in the past (Gray, *in litt.* 1998; ICBEMP 1996). However, Kostow (1995) reported "suspected" historical WCT habitat has been reduced 59 %, based on assumptions (no substantive evidence) that WCT had a wider historical distribution in the North Fork and Middle Fork. The distribution of WCT in various branches of the John Day River system may have been much further downstream than at present; descriptions of the mainstem river valley by explorers and trappers such as Peter Skene Ogden indicate conditions suitable to these fish prior to European settlement of the West. Likewise, distribution of year-round resident fish in the valley and foothill reaches of tributaries may have been reduced from the historic distribution due to habitat alteration (Gray, *in litt.* 1998).

Currently, no major physical barriers to WCT movement and migration occur in the various John Day River branches. However, numerous agricultural diversion dams, many with insufficient fish-passage features, occur throughout main rivers and tributaries of the John Day drainage, and various WCT stocks are often isolated from one another by warm water and low stream flow during warm months (Kostow 1995). Gray (*in litt.* 1998) reported that no occupied tributaries, except for Strawberry Creek, had physical passage barriers to WCT. Gray (*in litt.* 1998) also reported modified habitat conditions and geographic distance between occupied stream reaches as further WCT isolating mechanisms. Land ownership of currently occupied resident WCT habitat in the upper John Day River includes 36 % (71 miles) private and 64 % (126 miles) Federal (Malheur National Forest) ownership, and currently occupied seasonal WCT habitat in the upper John Day River includes 100 % (94 miles) private ownership (based on map by Pence [*in litt.* 1998]). Land ownership of currently occupied WCT habitat in the North Fork John Day includes 2 % (0.5 miles) private and 98 % (23.0 miles) Federal Umatilla National Forest) ownership (based on Umatilla National Forest map) (Table 1).

The John Day drainage consists of two major watersheds with WCT occupation, the upper mainstem John Day and the upper North Fork John Day rivers. Resident WCT are the dominant life-history form present; however, recent research has indicated larger, possibly fluvial life forms are present in the mainstem John Day River (Gray, *in litt.* 1998; M. Gray, ODFW, *pers. comm.* 1999). Westslope cutthroat trout distribution overlaps with resident redband trout, with WCT generally being found in reaches with higher gradient, cooler temperatures, and more numerous large woody debris (Gray, *in litt.* 1998). Westslope cutthroat trout distribution in the John Day drainage also overlaps with bull trout, steelhead trout, and chinook salmon. Hybridization and introgression between WCT and redband trout has been noted in areas where overlapping distribution occurs (Kostow, *in litt.* 1998; Gray, *in litt.* 1998).

Upper John Day River Watershed

Kostow (*in litt.* 1995), Gray (*in litt.* 1998), and Hemmingsen and Gray (1999 draft) reported WCT distribution upstream from the mainstem John Day River. Malheur National Forest (Pence, *in litt.* 1998) provided an updated WCT distribution map that contains additional WCT records, including presumed seasonal habitat distribution. Based on the Pence (*in litt.* 1998) distribution map, resident WCT currently occupy: 1) Fields Creek and tributaries; 2) Moon Creek; 3) McClellan Creek; 4) Ingle Creek; 5) Laycock Creek; 6) Canyon Creek and tributaries; 7) Little Pine Creek; 8) Dog Creek; 9) Pine Creek; 10) Indian Creek and tributaries; 11) Strawberry Creek and tributaries; 12) Upper John Day River and tributaries (including major tributaries: Graham, Call, Roberts, Reynolds, Deardorff, and Rail creeks); 13) Dixie Creek and tributary; 14) Bear Creek; 15) Beech Creek and tributaries; 16) Birch Creek; and 17) Belshaw Creek. Portions of a total of 64 rivers, streams, and tributaries are occupied either year-round (approximately 197 miles/315 km) or seasonally by WCT (additional 94 miles/152 km) (calculated from map by Pence, *in litt.* 1998). Seasonal WCT habitat includes the lower portions of most of these occupied tributaries, an additional tributary without resident WCT (Widows Creek) and the mainstem John Day River downstream to Widows Creek (between the towns of Dayville and Mount Vernon). These “seasonal” zones appear to be habitat for wandering or migratory WCT (Gray, ODFW, *pers. comm.* 1999). Hemmingsen and Gray (1999 draft) conservatively estimate WCT occupying at least 355 km of 41 streams.

Data generated by the ICBEMP (1996) predicts that 33 subwatersheds (i.e. HUCs) occur in the mainstem John Day River within the current range of WCT. Westslope cutthroat trout presence is known within 17 subwatersheds, 13 subwatersheds are known to not contain WCT, and the ICBEMP model predicts an additional two subwatersheds contain WCT, while the model predicts one additional subwatershed does not contain WCT (ICBEMP 1996). All occupied subwatersheds in the mainstem John Day are predicted or known to have “depressed” WCT populations.

Resident WCT distribution overlaps with resident bull trout habitat in Indian Creek, the upper mainstem John Day River and the tributaries to the upper mainstem John Day River (Roberts, Call, Rail, Reynolds, and Deardorff creeks) (47.5 miles total), and seasonal WCT distribution overlaps with migratory bull trout habitat throughout the upper mainstem John Day River downstream to the town of John Day (approximately 42 additional miles). Cursory analysis indicates bull trout and WCT occur sympatrically in the mainstem John Day River and its tributaries, wherever bull trout are found (overlap between these two species, for resident and migratory forms, is approximately 90 miles). Westslope cutthroat trout are substantially more widely distributed than bull trout in the upper mainstem John Day River.

Table 1.--Mileages of WCT Occupancy, Land Ownership - Upper John Day River (from map-wheel calculations using Pence [*in litt.* 1998] map).

Resident - Private Lands	71 miles
Resident - Public Lands	126 miles
Resident - Total	197 miles
Seasonal - Private Lands	94 miles
Seasonal - Public Lands	0 miles
Seasonal - Total	94 miles
Combined Mileage	291 miles

Resident WCT are the one known life-history form found in the upper John Day River watershed. Resident fish occur in upper, forested reaches of the above streams. Larger, possibly migratory forms have only been found in the well-connected, upper headwaters area (where Call, Rail, Reynolds, Roberts, Deardorff, and Graham creeks confluence with the mainstem John Day River), and in mainstem riverine habitats downstream in broad river valleys (Gray, *in litt.* 1998). Radiotelemetry investigations have also identified larger WCT utilizing “seasonal” habitats (Gray, *in litt.* 1998; Gray, ODFW, *pers. comm.* 1999), as noted above. Resident forms are often isolated in single streams, separated from other stocks by distance and habitat conditions. However, numerous stocks in the Upper John Day River exhibit occupation of multiple, connected tributary streams that are, as a group, isolated from other, single stream stocks by geographic distance and habitat conditions (Gray, *in litt.* 1998; Pence, *in litt.* 1998). This connectivity is important to avoid isolation and protect the interconnected stocks from cumulative watershed effects (Hemmingsen and Gray 1999 draft). No information is available regarding WCT spawning locations in the upper mainstem John Day River or its tributaries.

Kostow (1995) reported, based on 1990 and 1992 stream-survey data, almost all John Day drainage WCT stocks having more than 300 spawning adults. Pence (*in litt.* 1998) indicated that WCT numbers in the Upper John Day, Prairie City, and Canyon Creek 5th-field HUC watersheds (upper mainstem John Day River; Graham, Roberts, Call, Rail, Reynolds, Deardorff, Strawberry, Indian, Pine, Dog, Little Pine, Canyon, Dixie, and Bear creeks) were "relatively strong" (based on subjective field observations), while WCT numbers in the Beech Creek, Mount Vernon, and Fields 5th-field HUC watersheds (Fields, Moon, McClellan, Ingle, Laycock, Beech, Birch, and Belshaw creeks) were "generally lower." Kostow (1995) reported, based on juvenile fish-trap data at irrigation diversions, a recent downward trend in WCT abundance. However, these data may not be an accurate measure of population trends (Hooton, ODFW, *pers. comm.* 1998).

<u>Upper North Fork John Day River Watershed</u>

Confusion exists as to the origin of WCT found in the North Fork John Day River watershed. No genetic data are available for these fish (Unterwegner, ODFW, *pers. comm.* 1998). ICBEMP (1996) analysis indicates all North Fork John Day WCT stocks were introduced. Hemmingsen and Gray (1999 draft) indicate at least some of the North Fork John Day WCT stocks may be either introduced WCT, or another cutthroat subspecies (Lahontan and Yellowstone cutthroat have been stocked in certain North Fork John Day reservoirs in the past). For purposes of this analysis, USFWS will consider these fish WCT.

Kostow (1995) reported WCT from Desolation (South Fork Desolation Creek) and Granite Creek (Lake and Clear creeks) watersheds. Hirsch (*in litt.* 1998) reports WCT were introduced in South Fork Desolation Creek by ODFW (unknown date), and provides a WCT distribution map for the upper North Fork John Day River, based on previous U.S. Forest Service and ODFW stream surveys, indicating WCT occupy South Fork Desolation Creek; Lake Creek and tributary; and Clear Creek and tributaries (portions of eight total streams). Hemmingsen and Gray (1999 draft) indicate WCT occupy portions of seven streams. Gray (*in litt.* 1998) reports cutthroat trout found in the Olive Lake area (Lake Creek watershed) may have been brought there from outside the State (Kostow 1995 indicated Lahontan cutthroat trout have been stocked in Olive Lake; Hemmingsen and Grey [1999 draft] indicate both Lahontan and Yellowstone cutthroat have previously been stocked in Olive Lake). Within the Upper North Fork John Day River, WCT are found almost exclusively on Umatilla National Forest lands. Bull trout overlap with WCT in 13 miles of stream in the North Fork John Day River watershed.

Little summarized information is available for North Fork John Day WCT. Historic distribution data is not available (Hirsch, *in litt.* 1998); ICBEMP (1996) analysis indicates all stocks are introduced. Resident fish occur in the above drainages; however, no information was available regarding presence of migratory forms or seasonal distributions of WCT. No information is available regarding WCT spawning locations.

Data generated by ICBEMP (1996) predicts that 10 subwatersheds (i.e. HUCs) occur in the North Fork John Day River within the current range of WCT. Westslope cutthroat trout presence is known within 4 subwatersheds, and 6 subwatersheds have no information (ICBEMP 1996). All occupied subwatersheds in the North Fork John Day River watershed are predicted or known to have “depressed” WCT populations.

In summary, WCT occur in about 51 tributaries or stream reaches that collectively encompass 315 linear miles of stream habitat, distributed between 2 watersheds, in the John Day River drainage (Appendix Table 2).

V. Summary of Factors and Threats Affecting Westslope Cutthroat Trout

The following is a discussion of the five listing factors set forth in section 4(a)(1) of the Endangered Species Act and related regulations (50 CFR Part 424), and the applicability of these factors to the WCT. Each of the five factors will be discussed by major drainage.

Oldman River Drainage

A. The Present or Threatened Destruction, Modification or Curtailment of the Species' Habitat or Range

Most lands in the Oldman drainage are in Glacier National Park. National Park Service policies protect native species like WCT, and preclude the adverse modification of WCT habitat. In other areas of the drainage, major land-use activities consist primarily of livestock grazing, although grazing does not occur within the range of extant WCT stocks.

B. Overutilization for Commercial, Sporting, Scientific or Educational Purposes

Angler harvest of WCT in the Oldman River drainage is closely regulated by the National Park Service, Glacier National Park. Collection of WCT for scientific and educational purposes, permitted by the National Park Service only for legitimate purposes, has a negligible effect on WCT stocks in the drainage.

C. Disease or Predation

Disease and predation are not known to be important factors presently affecting WCT in the Oldman River drainage.

D. Inadequacy of Existing Regulatory Mechanisms

There are no evident inadequacies in existing regulatory mechanisms that affect WCT in the Oldman River drainage.

E. Other Natural or Manmade Mechanisms

Stocking of nonnative rainbow trout and Yellowstone cutthroat trout in the Oldman River drainage, primarily during the first half of this century, has led to interbreeding and the loss of genetically pure WCT in many parts of the drainage (Marnell 1988). Where genetically pure WCT stocks persist, they may be threatened by interbreeding with these nonnative species.

Missouri River Headwaters Drainage

A. The Present or Threatened Destruction, Modification or Curtailment of the Species' Habitat or Range

Major land-use activities in the Missouri River Headwaters drainage that may adversely affect WCT include livestock grazing and other agricultural practices, mining, and forestry practices. The Montana Department of Environmental Quality (MTDEQ) lists 37 streams in the Lower Missouri River drainage as being water-quality impaired as the result of forestry practices, 171 impaired by agricultural practices, 107 impaired by water withdrawals, 60 impaired by roads, and 50 impaired by mining (MTDEQ 1998; Appendix Table 5). Many of these streams are impaired by more than one activity. Information on the possible occurrence of WCT in these streams is presently unavailable, however.

B. Overutilization for Commercial, Sporting, Scientific or Educational Purposes

Although angler harvest of WCT may have negatively affected some stocks of this subspecies earlier in this century, angler harvest is now closely regulated in the Missouri River Headwaters drainage and is not considered a threat to the subspecies (MTFWP, *in litt.* 1999). In all of the waters in the Missouri River Headwaters drainage, fishing for WCT is restricted to catch-and-release. Collection of WCT for scientific and educational purposes, permitted by Montana Fish, Wildlife and Parks only for legitimate purposes, has a negligible effect on the WCT population (MTFWP, *in litt.* 1999).

C. Disease or Predation

Whirling disease, caused by a protozoan parasite that requires an oligochaete (an aquatic earthworm) as its intermediate host, was discovered in rainbow trout in Montana in 1994. Whirling disease has been detected in all the major rivers the Missouri River Headwaters drainage (Gustafson 1996). Extensive research is being conducted to determine the distribution of whirling disease in Montana, the susceptibility of WCT (a close relative of rainbow trout) to whirling disease, and possible control measures. Research suggests that WCT in headwater streams will not be affected by whirling disease because these streams are not suitable for colonization by the intermediate host for the whirling disease organism. Moreover, current research suggests that, although the whirling disease organism may be present in streams, low levels of the organism are unlikely to result in deleterious infections in fish, including cutthroat trout. Consequently, whirling disease is not considered an important threat to extant WCT stocks in the Missouri River Headwaters drainage.

D. Inadequacy of Existing Regulatory Mechanisms

There are no evident, inherent inadequacies in existing federal, state or local regulatory mechanisms that affect WCT in the drainage. However, effective implementation of the various regulatory mechanisms (see **VI. Ongoing Regulatory and Conservation Actions**) that potentially affect WCT depends largely upon the appropriation of adequate funding and, ultimately, commitment on the part of the management or regulatory agencies to fulfill their respective responsibilities. Where these responsibilities are not being fulfilled, WCT may be threatened by ongoing or planned, adverse changes in their habitat or by chronic, adverse effects that remain unabated.

E. Other Natural or Manmade Mechanisms

Nonnative fish species were extensively stocked in many areas of the Missouri River Headwaters drainage, beginning in the 1890s, with substantial federal government support (e.g., hatchery fish provided by the U.S. Fish Commission). As a result, nonnative brook trout, brown trout and rainbow trout became established long ago in many streams and lakes throughout the drainage (MTFWP, *in litt.* 1999). Although such stocking has not occurred in Montana for more than two decades, the nonnative fishes that became established probably constitute the greatest contemporary threat to the maintenance and restoration of WCT in the drainage.

Lower Missouri River Drainage

A. The Present or Threatened Destruction, Modification or Curtailment of the Species' Habitat or Range

Major land-use activities in the Lower Missouri River drainage that may adversely affect WCT include livestock grazing and other agricultural practices, mining, and forestry practices. The Montana Department of Environmental Quality (MTDEQ) lists 14 streams in the Lower Missouri River drainage as being water-quality impaired as the result of forestry practices, 100 impaired by agricultural practices, 65 impaired by water withdrawals, 24 impaired by roads, and 54 impaired by mining (MTDEQ 1998; Appendix Table 5). Many of these streams are impaired by more than one activity. Information on the possible occurrence of WCT in these streams is presently unavailable, however.

B. Overutilization for Commercial, Sporting, Scientific or Educational Purposes

Although angler harvest of WCT may have caused appreciable declines in some stocks of this subspecies earlier in this century, angler harvest is now closely regulated in the Lower Missouri River drainage and is not considered a threat to the subspecies (MTFWP, *in litt.* 1999). In all of the waters in the Lower Missouri River drainage, fishing for WCT is restricted to catch-and-release.

C. Disease or Predation

In the Lower Missouri River drainage, whirling disease has been detected in the mainstem Missouri River and several tributaries (Gustafson 1996). Extensive research is being conducted to determine the distribution of whirling disease in Montana, the susceptibility of WCT (a close relative of rainbow trout) to whirling disease, and possible control measures. Research suggests that WCT in headwater streams will not be affected by whirling disease because these streams are not suitable for colonization by the intermediate host for the whirling disease organism. Moreover, current research suggests that, although the whirling disease organism may be present in streams, low levels of the organism are unlikely to result in deleterious infections in fish, including cutthroat trout. Consequently, whirling disease is not considered an important threat to extant WCT stocks in the Lower Missouri River drainage.

D. Inadequacy of Existing Regulatory Mechanisms

There are no evident, inherent inadequacies in existing federal, state or local regulatory mechanisms that affect WCT in the drainage. However, effective implementation of the various regulatory mechanisms (see **VI. Ongoing Regulatory and Conservation Actions**) that potentially affect WCT depends largely upon the appropriation of adequate funding and, ultimately, commitment on the part of the management or regulatory agencies to fulfill their respective responsibilities. Where these responsibilities are not being fulfilled, WCT may be threatened by ongoing or planned, adverse changes in their habitat or by chronic, adverse effects that remain unabated.

E. Other Natural or Manmade Mechanisms

Although stocking of nonnative fish species has not occurred in the drainage for more than two decades, the nonnative fishes that have become established there probably constitute the greatest contemporary threat to the maintenance and restoration of WCT in the drainage.

Kootenai River Drainage, Montana

A. <u>The Present or Threatened Destruction, Modification or Curtailment of the Species' Habitat or Range</u>

Timber management is the dominant land use in the Kootenai River drainage, and an extensive road system to support forestry practices and other forest uses exists throughout the drainage. Forestry practices have had adverse effects on the habitats of WCT in some areas of the drainage. Seven streams (95 miles) in the upper Kootenai River drainage, 5 streams (124 miles) in the middle Kootenai River drainage, and one stream (7 miles) in the lower Kootenai River drainage are considered water-quality impaired as a result of forestry practices (MDHES 1994). The Montana Department of Environmental Quality (MTDEQ) lists 23 streams in the Kootenai River drainage as being water-quality impaired as the result of forestry practices, nine impaired by agricultural practices, and 18 impaired by water withdrawals; additional impairments result from other land-use practices (MTDEQ 1998; Appendix Table 5). Many of these streams are water-quality impaired by more than one activity. Information on the possible occurrence of WCT in these streams is presently unavailable, however.

B. <u>Overutilization for Commercial, Sporting, Scientific or Educational Purposes</u>

Although angler harvest of WCT may have caused appreciable declines in some westslope stocks earlier in this century, angler harvest is now closely regulated in Montana and is not considered a threat to the subspecies (MTFWP, *in litt.* 1999). In many waters in the Kootenai River drainage, fishing for WCT is restricted to catch-and-release. Elsewhere in the drainage, harvest is greatly restricted.

C. <u>Disease or Predation</u>

Whirling disease has not been found in the Kootenai River drainage (Gustafson 1996). We are aware of no other diseases or predators than pose threats to WCT in the drainage.

D. <u>Inadequacy of Existing Regulatory Mechanisms</u>

There are no evident, inherent inadequacies in existing federal, state or local regulatory mechanisms that affect WCT in the drainage. However, effective implementation of the various regulatory mechanisms (see **VI. Ongoing Regulatory and Conservation Actions**) that potentially affect WCT depends largely upon the appropriation of adequate funding and, ultimately, commitment on the part of the management or regulatory agencies to fulfill their respective responsibilities. Where these responsibilities are not being fulfilled, WCT may be threatened by ongoing or planned, adverse changes in their habitat or by chronic, adverse effects that remain unabated.

E. Other Natural or Manmade Mechanisms

As the result of stocking for recreational purposes, nonnative brook trout, brown trout and rainbow trout became established long ago in many streams and lakes throughout the Kootenai River drainage. Although such stocking has not occurred for more than two decades, the nonnative fishes that became established probably constitute the greatest contemporary threat to the maintenance and restoration of WCT in the state (MTFWP, *in litt.* 1999).

Clark Fork River Drainage

A. <u>The Present or Threatened Destruction, Modification or Curtailment of the Species' Habitat or Range</u>

Major land-use activities in the Clark Fork River drainage that may adversely affect WCT include forestry practices, mining, livestock grazing and other agricultural practices, and urbanization. The Montana Department of Environmental Quality (MTDEQ) lists 77 streams in the Clark Fork River drainage as being water-quality impaired as the result of forestry practices, 143 impaired by agricultural practices, 99 impaired by water withdrawals, 71 impaired by roads, and 73 impaired by mining (MTDEQ 1998; Appendix Table 5). Many of these streams are impaired by more than one activity. Information on the possible occurrence of WCT in these streams is presently unavailable, however.

The Montana Bull Trout Scientific Group ranked mining in the Blackfoot River watershed as a high risk to bull trout restoration (MBTSG 1995C). Mining of gold, silver, lead, and copper has occurred in Blackfoot River headwaters during the past century, and effluents from the mines continue to result in the loss of habitat for bull trout (MBTSG 1995C). Altogether, 153 miles of streams in the Middle Clark Fork River watershed are water-quality impaired because of mining (MDHES 1994).

Most of the large tributaries in the northern region of the Bitterroot River watershed are diverted for irrigation (MBTSG 1995B). Nearly 65 miles of stream in the Bitterroot River and at least 18 of its tributaries experience chronic low-flow conditions during the irrigation season (MBTSG 1995B). Intensive livestock grazing, particularly in the Deerlodge valley, Flint Creek valley, and parts of the Rock Creek valley, has adversely affected water quality and fisheries habitat in those areas of the Upper Clark Fork watershed (MBTSG 1995A).

The human population and associated rural residential development have been increasing rapidly in the Bitterroot Valley (MBTSG 1995B). Development can lead to alteration of stream and riparian habitats. The lower Bitterroot River is a major non-point source of nutrient pollution, primarily from sewage effluents and land development (U.S. EPA 1993 *in* MBTSG 1995B).

B. <u>Overutilization for Commercial, Sporting, Scientific or Educational Purposes</u>

Angler harvest is closely regulated in the Clark Fork River drainage and is not considered a threat to WCT (MTFWP, *in litt.* 1999). In many waters in the drainage, fishing for WCT is restricted to catch-and-release.

C. <u>Disease or Predation</u>

In the Clark Fork River drainage, whirling disease has been detected in the Blackfoot River watershed, the Flint Creek-Rock Creek watershed, and the upper Clark Fork River watershed (Gustafson 1996). Extensive research is being conducted to determine the distribution of whirling disease in Montana, the susceptibility of WCT (a close relative of rainbow trout) to whirling disease, and possible control measures. Research suggests that WCT in headwater streams will not be affected by whirling disease because these streams are not suitable for colonization by the intermediate host for the whirling disease organism. Moreover, current research suggests that, although the whirling disease organism may be present in streams, low levels of the organism are unlikely to result in deleterious infections in fish, including cutthroat trout. Consequently, whirling disease is not considered an important threat to extant WCT stocks in the Clark Fork River drainage.

Predation on WCT by nonnative predatory fishes poses a threat to WCT in a few localized areas. The highly predacious northern pike *Esox lucius*, for example, was illegally introduced into the Clearwater River system (MFWP 1997).

D. Inadequacy of Existing Regulatory Mechanisms

Existing regulatory mechanisms failed to prevent the illegal stocking of northern pike into the Clearwater River system. There are no other evident, inherent inadequacies in existing federal, state or local regulatory mechanisms that affect WCT in the drainage. However, effective implementation of the various regulatory mechanisms (see **VI. Ongoing Regulatory and Conservation Actions**) that potentially affect WCT depends largely upon the appropriation of adequate funding and, ultimately, commitment on the part of the management or regulatory agencies to fulfill their respective responsibilities. Where these responsibilities are not being fulfilled, WCT may be threatened by ongoing or planned, adverse changes in their habitat or by chronic, adverse effects that remain unabated.

E. Other Natural or Manmade Mechanisms

Stocking of nonnative fish species in Clark Fork River drainage began in the1890s and, with substantial federal government support (e.g., hatchery fish provided by the U.S. Fish Commission), soon became the principal fisheries management tool of the state game and fish agency. As a result, nonnative brook trout, brown trout and rainbow trout became established long ago in many streams and lakes throughout Montana (MTFWP, *in litt.* 1999). Although such stocking has not occurred in the drainage for more than two decades, the nonnative fishes that became established probably constitute the greatest contemporary threat to the maintenance and restoration of WCT in the drainage.

Many people in the Bitterroot River watershed are building private fish ponds on their property and stocking them with brook trout, leading to concern that these introduced fish could spread into tributaries where they do not already exist (MBTSG 1995B). In addition, the genetic integrity of WCT can be threatened by interbreeding with nonnative rainbow trout and Yellowstone cutthroat trout (MTFWP, *in litt.* 1999).

Flathead River Drainage

A. The Present or Threatened Destruction, Modification or Curtailment of the Species' Habitat or Range

Timber management is the dominant land use in the Flathead River drainage, where an extensive road system to support forestry practices and other forest uses exists. In addition, rural residential development is increasing, particularly in the Flathead Lake area; resulting domestic sewage and human-caused changes to stream morphology are considered threats to water quality (MBTSG 1995D). The Montana Department of Environmental Quality (MTDEQ) lists 17 streams in the Flathead River drainage as being water-quality impaired as the result of forestry practices and 16 streams impaired by agricultural practices; additional impairments result from other land-use practices (MTDEQ 1998; Appendix Table 5). Many of these streams are water-quality impaired by more than one activity. Information on the possible occurrence of WCT in these streams is presently unavailable, however.

B. Overutilization for Commercial, Sporting, Scientific or Educational Purposes

Angler harvest of WCT is closely regulated in Montana and not considered a threat to the subspecies in the Flathead River drainage (MTFWP, *in litt.* 1999). In many WCT waters in the drainage, fishing for WCT is restricted to catch-and-release. Elsewhere in the drainage, only limited harvest of WCT is allowed.

C. Disease or Predation

Whirling disease has been detected in trout in the Swan River watershed of the Flathead River drainage (Gustafson 1996). Where WCT coexist with both the protozoan that causes the disease and the protozoan's intermediate host, whirling disease poses a threat to WCT. However, extensive research is being conducted to determine the distribution of whirling disease in Montana, the susceptibility of WCT (a close relative of rainbow trout) to whirling disease, and possible control measures. Research suggests that WCT in headwater streams will not be affected by whirling disease because these streams are not suitable for colonization by the intermediate host for the whirling disease organism. Moreover, current research suggests that, although the whirling disease organism may be present in streams, low levels of the organism are unlikely to result in deleterious infections in fish, including cutthroat trout. Consequently, whirling disease is not considered an important threat to most extant WCT stocks in the Flathead River drainage.

Predation on WCT by nonnative predatory fishes poses a threat to WCT in a few localized areas. In the Flathead Lake basin, there are 13 introduced, nonnative species of fish with which WCT must coexist (MBTSG 1995D). Among these is lake trout *Salvelinus namaycush*, which has become the dominant species in Flathead Lake. Juvenile lake trout have also been found in major tributaries to the lake (MBTSG 1995D). Hungry Horse Dam protects native fishes in the South Fork Flathead River watershed, the most intact native fish assemblage in western

Montana, by preventing the upstream movement of nonnative fishes, particularly lake trout, into the watershed (MBTSG 1995E). Bigfork Dam has benefitted the Swan River watershed because the dam prevents the upstream movement of nonnative fishes, particularly lake trout, into the Swan drainage (MBTSG 1996A). Over 100 illegal fish introductions have been documented in northwest Montana during the past 20 years (MBTSG 1995E). Montana FWP does not stock nonnative predatory fishes into waters harboring genetically pure WCT and aggressively prosecutes anyone caught illegally transferring live fish or attempting to do so (MTFWP, *in litt.* 1999).

D. Inadequacy of Existing Regulatory Mechanisms

Existing regulatory mechanisms failed to prevent the more than 100 illegal fish introductions that have been documented in northwest Montana during the past 20 years. There are no other evident, inherent inadequacies in existing federal, state or local regulatory mechanisms that affect WCT in the drainage. However, effective implementation of the various regulatory mechanisms (see **VI. Ongoing Regulatory and Conservation Actions**) that potentially affect WCT depends largely upon the appropriation of adequate funding and, ultimately, commitment on the part of the management or regulatory agencies to fulfill their respective responsibilities. Where these responsibilities are not being fulfilled, WCT may be threatened by ongoing or planned, adverse changes in their habitat or by chronic, adverse effects that remain unabated.

E. Other Natural or Manmade Mechanisms

Although authorized stocking of nonnative fish species has not occurred in for more than two decades, the nonnative fishes that became established probably constitute the greatest contemporary threat to the maintenance and restoration of WCT in the drainage. Nonnative fish species that have become established in the drainage include lake trout, kokanee salmon, northern pike, and largemouth bass *Micropterus salmoides* (MBTSG 1996A).

Pend Oreille Drainage, Idaho

A. <u>The present or threatened destruction, modification, or curtailment of the species' habitat or range</u>

The WCT in Pend Oreille drainage, Idaho, have been negatively affected by habitat fragmentation resulting from mainstem dams constructed without fish passage facilities. These dams, constructed at Albeni Falls (1952) and Cabinet Gorge (1951), contributed to habitat fragmentation for fluvial and adfluvial bull trout populations and are likely associated with WCT declines as well (Mauser *et al.* 1988). The construction of Cabinet Gorge and other dams eliminated 90 % of the available spawning and rearing habitat for Pend Oreille Lake migratory fish using the Clark Fork River and tributaries (Irving 1986 in Hoelscher and Bjornn 1989; Mauser *et al.* 1988). The estimated harvest levels for both WCT (8000+) and bull trout (5000+) peaked in 1953 and experienced dramatic declines by the 1960s (Pratt 1985, Bowler *et al.* 1978). With less than 1000 WCT (in most years) being harvest annually (by 1966), this was an even more dramatic decrease than observed with bull trout. Albani Falls Dam, completed in 1952, may also have contributed to these abrupt declines in abundance and harvest.

The construction and operation of these dams has probably had the greatest influence on habitat of migratory WCT in the Pend Oreille River portion of this drainage. This along with other development activities have changed the physico-chemical and aquatic biota of the river to be less suitable for salmonid survival (Horner 1989 in Bennett and DuPont 1993). Daily average water temperatures >21 ^{o}C (39 days in 1991 and 48 days in 1992), substrate dominated by silt (67 %) and sand (19.5 %), low water velocities (generally between 0-18 cm/s) allowing for fine sediment deposition, and lack of a thermocline for coolwater sanctuary are several elements influencing the Pend Oreille River to be unsuitable for salmonids (Bennett and DuPont 1993). Bennett and DuPont (1993) also noted that improperly placed culverts restricted salmonids from accessing tributary streams, and land-use practices has degraded spawning and rearing habitat for salmonids in accessible tributaries.

Forest management practices including timber harvest and road construction, both past and current, are major factors in degraded watershed conditions and aquatic habitats in the Pend Oreille Lake watershed managed by the Idaho Panhandle National Forests (Cross and Kasun, USFS, *pers. comm.* 1993). Within the Priest Lake and Pend Oreille watershed there is a trend toward degraded stream conditions which is now a constraint to the management of about 70 % of National Forest lands (Kasun, USFS, *in litt.* 1992a; USFS, *in litt.* 1994a).

The development of road systems in the Pend Oreille drainage have contributed to extensive sediment input and poor channel conditions throughout the drainage. Road densities have been used to correlate the probability of a stream to support bull trout populations (Lee *et al.* 1997 in USFS, *in litt*. 1998e). Meaning, the higher the road densities, the lower the probability of finding strong bull trout populations. Baseline environmental conditions for road densities were considered good if densities were less than 0.7 m/m^2, moderate if densities were between 0.7 m/m^2 and 1.7 m/m^2, and poor if densities were greater than 1.7 m/m^2 (Lee *et al.* 1997 in USFS, *in* *litt*. 1998e). While these determinations were made for bull trout, they too can be used for assessing threats to WCT. It was determined that within the 19 HUCs the USFS and the Service are conducting bull trout consultation on in the Pend Oreille Lake and River watersheds, road densities are considered poor in 11, moderate in 6, and good in 2 (USFS, *in litt*. 1998e). The range of road densities in these HUCs is 0.6-4.5 m/m^2. Within the Priest Lake watershed, it was determined that within the 16 HUCs the USFS and the Service are conducting bull trout consultation, road densities are considered poor in 13, moderate in 2, and good in 1 (USFS, *in litt*. 1998e). The range of road densities in these HUCs is 0.0-6.2 m/m^2. Until road densities are reduced significantly in this drainage, threats to WCT are considerable.

Within the Pend Oreille Lake and river watersheds, the U.S. Forest Service (52) and Bureau of Land Management (15) have identified ongoing or proposed actions for which bull trout consultation is occurring. Within the Priest Lake watershed, the U.S. Forest Service has identified 71 ongoing or proposed actions in 16 watersheds for which bull trout consultation is occurring. This does not include proposed or ongoing actions in HUCs in the Pend Oreille Lake (11) and Priest Lake (3) watersheds where bull trout are thought to be absent and consultation on actions does not occur, or include proposed actions that are being completed through the streamlining process (USFS, *in litt.* 1998e; S. Audet, USFWS, *pers. comm.* 1999). In addition, there is approximately 204,406 acres of State endowment land that encompass approximately 15 HUCs in this Priest Lake watershed that are administered by IDL where consultation does not occur.

In recent years, the Halfway, Silverleaf, and Packsaddle timber sales resulted in additional logging and roading in Gold Creek drainage. There was a local working group guided by State authorities attempting to develop best practices to restore Gold Creek, but it was abolished in 1996. On June 13, 1997, the record of decision was signed for the Packsaddle timber sale. This project includes logging in unstable soils of Kickbush Gulch, tributary to Gold Creek, and more logging in unstable soils in North Gold Creek drainage (Sedler, *in litt.* 1997). The Forest Service is also proposing to harvest timber from more than 1,000 acres during the West Gold Project (USFS, *in litt.* 1998f). The U.S. Forest Service has adopted the Gold Creek complex as a focal watershed to provide for a high probability of maintaining native fish communities. Focal watersheds as outlined by the Aquatic Ecosystem Strategy (USFS, *in litt*. 1994) are watersheds where restoration efforts will improve the current stream channel and fish habitat conditions. Thus far, there have been no active restoration efforts to the stream channel and fish habitat except those associated with ongoing actions.

Major hydrologic changes are ongoing in much of the Lightning Creek system, where, in some reaches, channel changes annually, and it appears as if a "giant cat [tractor] with a ripper went through it" (Nelson, IDFG, *pers. comm.* 1993). Roads in Rattle and Lightning Creek washed out again in February 1996 attesting to the instability watershed conditions in this drainage (Chatel, USFS, *pers. comm.* 1997).

As in Lightning Creek, visible changes have occurred during recent years in Trestle Creek, including new channels, channel broadening, heavy bed load movement and log jams (Nelson, IDFG, *pers. comm.* 1993).

During 1993, the Forest Service determined riffle stability indices for 25 sites in Trestle Creek, with a range of 49 to 83, mean 67 (Cross, USFS, *in litt.* 1993, from bull trout admin. record). Indices between 50 and 99 are regarded as a continuum of stream aggradation. Index numbers less than 70 are considered to represent dynamic equilibrium and to be generally supportive of fish habitat needs. Index values greater than 90 are out of equilibrium (Kappesser 1993). Of the 25 indices from Trestle Creek, 10 were greater than 70.

There have been attempts to rectify recently observed habitat degradation and potential intermittency in Trestle Creek. Based on State and Federal Clean Water Act antidegradation regulations and the State Forest Practices Act, a local working committee was established to develop best management practices to protect Trestle Creek because it is very important as bull trout spawning and rearing habitat (Corsi, IDFG, *pers. comm.* 1994). This program was abolished in 1996. The U.S. Forest Service identified Trestle Creek a focal area for sustaining strong native fish populations (USFS, *in litt*. 1994b). Independently, the Forest Service has completed watershed analysis and hands-on restoration on the public lands portions of Trestle Creek (USFS, *in litt*. 1995b). Ongoing monitoring will evaluate effectiveness of this work (Chatel, USFS, *pers. comm.* 1997).

The Forest Service determined riffle stability indices ranging from 67 to 95 (mean 82) at five sites on Gold Creek within spawning areas (Kasun, *in litt.* 1992b). This is a strong indication of disequilibrium, channel aggradation and aquatic habitat loss in Gold Creek (Kappesser 1993). These findings were verified when the Idaho Division of Environmental Quality estimated the riffle stability in this same stream to be 84 (Hoelscher, *in litt.* 1993, from bull trout admin. record). The U.S. Forest Service identified Gold Creek a focal area for sustaining strong native fish populations (USFS, *in litt*. 1994b). This stream is considered to be water quality limited in regard to attainment of beneficial uses from sediments released through a combination of forest management, roading, and mining.

In excess of 100,000 cubic yards of mining wastes have been deposited and continue to be redistributed into the Gold Creek system. Problems in Gold Creek are being addressed under Clean Water Act antidegradation regulations by the State of Idaho, in part because of redistribution of fine-grained materials released from mining activities (B. Hoelscher, IDEQ, *pers. comm.* 1994). Several large landslides in recent years have contributed fine materials to the stream adding to the degraded condition of the stream channel.

Similarly, instability was observed with heavy bed load deposition and channel realignment in lower Granite Creek. This is attributed to latent effects of older timber sales and roading (Chatel, USFS, *pers. comm.* 1997). In recent years, excessive bed load aggradation has formed a barrier (seasonal) with approximately 100 meters of stream going sub-surface just above Sullivan

Springs in Granite Creek (Chatel, USFS, *pers. comm.* 1997; D. Vidergar, U. of Idaho, *pers. comm.* 1998).

During the winter of 1996-97, snow, ice, and wind, damaged or blew over trees throughout the Priest Lake watershed which provided ideal breeding conditions for the douglas-fir bark beetles (USFS, *in litt*. 1999c). This resulted in an outbreak for which approximately 15,300 acres of mature Douglas-fir trees were killed. The U.S. Forest Service is currently developing the Douglas-fir Beetle Project for the purpose of harvesting trees in stands infested with bark beetle. The proposed action would harvest approximately 5,271 acres, of which approximately 3,167 acres are proposed for regeneration harvests. Regeneration harvests would likely retain less than 30 % of the stand basal area and some openings will exceed 40 acres. In addition, 14.3 miles of temporary roads will be constructed and 83.7 miles of roads will be reconstructed. The intent of the action is to harvest trees in stands infested with bark beetle that may then provide funding for vegetation and aquatic restoration. Extensive road maintenance, stream crossing removal and improvements, and road obliteration are proposed (USFS, *in litt*. 1999d).

In the Granite Creek subwatershed (Priest Lake), three actions (road repair, earthen barrier, and the Stimson access road) have been identified as a threat "likely to adversely affect" bull trout because the actions contribute sediments to the stream and contributed to channel instability that delay recovery. Westslope cutthroat trout have been identified as present in Granite Creek and are expected to be adversely affected as well (USFS, *in litt.* 1998g; IDFG, *in litt.* 1998a).

B. <u>Overutilization for commercial, recreational, scientific, or educational purposes</u>

Within Pend Oreille Lake, Pend Oreille River, and the Clark Fork River, restrictive harvest regulations for WCT have been implemented. The Gold, North Gold, and Trestle Creek tributaries have been closed to all fishing, while other tributaries in the drainage have restrictive regulations allowing the harvest of two trout from the Saturday of Memorial Day weekend to August 31. The harvest of four trout (excluding bull trout) is permitted year-round in Pend Oreille Lake and from the Saturday of Memorial Day weekend to August 31, in the Clark Fork River (IDFG, *in litt*. 1998b). While these regulations have been implemented to protect native species, WCT are vulnerable to angling and relatively low fishing effort can produce high levels of exploitation, which in turn could prevent WCT from recovering even under special regulations (Rieman and Apperson 1989). Although sport fishing harvest levels have not been monitored for the lake since 1991, the State of Idaho believes that annual harvest levels today are similar to that in 1991 of approximately 750 WCT (Horner, IDFG, *pers. comm.* 1999).

Within the Priest Lake watershed, restrictive fishing regulations established in 1982 closed fishing in major tributary streams that were used by WCT for rearing, and implemented a harvest minimum size limit of 38 cm for Priest and Upper Priest Lake. However, lake trout predation remained a limiting factor to increasing WCT numbers and in 1988 the consumptive fishery was closed (Mauser *et al.* 1988). Prior to that time, harvest by anglers was identified as one reason for their decline.

Another activity believed to contribute to the decline of WCT in the Priest Lake watershed was spawn taking. During the late 1930s and the 1940s, WCT spawners in Granite and Gold Creeks were collected at traps and stripped of eggs and milt. Spawn taking was eliminated in 1947, that year 1,660 spawners were caught at the Granite Creek trap. Approximately 30 % of the eggs collected from WCT at these locations were distributed to waters other than the Priest Lake watershed (USFS, *in. litt*.1998g)

C. Disease or predation

In Priest Lake, once lake trout became abundant after opossum shrimp were established, the WCT fishery declined dramatically. This is considered to be a major factor limiting WCT numbers, and is believed to be the primary reason for the failure of WCT enhancement (Mauser *et al.* 1988; Mauser *et al.* 1988 in Rieman and Apperson 1989). Predation of WCT is known to occur by numerous native (bull trout and northern pikeminnow) and introduced species (lake trout) and is an important source of mortality to WCT, and can act as a destabilizing force when habitat loss and overexploitation is experienced (Rieman and Apperson 1989).

There was no known lake trout harvest in Lake Pend Oreille during the early 1980s (Pratt 1984b). Lake trout did not appear in the 1985 creel census reports but 25 fish were reported in 1990. During 1991, creel checkers observed 43 lake trout harvested and many more were reported to have been harvested by anglers targeting this species (Paragamian and Ellis 1993). This is a potential threat (predation) to WCT in Lake Pend Oreille because there is no established remedy should lake trout become a dominant fish species. In nearby Priest Lake, once lake trout became abundant after opossum shrimp were established, the WCT fishery declined dramatically and is believed to be the primary reason for failure of cutthroat enhancement (Mauser *et al.* 1988; Mauser *et al.* 1988 in Rieman and Apperson 1989).

The water source (Spring Creek) for the Clark Fork Hatchery is inhabited by brook trout that have Infectious Pancreatic Necrosis (IPN). The broodstock fish (including rainbow trout and WCT) from the Clark Fork Hatchery that are used for stocking lakes, rivers, and streams in this drainage (and all of Idaho Panhandle region) are known to be infected with IPN (Horner, IDFG, *pers. comm.* 1999). This is a contagious virus that effects young fish, generally 80-90 mm in length and may cause large losses (Van Duijn 1967; Horner, IDFG, *pers. comm.* 1999). The extent of this threat in this drainage is unknown. However, because Spring Creek is also used as a water source for the town of Clark Fork, Idaho, treating the brook trout and the stream to rid it of IPN is unlikely, and fish from the Clark Fork Hatchery with IPN will continue to be propagated in this drainage (Horner, IDFG, *pers. comm.* 1999). Available information does not identify any other disease threats in this drainage.

In 1998, bull trout conservation efforts by IDFG resulted in the removal of 912 lake trout from Upper Priest Lake. However, increasing catch rates during the latter part of the project (Oct. and Nov.), combined with information from tagged fish, indicated that immigration from Priest Lake is occurring (Fredericks 1999). The IDFG is currently evaluating the feasibility of preventing lake trout immigration to Upper Priest Lake with fish passage barriers in the Thorofare. It is uncertain whether or not IDFG is willing to accept the political consequences of lake trout population control throughout the Priest Lake watershed, thus controlling the threat. The IDFG also removed brook trout in three Upper Priest Lake streams (Rock, Ruby, and Trapper Creeks). It was determined based on depletion estimates that over 90 % of brook trout from Rock and Trapper Creeks and approximately 50 % of the brook trout were removed from Ruby Creek (Fredericks 1999). While these projects were completed with primary emphasis on bull trout conservation, WCT are also expected to benefit from the work completed by IDFG.

D. The inadequacy of existing regulatory mechanisms

The Forest Service INFISH strategy has amended the Idaho Panhandle National Forests plan to allow no new net-loss of native trout habitat (USFS 1995). Overall, INFISH has worked to maintain degraded aquatic habitat and needs to be upgraded to restore degraded habitats (B. Roper, USFS, *pers. comm.* 1999). On the Idaho Panhandle National Forests, about 97 % of all actions are in compliance with INFISH.

The AES adopted by the Idaho Panhandle National Forests is viewed as affirmative direction to conduct watershed restoration and maintain native fish communities (USFS, *in litt.* 1994b). The AES is directed primarily to bull trout spawning and juvenile rearing areas, with a considerable amount of WCT not addressed. The application of the AES takes a “passive” approach in watersheds that are designated as “Focal” watersheds, in that the Forest Service tends to avoid management action in these areas that would degrade habitat (USFS, *in litt.* 1994b; Roper, USFS, *pers. comm.* 1999). In other watersheds, the application of the AES is meant to take an “active” approach at restoring degraded habitat. However, restoration is not occurring as fast as it should because of funding constraints (Roper, USFS, *pers. comm.* 1999).

Forest practices on state and private lands are subject to minimum standards set forth in the Idaho Forest Practices Act (FPA). These standards are administered and enforced by and the Idaho Department of Lands (IDL) and compliance in general is high (J. DuPont, IDL, *pers. comm.* 1999; Corsi, IDFG, *pers. comm.* 1998). There is approximately 247,878 acres of endowment land in this drainage that are administered by IDL. When determined to be inadequate to protect beneficial uses, standards in the FPA are amended (DuPont, *in litt.* 1998). A recent addition to the FPA is the Cumulative Watershed Effects process developed to ensure that cumulative impacts from two or more logging operations will not impair water quality (DuPont, *in litt.* 1998).

Standards set forth in the FPA for state and private lands are generally less than those on federal lands and in some cases are inadequate (Corsi, IDFG, *pers. comm.* 1998; Roper, USFS, *pers. comm.* 1999). While the FPA affords adequate standards to keep sediment out of the streams, in some cases is inadequate in protecting the Stream Protection Zones by having minimal standards for long term large woody debris and shade retention (Corsi, IDFG, *pers. comm.* 1998). The FPA was also found to be inadequate when looking at road densities and the hydrologic impacts of clear cutting within rain on snow zones. While the standards set forth in the FPA are considered a step in the right direction, there are still holes that need to be addressed for protecting beneficial uses of streams administered by IDL (Corsi, IDFG, *pers. comm.* 1998).

On July 10, 1998, the Columbia River population of bull trout were listed as threatened under the Endangered Species Act. Section 7 (a) (2) of the ESA requires that any actions with Federal involvement that may affect bull trout go through the consultation process with the U.S. Fish and Wildlife Service. Where bull trout and WCT have overlapping ranges, consultation to minimize or eliminate adverse affects of the action on bull trout could be expected to minimize effects to WCT as well. However, within the Pend Oreille Lake drainage there are many tributary streams where bull trout are thought to be absent and consultation on actions has not occurred. Using data generated by ICBEMP for the Pend Oreille Lake watershed, 51 HUCs compose this drainage of which bull trout are known or predicted present in 21 HUCs, and known or predicted absent in 30 HUCs. The ICBEMP data indicates that WCT are known or predicted present in 49 of these HUCs, and known or predicted absent in two HUCs. Therefore, in 30 HUCs, WCT may not receive adequate protection from ongoing and future actions as a secondary benefit of protecting bull trout. Within the Priest Lake watershed, 36 HUCs compose the drainage, of which bull trout are known or predicted present in 13 HUCs, and known or predicted absent in 23 HUCs. The ICBEMP data indicates that WCT are known or predicted present in 35 of these watersheds, and known or predicted absent in one HUC. Therefore, in 22 HUCs, WCT may not receive adequate protection from ongoing and future actions as a secondary benefit of protecting bull trout.

Seventeen stream segments totaling 194.51 miles identified as occupied by WCT are now designated among the water quality limited streams under section 303 (d) of the Clean Water Act of which none have been restored (IDEQ, *in litt*. 1998). Sediment and temperature are identified as the primary pollutants responsible for designation on the list. Forest management and roads are the primary impact to these tributaries and associated watersheds.

E. <u>Other natural or manmade factors affecting the species' continued existence</u>

Stocking records dating back to 1925 from the IDFG indicates that numerous species of nonnative salmonids and various other exotic fishes have been stocked within the Lake Pend Oreille drainage (IDFG, *in litt*. 1998c). In this time frame, there has been thousands of separate stockings of various amounts ranging from a few fish to several hundred thousand. With the introduction of exotic fish species, competition, predation, and hybridization has increased (Rieman and Apperson 1989). Additional stocking of nonnative fishes occurred prior to 1925 by IDFG, sportsman groups, and private individuals (B. Hutchinson, IDFG, *pers. comm.* 1999).

Rieman and Apperson (1989) summarized that while competition between WCT and nonnative fish is minimized in streams by habitat segregation, the loss of suitable WCT habitat has allowed for nonnative fishes to expand into altered habitats. Brook trout tend to replace WCT where they have declined, whereas rainbow trout (once established and naturally reproducing) can displace WCT where the two overlap. The coexistence of rainbow trout and WCT likely results in extensive hybridization (Rieman and Apperson 1989). These threats are occurring in the Pend

Oreille drainage with rainbow trout and brook trout observed in 70 % and 45 %, respectively of tributary streams surveyed (Hoelscher 1993; Pratt 1984b). These threats have also been documented in the Priest Lake watershed with brook trout and rainbow trout observed in many of the tributary streams surveyed. The stocking of hatchery trout may not directly displace WCT, but create increased fishing pressure and aggravate the overexploitation of WCT in the same waters (Rieman and Apperson 1989). In addition, fishing pressure may increase with the wide distribution and abundance of wild nonnative species, which may as well aggravate the exploitation of WCT in the same waters.

Brook trout were introduced into many tributaries of Priest Lake prior to the 1920s and have replaced WCT in many tributaries and reduced rearing habitat by an estimated 50 % (Mauser *et al.* 1988; Bjornn 1957 in Mauser *et al.* 1988). Westslope cutthroat trout were heavily stocked on top of established brook trout populations but failed to displace them and did not improve WCT survival (Rieman and Apperson 1989).

Pend Oreille Drainage, Washington

A. <u>The present or threatened destruction, modification, or curtailment of the species' habitat or range</u>

Dams for hydroelectric development and flood control, such as Boundary, Box Canyon, Calispell Creek, Albeni Falls, Ione Municipal, Mill Pond, and Sullivan Lake form barriers that have isolated WCT in the Pend Oreille River drainage (Schneider, USDI, *in litt.* 1997; Shuhda, USFS, *pers. comm.* 1999).

> "From the dam site (Box Canyon) upstream for approximately 25 miles is found the majority of riffle and fishable pool area in the entire Pend Oreille River...When Box Canyon Dam is built at least 75 % of the best water in the Pend Oreille will be destroyed as trout and whitefish habitat" (Earnest 1952, WDG, in Ashe and Scholz 1992).

Since impoundment in 1955 at Box Canyon Dam, the Pend Oreille River has become a seasonally warm, slow moving reservoir, unfavorable to salmonids (including fluvial WCT), and favorable to the exotic species that now dominate (Ashe and Scholz 1992). In general, decreased habitat diversity, increased water temperatures, and lower food availability were the result of dam construction. During the months of July, August and the first week of September 1997, the water quality criteria of 20 ^{o}C was exceeded daily throughout the reservoir (Cascade Environmental Services, Inc. and Duke Engineering & Services, Inc. 1998).

Habitat conditions in the reservoirs are marginal for WCT with water temperatures reaching 73 ^{o}F (approx. 23 ^{o}C) in Box Canyon and 72 ^{o}F (approx. 22 ^{o}C) in Boundary Reservoirs (Shuhda, USFS, *pers. comm.* 1999). Optimal water temperature for WCT is 11 ^{o}C to 15.5 ^{o}C (Hickman and Raleigh 1982 in Ashe and Scholz 1992). Water temperatures in this range are being tolerated by nonnative fish species such as brown and rainbow trout (Bennett and Liter 1991). Within the 55 mile section of Box Canyon Reservoir, only three areas had a substrate composed of something other than sand and silt (Shuhda, USFS, *pers. comm.* 1999). Now only about 8 miles (approximately 15 %) of the Box Canyon reach are considered as riverine habitat that trout species prefer (Ashe and Scholz 1992).

Ashe and Scholz (1992) indicate that even if the Pend Oreille River could support a healthy trout population it appears that the tributaries to the Box Canyon Reservoir have only limited potential to produce large numbers of trout that could be recruited into the fishery in the reservoir. They found that where spawning habitat was of good quality, the tributaries are typically unproductive with food availability limiting trout production.

Threats to WCT in tributaries throughout this drainage include increased water temperature, sediment loading from surface erosion, bank erosion, and habitat degradation from logging, road system deficiencies, and grazing (Ashe and Scholz 1992; C. Vail, WDFW, *pers. comm.* 1997; KNRD and WDFW 1995). LeClerc Creek drainage is heavily entered for timber harvest and there has been excessive grazing by livestock in riparian habitats. In addition railroads were built in some creek bottoms, and in the 1920s, flumes and splash dams were commonly used (Shuhda, USFS, *pers. comm.* 1997) These practices have resulted in water temperature greater than 60 °F and movement of granitic sediments. On the West Branch of LeClerc Creek, a splash dam (Diamond Match) has created a migration barrier approximately 15 feet in height which has trapped a significant amount of fine sediment behind it. The stability of this structure is of concern and if it fails will be devastating to the stream. Westslope cutthroat trout are present below this structure (Maroney, KNRD, *pers. comm.* 1999).

Land-use practices within the Pend Oreille River drainage has degraded both habitat and community dynamics of native WCT. The degraded conditions have been conducive to the nonnative fish communities (KNRD and WDFW 1995). It was found that within two snorkeling reaches on Mill Creek that had higher quality habitat, the density of WCT was high, however, the abundance of brook trout within these reaches was far greater.

Analysis of habitat data from seven tributary streams (Mill, Fourth of July, Cee Cee Ah, Cedar, Mineral, Whiteman, and Indian Creeks) indicated that high rates of sedimentation and lack of overwintering habitat are of concern (KNRD and WDFW 1995). Six of the seven streams surveyed (except Cedar Creek) during the "Kalispell Resident Fish Project" (1995) exhibited high rates of embeddedness (mean = 72.4 % +/- 12.8) and low habitat diversity with limited pools. Physical instream inventory data for five tributary streams in the LeClerc watershed indicated that in all reaches (33) surveyed, INFISH Riparian Management Objectives for pools/mile (range 0-24) and water temperature in the summer months were not met (USFS, *in litt.* 1997b). Within six perennial, fish bearing streams in the Lost Ruby watershed, all are experiencing high levels of embeddedness (USFS-Lost Ruby, *in litt.* 1995).

B. <u>Overutilization for commercial, recreational, scientific, or educational purposes</u>

The harvest of two WCT is allowed in the Pend Oreille River year around, and in tributaries from June 1 to October 31 (WDFW, *in litt*. 1998b). Since WCT are vulnerable to angling, even relatively low fishing effort can produce high levels of exploitation (Rieman and Apperson 1989). The total estimated catch of WCT in the Pend Oreille River in 1989 was 91 with 86 harvested (Barber *et al.* 1989 in Ashe and Scholz 1992). The resident form of WCT found in the upper most reaches of tributaries are less susceptible to harvest because of difficulty in accessing the stream and because they are generally of small size and not selected by anglers (WDFW, *in litt.* 1998a).

C. <u>Disease or predation</u>

Predation of WCT is known to occur by numerous native and introduced species and is an important source of mortality to WCT and can act as a destabilizing force when habitat loss and overexploitation is experienced (Rieman and Apperson 1989). It was determined that 63 % of the fish community (such as northern pikeminnow, largemouth bass, yellow perch, brown trout, and rainbow trout) in Box Canyon Reservoir were potential predators to young of the year salmonids (Bennett and Liter 1991 in Bennett and Garrett 1994). Approximately 150,000 large mouth bass are stocked annually into Box Canyon Reservoir by the KNRD (Maroney, KNRD, *pers. comm.* 1999)

The operation of a weir in Skookum and Tacoma Creeks indicated that a majority of various trout species that recruit to the reservoir annually are subyearlings (25-50 mm) and are probably subject to heavy predation (Bennett and Garrett 1994). However, most of these were brown trout and very few were WCT. Eighteen WCT (46-440 mm) were captured migrating downstream (in traps) in seven tributaries (Mill, Middle, E. Branch LeClerc, W. Branch LeClerc, Cedar, Ruby, and Indian Creeks) in 1998 (KNRD, *in litt.* 1999; FERC 1999). Regardless of the level of WCT recruitment from these tributaries during the studies, it is assumed that WCT recruit from tributaries throughout the drainage, and if they recruit as subyearlings, they too would be subject to heavy predation. Available information does not identify any disease problems in this drainage.

D. <u>The inadequacy of existing regulatory mechanisms</u>

The Forest Service INFISH strategy has amended the Colville National Forest Plan to allow no new net-loss of native trout habitat (USFS 1995). Overall, INFISH has been a good tool for fisheries resource managers in this drainage with respect to having clearer direction and influence regarding timber sales and grazing management. However, INFISH works to maintain degraded aquatic habitat because it doesn’t give direction to restore degraded aquatic habitat. INFISH was originally designed as an interim policy and lacks funding to monitor projects to determine if they are within standards (Shuhda, USFS, *pers. comm.* 1999). Most streams in the New Moon Ecosystem Analyses area fail to meet the INFISH Riparian Management Objectives for width to depth ratio and pool frequency (USFS, *in litt.* 1996a; 1996b).

In tributaries that have multiple ownership where private lands are found above federal lands in the watershed, degradation of aquatic habitat on federal lands may continue even when INFISH standards are met. This is expected because the Washington Forest Practices Act has had insufficient standards in type 3, 4, and 5 streams to protect aquatic habitat and detrimental effects on channel dynamics downstream continues (Maroney, KNRD, *pers. comm.* 1999). Emergency Rules established by the Forest Practices Board for bull trout and suitable habitat amend the Forest Practices Act and provide new standards that will better protect riparian areas on state and private land where applied. However, these standards are only applied to forest practices that are initiated after the November 18, 1998, effective date and do not apply to ongoing projects nor does it do anything to enhance past indiscretions (M. Eames, USFWS, *pers. comm.* 1999).

On July 10, 1998, the Columbia River population of bull trout were listed as threatened under the Endangered Species Act. Section 7 (a) (2) of the ESA requires that any actions with Federal involvement that may affect bull trout go through the consultation process with the U.S. Fish and Wildlife Service. Where bull trout and WCT have overlapping ranges, consultation to minimize or eliminate adverse affects of the action on bull trout could be expected to minimize effects to WCT as well. However, within the Pend Oreille River drainage there are many tributary streams where bull trout are thought to be absent and consultation on actions has not occurred. Using data generated by ICBEMP for the Pend Oreille River drainage, 40 HUCs compose this drainage of which bull trout are known or predicted present in 25 HUCs, and known or predicted absent in 15 HUCs. The ICBEMP data indicates that WCT are known or predicted present in 38 of these watersheds, and known or predicted absent in two HUCs. Therefore, in 13 HUCs, WCT may not receive adequate protection from ongoing and future actions as a secondary benefit of protecting bull trout.

The Pend Oreille River and three tributary streams that WCT are known to occupy are designated as water quality limited streams under section 303 (d) of the Clean Water Act in this drainage (WDE, *in litt*. 1999). Water temperature was identified as the parameter exceeding established criteria for the Pend Oreille River, Lost Creek, and Ione Creek, while Skookum Creek exceeded criteria for fecal coliform. No TMDLs have been established in this drainage and these threats continue.

Conservation efforts to enhance habitat and populations of native WCT and bull trout have begun in tributaries to Box Canyon Reservoir in recent years. In 1995, the Kalispel Natural Resource Department (KNRD) in conjunction with WDFW initiated the Kalispel Resident Fish Project. Enhancement projects began in 1996 have accomplished riparian fencing and vegetation planting, created instream habitat, and removed a beaver dam that was a migration barrier and created new spawning habitat with its removal. This stream enhancement work has been completed in Whitman, Mineral, Middle Branch LeClerc, Forth of July, Mill, Cee Cee Ah, Browns, Skookum, and Indian Creeks (KNRD 1998, draft). The Colville National Forest has also been completing enhancement projects in LeClerc Creek that includes riparian planting and fencing (Shuhda, USFS, *pers. comm.* 1999). However, few habitat enhancement projects have been completed in tributaries to Boundary Reservoir.

A settlement between the Pend Oreille County PUD and numerous parties (Department of Interior, BIA, Kalispel Tribe of Indians, USFS, and WDFW) was reached in May 1998. The settlement ($6.3 million) was for compensation of environmental damages caused by illegal innundation of non-project lands by the PUD's Box Canyon Hydroelectric Project. The settlement will be used for environmental mitigation and enhancement. Tributary assessment and enhancement projects ($870,000) to benefit cold water fishery resources has been identified as terms of the agreement (USFWS, *in litt.* 1998). Stream assessments in Cee Cee Ah, LeClerc, Middle Creek, Ruby, Skookum and Calispell Creek watersheds will be completed over three years beginning in 1999 (KNRD, *in litt.* 1999). The settlement agreement also identified terms for: erosion control measures ($200,000), Habitat Evaluation Procedures ($238,000), habitat acquisition, restoration, and/or enhancement ($2.5 million) based on results of the Habitat Evaluation Procedures, and for erosion control and fish and wildlife projects ($900,000) on the Colville National Forest (USFWS, *in litt.* 1998). Enhancement work will begin in 1999 and continue for 4 years (H. Browers, USFWS, *pers. comm.* 1999).

E. Other natural or manmade factors affecting the species' continued existence

Rieman and Apperson (1989) summarized that while competition between WCT and nonnative fish is minimized in streams by habitat segregation, the loss of suitable WCT habitat has allowed nonnative fishes to expand into altered habitats. Brook trout tend to replace WCT where they have declined, whereas rainbow trout (once established and naturally reproducing) can displace WCT where the two overlap. Other nonnative fish species such as brown trout can influence WCT through competition and predation. Although the distribution and abundance of rainbow trout in tributary streams in Box Canyon reservoir is limited, they are more abundant in Boundary Reservoir. Rainbow trout and WCT were found to prefer the same type of habitat in the Sullivan Creek watershed and where the two coexist, hybridization is likely. These threats occur in the Pend Oreille River drainage with brown, brook, and/or rainbow trout observed in most of the tributary streams surveyed. In addition, the wide distribution and abundance of nonnative species increases fishing pressure which may aggravate the exploitation of WCT in the same waters.

Since the early 1900s, stocking programs have introduced nonnative trout and other exotic species into the Pend Oreille River watershed (Bennett and Liter 1991; Ashe and Scholz 1992). The introduction of rainbow, brown, and brook trout has greatly increased the risk of competition, predation, and hybridization. The last stocking of brook trout in this drainage was in 1992 and rainbow trout in 1993 (Shuhda, USFS, *pers. comm*. 1999). Limited genetic analysis on salmonids has been conducted in this drainage. Fish from lower Sullivan Creek were shown to be pure rainbow trout likely derived from coastal stocks and fish from Sand Creek are hybrid swarms with redband trout and coastal rainbow trout contributing (93 %) most of the genetic material and native WCT genes comprising the remaining material (Leary, *in litt*. 1997; Kanda and Leary, *in litt*. 1998).

Recent studies found that brown trout (8 of 13 streams sampled) and brook trout (12 of 13 streams sampled) are the most widely distributed and abundant trout species in tributaries to Box Canyon Reservoir. Brown trout were found to be the most abundant in downstream reaches and brook trout were highest in upstream reaches (Ashe and Scholz 1992; Bennett and Liter 1991). Rainbow trout were found to have limited distribution and abundance during these studies. When more than one nonnative salmonid is present within a tributary, the native WCT are found in low densities ranging from 0.1-13.2 fish/100 m^2 or are absent altogether (KNRD and WDFW 1995). Recent monitoring conducted by the KNRD found that in only two tributaries (of 10 surveyed), WCT had higher densities than brook trout (KNRD, *in litt.* 1999). Within the Lost Ruby and Gardin-Taco Analysis Areas, brook trout are replacing or have a competitive advantage over WCT in most stream reaches because of habitat degradation (USFS, *in litt.* 1995; USFS, *in litt.* 1998h).

In 1997, snorkeling surveys conducted in five tributary streams (Slate, Sullivan, Flume, Sweet, and Sand Creeks) to Boundary Reservoir identified that nonnative species (rainbow, brook and brown trout) were most abundant comprising 74 % of the fish observed (R2 Resource Consultants, Inc. 1998). Westslope cutthroat trout accounted for only 16 % of the fish observed and WCT x rainbow trout hybrids accounted for another 5 %. Of the nonnative species present, rainbow trout were the most abundant comprising 60 % of all fish observed. As indicated above, rainbow trout from Sullivan Creek are of coastal origin and those fish from Sand Creek are hybrid swarms of coastal rainbow, redband, and WCT.

The construction of Box Canyon Dam has created sloughs at the mouths of many tributaries where they enter the reservoir. These sloughs have areas of low or no flow and may act as thermal or migration barriers between the tributaries and the reservoir. This type of habitat is utilized by numerous fish species (native and nonnative) and a predator trap is created (Kalispel Tribe of Indians, *in litt.* 1997).

Spokane River Drainage

A. The present or threatened destruction, modification, or curtailment of the species' habitat or range

Forest management practices including timber harvest and road construction, both past and current, are major contributors to degraded watershed conditions and aquatic habitats on public lands in the Spokane River drainage managed by the Idaho Panhandle National Forests (Cross and Kasun, USFS, *pers. comm.* 1993; Isaacson 1994; Cross and Everest 1995).

During the winter of 1996-97, snow, ice, and wind, damaged or blew over trees throughout the Spokane River drainage which provided ideal breeding conditions for the douglas-fir bark beetles (USFS, *in litt*. 1999c). This resulted in an outbreak for which approximately 6,578 acres of mature Douglas-fir trees were killed. The U.S. Forest Service is currently developing the Douglas-fir Beetle Project for the purpose of harvesting trees in stands infested with bark beetle. The proposed action would harvest approximately 10,785 acres, of which approximately 1,053 acres are proposed for regeneration harvest. Regeneration harvests would likely retain less than 30 % of the stand basal area and some openings will exceed 40 acres (range 5-85 acres). Within the project area, 1,170 feet of riparian vegetation will be removed, 8.7 miles of temporary roads constructed, and 24.9 miles of roads reconstructed. The intent of the action is to harvest trees in stands infested with bark beetle that may then provide funding for vegetation and aquatic restoration. Extensive road maintenance, stream crossing removal and improvements, and road obliteration are proposed (USFS, *in litt*. 1999d). The Service and Forest Service are currently consulting on this project minimize adverse effects on fish and aquatic habitat.

Within the Spokane River drainage, the U.S. Forest Service and Bureau of Land Management have identified 1,573 and 48, respectively, ongoing or proposed actions for which bull trout consultation is occurring. This does not include proposed or ongoing actions in the entire South Fork Coeur d'Alene River drainage HUCs where bull trout are thought to be absent and consultation on actions does not occur or proposed actions that are being completed through the streamlining process (USFS, *in litt.* 1998i; Audet, USFWS, *pers. comm.* 1999).

Anthropogenic changes within the St. Joe River watershed have added to environmental disturbances in terms of magnitude and frequency that are far beyond the historic range of natural variability causing the biotic system to be compromised (USFS, *in litt.* 1998j). The most profound disturbances are from roads and road networks which have created extensive mass wasting. From Gold Creek downstream, tributary fish habitat is in an impaired condition and on a downward trend.

Development of road systems in the Spokane River drainage has contributed to extensive sediment input and poor channel conditions throughout the drainage. Road densities have been used to correlate the probability of a stream to support bull trout populations (Lee *et al.* 1997b in USFS, *in litt*. 1998e). Meaning, the higher the road densities, the lower the probability of finding strong bull trout populations. Baseline environmental conditions for road densities were considered good if densities were less than 0.7 m/m^2, moderate if densities were between 0.7 m/m^2 and 1.7 m/m^2, and poor if densities were greater than 1.7 m/m^2 (Lee *et al.* 1997b in USFS, *in litt*. 1998e). While these determinations were made for bull trout, they too can be used for assessing threats to WCT. It was determined that within the 58 HUCs the USFS and the Service are conducting bull trout consultation, road densities are considered poor in 33, moderate in 16, and good in nine (USFS, *in litt*. 1998i; 1998j). The range of road densities in these HUCs is 0.0-9.7 m/m^2. The nine HUCs that have good road densities are all located in the upper portion of the St. Joe River watershed and until road densities are reduced significantly in the remainder of the drainage, threats to WCT are considerable.

The mean residual pool volume in managed watersheds are significantly reduced as compared to unmanaged watersheds. Changes in quality and frequency of pool habitat as a result of channel destabilization has had a negative influence on the carrying capacity of WCT (Cross and Everest 1995). Dunnigan (1997) determined that the lowest WCT densities in the Coeur d'Alene River watershed coincided with watersheds that had the most intense forest practices within the past 30 years and the lowest pool frequencies. Bedload accumulation has filled many pools and turned them into riffles or glides in the North Fork Coeur d'Alene River (Davis *et al.* 1997 in draft). The mainstem St. Joe River pool habitat conditions are important for long term viability of WCT, as they utilize this area as over-wintering habitat. Juvenile WCT typically enter the substrate for cover in the winter and the larger fish congregate in pools, often in large numbers (McIntyre and Rieman 1995; Peters 1988 and Lewinsky 1986 in McIntyre and Rieman 1995). Habitat conditions from Gold Creek downstream have been and continue to be a major concern due to bedload inputs from tributary streams (USFS, *in litt.* 1998j).

Surveys using a Riffle Stability Index (RSI) provided a direct measurement of sediment aggradation, or sediment accumulation in stream riffles. The RSI numbers can range from less than 50 to 100, where 100 represents a riffle that is entirely aggraded. Values between 40 and 60 indicate riffles that are in dynamic equilibrium. Disequilibrium occurs progressively with values between 70 and 90. Twenty nine sites in unmanaged watersheds in the Coeur d'Alene and St. Joe drainages had a mean on RSI of 51, while the RSI for 268 sites in managed watersheds had an average of 79.5, indicating a trend toward disequilibrium (Kappesser 1993). The RSI at Prichard, on the North Fork Coeur d'Alene River was 60 in 1967, but by 1991 had increased to 98 (Kappesser 1993; Barnes 1967 in Kappesser 1993). In the past 25 years, a combination of road construction, timber harvest, and mining have driven this system to disequilibrium. The elevation of the channel bottom has raised more than two feet since 1967 (Kappesser 1993). The observed differences in the relative abundance of pools and riffles between managed and unmanaged watersheds suggested that sediments scoured from roaded and harvested headwater channels were aggrading in lower reaches (Cross and Everest 1995). Existing conditions are the result of cumulative impacts of more than 100 years.

Evaluation of watershed conditions in the Spokane River drainage has indicated that about 61 % of the Forest Service managed watersheds do not meet Forest Plan standards, and that this is a continuing negative trend (Kasun, USFS, *in litt.* 1992a). Streams in the most degraded condition have habitat loss, stream morphology changes, cobble embeddedness, and temperature increases.

Westslope cutthroat trout distribution and abundance in the lower St. Joe and St. Maries Rivers have declined greatly due to management activities. Within the St. Maries River watershed, poor water quality from grazing has increased water temperatures, sediment affecting spawning gravels, and nutrient levels, which were identified as a limiting factor to all life stages of WCT (Owen, USFS, *pers. comm*. 1998; USFS, *in litt.* 1998j).

Vulnerability of aquatic habitats to sedimentation was illustrated during a recurrent rain-on-snow event in the St. Joe River watershed in February 1996. Large quantities of sediments, hundreds of thousands of cubic yards, were released into streams from well over 290 sites involving road slumps, landslides, extensive stream bank erosion and debris torrents in areas generally below 4,000 feet in elevation (Patten, USFS, *in litt.* 1996, from bull trout admin. record). The majority of the sites releasing sediment resulted from past land management activities, primarily timber harvest and associated roads (Owen, USFS, *in litt.*1996, from bull trout admin. record). The resulting damages to fish habitat are expected to be long-lasting (Patten, USFS, *in litt.* 1996, from bull trout admin. record).

Watershed restoration work enabled Cougar Creek, the Autumn-Martin area in the headwaters of Steamboat Creek, and Picnic Creek, all Coeur d'Alene River watershed tributaries to withstand the February 1996 floods, although there was extensive loss of roads and sedimentation elsewhere in the watershed (Lider, USFS, *pers. comm.* 1997). In the St. Joe watershed, some recent watershed restoration work on timber sale sites, road obliterations, and check dams worked as designed in controlling sediment loading during this event (Hallisey, USFS, *in litt. 1997,* from bull trout admin. record).

Consistent with the Idaho Panhandle National Forests AES, watershed restoration work is proceeding in habitats in Gold Creek (Owen, USFS, *pers. comm.* 1997). In 1994 about 30 miles of roads were closed in Gold Creek watershed, tributary to the upper St. Joe River, and 6 miles of road are to be obliterated in 1997, as a timber sale condition. However, Gold Creek sub-drainage will remain heavily roaded. In nearby Simmons Creek, a watershed restoration project involving 50 miles of road obliteration and 15 miles of road closures leaving only the road prism was completed in 1997 (Owen, USFS, *pers. comm.* 1997).

Mining heavily negatively affected large portions of the Spokane River drainage. Impacts include discharge of massive quantities of waste materials, roading, stream diversion and alteration, watershed degradation from airborne emissions, and the release into the South Fork Coeur d'Alene River of 72 million tons of hazardous mine wastes laden with heavy metals such as lead, zinc and cadmium (Coeur d'Alene Tribe of Idaho *et al.* 1991).

During the early 1930s, the South Fork Coeur d'Alene River and about 20 miles of the lower Coeur d'Alene River were considered devoid of aquatic life due to heavy mining waste discharge (Ellis 1940). Some aquatic species have returned to the river. About 85 % of the bottom of 31,000 acre Lake Coeur d'Alene is contaminated with metals and the population and diversity of macroinvertebrates are greatly reduced (Woods, USGS, *pers. comm.* 1993, from bull trout admin. record). For more than a century, placer mining has altered aquatic habitats occupied by WCT.

Heller and Sherlock Creeks, upper St. Joe River tributaries were heavily placer mined early in this century. There was an unauthorized suction dredge operation in the Heller Creek in 1995 (Owen, USFS, *pers. comm.* 1997).

About 45 miles of the lower Coeur d'Alene, St. Joe, and St. Maries Rivers have been channelized and diked for a combination of agriculture, protection, and navigation. This action may have reduced habitat structure, and forage base productivity and diversity relative to natural conditions. During 1997, the Economic Development Administration, without prior section 7 consultation, funded and began the removal of large cottonwoods from about 5.9 miles of levees along the St. Joe River. This is anticipated to elevate water temperatures and further limit the seasonal use of this area by migratory WCT.

B. <u>Overutilization for commercial, recreational, scientific, or educational purposes</u>

Recreational fishing throughout the Spokane River drainage has caused the abundance and size of WCT to decline and is still believed to be a threat (Hunt and Bjornn 1995; Owen, USFS, *pers. comm.* 1998; Maclay 1940; Thurow and Bjornn 1978; Dunnigan and Bennett 1995; McIntyre and Rieman 1995; Davis *et al.* 1997). Within the catch and keep portion of the St. Joe River, the absence of larger fish (> 330 mm) may indicate that once WCT attain lengths near the minimum harvest size limit, anglers reduce them to possession (Horner *et al.* 1987). Until more restrictive angling regulations were implemented starting in 1970, WCT were reduced to remnant levels throughout the drainage and in some areas remain low (Bowler 1974 in Hunt and Bjornn 1995; Hunt and Bjornn 1995; Dunnigan and Bennett 1995). In the upper St. Joe River and portions of the Coeur d'Alene River, densities of WCT increased with more restrictive fishing regulations (Hunt and Bjornn 1995; Thurow and Bjornn 1978). However, these increased densities of WCT have greatly increased fishing pressure particularly in the catch-and-release section. When catch levels of 25,000 to 50,000 fish (St. Joe River), and 12,000 to 18,000 fish (Coeur d'Alene River) are experienced, high numbers of handling related mortality is likely. This is considered an ongoing threat which is expected to continue as the popularity of these rivers and fly fishing increases.

C. <u>Disease or predation</u>

Whirling disease has been documented in brook trout from Big Creek, a tributary to the South Fork Coeur d'Alene River and in white fish from the North Fork Coeur d'Alene River (University of Idaho, *in litt.* 1998). Juvenile WCT from the St. Joe River tested positive for whirling disease (University of Idaho, *in litt.* 1998).

Predation of WCT is known to occur by numerous native (bull trout and northern pikeminnow) and introduced species (lake trout, Gerrard rainbow trout, chinook salmon, and several centrarchids and ictalurids) and is an important source of mortality to WCT. Predation can act as a destabilizing force when habitat loss and overexploitation is experienced, and may make recovery extremely difficult or impossible (Rieman and Apperson 1989).

The water source (Spring Creek) for the Clark Fork Hatchery is inhabited by brook trout that have Infectious Pancreatic Necrosis (IPN). The broodstock fish (including rainbow trout and WCT) from the Clark Fork Hatchery that are used for stocking lakes, rivers, and streams in this drainage (and all of Idaho Panhandle region) are known to be infected with IPN (Horner, IDFG, *pers. comm.* 1999). This is a contagious virus that effects young fish, generally 80-90 mm in length and may cause large losses (Van Duijn 1967; Horner, IDFG, *pers. comm.* 1999). The extent of this threat in this drainage is unknown. However, because Spring Creek is also used as a water source for the town of Clark Fork, Idaho, treating the brook trout and the stream to rid it of IPN is unlikely, and fish from the Clark Fork Hatchery with IPN will continue to be propagated in this drainage (Horner, IDFG, *pers. comm.* 1999).

D. <u>The inadequacy of existing regulatory mechanisms</u>

The Forest Service INFISH strategy has amended the Idaho Panhandle National Forests plan to allow no new net-loss of native trout habitat (USFS 1995). Overall INFISH has worked to maintain degraded aquatic habitat and needs to be upgraded to restore degraded habitats (Roper, USFS, *pers. comm.* 1999). On the Idaho Panhandle Forest, about 97 % of all actions are in compliance with INFISH .

In the Coeur d'Alene River watershed, INFISH has been used to oversize replacement culverts to both assure fish passage and reduce the probability of additional sediment loading or debris torrents resulting from repeat culvert failures. There have been no objective tests of INFISH's effectiveness involving unentered drainages (Horner and Corsi, IDFG, *pers. comm.* 1997).

There have been exceptions to INFISH standards. Under local and Congressional political pressure, exceptions to INFISH were granted in the Coeur d'Alene River watershed to repair Forest Service roads following the February 1996 floods (Cross, USFS, *in litt.* 1996, from bull trout admin. record; Owen and Lider, USFS, *pers. comm.* 1997; Corsi, IDFG, *pers. comm.* 1997).

The AES adopted by the Idaho Panhandle National Forests is viewed as affirmative direction to conduct watershed restoration and maintain native fish communities (USFS, *in litt.* 1994b). The AES is directed primarily to bull trout spawning and juvenile rearing areas, with a considerable amount of WCT not addressed. The application of the AES takes a “passive” approach in watersheds that are designated as “Focal” watersheds, in that the Forest Service tends to avoid management action in these areas that would degrade habitat (USFS, *in litt.* 1994b; Roper, USFS, *pers. comm.* 1999). In other watersheds, the application of the AES is meant to take an “active” approach at restoring degraded habitat. However, restoration is not occurring as fast as it should because of funding constraints (Roper, USFS, *pers. comm.* 1999).

Forest practices on state and private lands are subject to minimum standards set forth in the Idaho Forest Practices Act (FPA). These standards are administered and enforced by the IDL and compliance in general is high (DuPont IDL, *pers. comm.* 1999; Corsi, IDFG, *pers. comm.* 1999). There are approximately 114,191 acres of endowment land in this drainage that are administered by IDL. When determined to be inadequate to protect beneficial uses, standards in the FPA are amended (DuPont, *in litt.* 1998). A recent addition to the FPA is the Cumulative Watershed Effects process developed to ensure that cumulative impacts from two or more logging operations will not impair water quality (DuPont, *in litt.* 1998).

Standards set forth in the FPA for state and private lands are generally less than those on federal lands and in some cases are inadequate (Corsi, IDFG, *pers. comm.* 1998; Roper, USFS, *pers. comm.* 1999). While the FPA affords adequate standards to keep sediment out of the streams, in some cases is inadequate in protecting the Stream Protection Zones by having minimal standards for long-term large woody debris and shade retention (Corsi, IDFG, *pers. comm.* 1998). The FPA was also found to be inadequate when looking at road densities and the hydrologic impacts of clear cutting within rain on snow zones. While the standards set forth in the FPA are considered a step in the right direction, there are still holes that need to be addressed for protecting beneficial uses of streams administered by IDL (Corsi, IDFG, *pers. comm.* 1998).

On July 10, 1998, the Columbia River population of bull trout were listed as threatened under the Endangered Species Act. Section 7 (a) (2) of the ESA requires that any actions with Federal involvement that may affect bull trout go through the consultation process with the U.S. Fish and Wildlife Service. Where bull trout and WCT have overlapping ranges, consultation to minimize or eliminate adverse affects of the action on bull trout could be expected to minimize effects to WCT as well. Bull trout within the Coeur d'Alene River watershed are considered to be functionally extinct, with only occasional individuals documented within the drainage. Because of this, most Federal actions within the Coeur d'Alene River watershed have underdone informal consultation, as opposed to formal consultation. Through the informal consultation process, the Service can only provide conservation recommendations, implementation of which are voluntary on the part of the Federal agency involved. By contrast, formal consultation often yields reasonable alternatives to reduce or eliminate adverse effects on the species.

Within the St. Joe River watershed, formal consultation affords added protection to WCT where bull trout spawning and rearing occurs. However, in tributaries where bull trout have not been documented in many years because of habitat alterations and anthropogenic influences, actions that would otherwise likely adversely affect bull trout are still occurring. Using data generated by ICBEMP for the Spokane River drainage, 166 HUCs compose this drainage of which bull trout are known or predicted present in 50 HUCs, and known or predicted absent in 116 HUCs. The ICBEMP data indicates that WCT are known or predicted present in all 166 of these watersheds. Therefore, in 116 HUCs, WCT may not receive adequate protection from ongoing and future actions as a secondary benefit of protecting bull trout.

The Comprehensive Environmental, Response, Compensation and Liability Act (1980), or superfund, has not been applied to restore large portions of the negatively affected Coeur d'Alene River or Lake Coeur d'Alene. Thus, heavy metals remain a threat in this system. In 1998, EPA declared the entire lower Coeur d'Alene River as part of the facility to be restored.

Seventy seven stream segments totaling 555.41 miles identified as occupied by WCT (roughly 36 % of total stream miles) are now designated among the water-quality-limited streams under section

303 (d) of the Clean Water Act (IDEQ, *in litt*. 1998). Sediment, temperature, habitat alteration, and metals are identified as some of the various pollutants responsible for designation on the list. Forest management and roads are the primary impact to these tributaries and associated watersheds. None of these stream segments has been remedied to date. Although there has been a limited amount of genetic analysis of WCT in this drainage, 4 stream segments (Alder Creek, Lake Creek, Copper Creek and the upper Little North Fork Coeur d'Alene River) that are on the 303 (d) list, have pure WCT documented within them (Kanda and Leary, *in litt.* 1998; Leary, *in litt.* 1995; Spruell *et al., in litt.* 1999).

Annually, IDFG collects trend information through transect monitoring and are currently attempting to identify critical habitat using radio telemetry (Horner, *in litt.* 1998). The stocking of catchable rainbow trout has been reduced and IDFG has developed a plan to construct four catch-out ponds in the Coeur d'Alene River drainage to be stocked with catchable rainbow trout (Horner, IDFG, *pers. comm.* 1999). While this would enable IDFG to eliminate the stocking program and manage for wild trout in the Coeur d'Alene River, funding constraints keeps this plan from being realized. Additional plans to enhance WCT in this drainage are not realized because of budget constraints (Horner, IDFG, *pers. comm.* 1999).

E. <u>Other natural or manmade factors affecting the species' continued existence</u>

Stocking records dating back to 1925 from the Idaho Department of Fish and Game indicates that numerous species of nonnative salmonids and various other exotic fishes have been stocked within the Spokane River drainage (IDFG, *in litt*. 1998c). In this time frame, there have been thousands of separate stockings of various amounts ranging from a few fish to several hundred thousand. With the introduction of exotic fish species, competition, predation, and hybridization has increased (Rieman and Apperson 1989). Additional stocking of nonnative fishes occurred prior to 1925 by IDFG, sportsman groups, and private individuals (Hutchinson, IDFG, *pers. comm.* 1999).

Rieman and Apperson (1989) summarized that while competition between WCT and nonnative fish is minimized in streams by habitat segregation, the loss of suitable WCT habitat has allowed for nonnative fishes to expand into altered habitats. Brook trout tend to replace WCT where they have declined, whereas rainbow trout (once established and naturally reproducing) can displace WCT where the two overlap. The coexistence of rainbow trout and WCT likely results in hybridization. These threats have been observed in the Spokane River drainage with rainbow trout and brook trout observed in many of the tributary streams surveyed. In addition, the stocking of catchable rainbow trout does not tend to displace WCT, but creates increased fishing pressure, which, along with the wide distribution and abundance of wild nonnative species, may aggravate the exploitation of WCT in the same waters (Rieman and Apperson 1989).

The presence of naturally occurring nonnative "wild" rainbow trout has been documented in the North Fork Coeur d'Alene River as far upstream as Tepee Creek and in the St. Joe River as far upstream as Ruby Creek. Naturally occurring rainbow have also been documented in the Little North Fork Coeur d'Alene River (Davis *et al.* 1997 in draft). These naturally occurring rainbows are within areas determined to be strongholds for WCT. Hybridization of WCT with rainbow trout has been documented within the drainage and is expected to continue with the increased distribution of rainbow trout.

Eutrophication of the 31,500 acre Lake Coeur d'Alene may be adversely impacting the remaining adfluvial WCT in the Spokane River drainage. Deoxygenation of the hypolimnion down to 30 % of saturation has been reported (Woods, USGS, *pers. comm.* 1993). The primary cause of the oxygen depletion is nutrient loading, particularly phosphorus released from forest management, agriculture, and sewage discharge. In addition, the benthic invertebrate component is absent, or greatly reduced, from large portions of the bottom of Lake Coeur d'Alene because of toxic concentrations of lead, cadmium, zinc, and copper in pore water and surficial lake bed sediments, adversely impacting the forage base for WCT.

Recent modeling indicates that in 10 to 20 years, eutrophication could become a self-sustaining process with large-scale release of nutrients and contaminants from lake sediments into the water column. The lake could then become uninhabitable by fish because of dissolved oxygen levels approaching zero on a regular basis (Woods, USGS, *pers. comm.* 1993). Non-point and point-source programs are now being considered to minimize nutrients loading and prevent this possibility.

Kootenai River Drainage, Idaho

A. The present or threatened destruction, modification, or curtailment of the species' habitat or range

Forest management practices, including timber harvest and road construction, both past and current, are major contributors to degraded watershed conditions and aquatic habitats on public lands in Idaho (Cross and Kasun, USFS, *pers. comm.* 1993).

Most (72 %) of the National Forest watershed area in Kootenai River drainage does not meet forest plan standards (Kasun, *in litt.* 1992a; USFS, *in litt.* 1994a), indicating a loss of physical habitat, and degraded water quality. Baseline data on watershed conditions throughout this drainage are not available to precisely quantify the rates of change. However, in recent years the proportion of watersheds in the Idaho Panhandle National Forests, including the Kootenai River drainage, not meeting forest plan standards has increased (Kasun, USFS, *pers. comm.* 1993).

Many of the tributary stream watersheds are considered "highly degraded" or "watersheds at risk" (USFS, *in litt.* 1998b). In the last 100 years, the drainage has seen a significant and different set of influencing factors with the rapid development of the area by man. These influences are in the form of large scale vegetative pattern changes and from physical stresses on the inherent stabilizing structures and functions of the watershed (USFS, *in litt.* 1998b).

Within the Kootenai River drainage, the U.S. Forest Service and Bureau of Land Management have identified 100 and eight, respectively, ongoing or proposed actions for which bull trout consultation is occurring. This does not include proposed or ongoing actions in HUCs (20) where bull trout are thought to be absent and consultation on actions does not occur or proposed actions that are being completed through the streamlining process (USFS, *in litt.* 1998b; Audet, USFWS, *pers. comm.* 1999). In the Grass Creek watershed, the Ripati grazing allotment has been identified as a threat "likely to adversely affect" bull trout because cattle have contributed to channel instability and riparian damage that delay recovery. Westslope cutthroat trout have been identified as present in Grass Creek and are expected to be adversely affected as well (USFS, *in litt.* 1998b; IDFG, *in litt.* 1998a).

The proposed Bluegrass Bound project, also in the Grass Creek watershed, contains 2,500+ acres of various silvicultural treatments that includes 10 units of regeneration type harvest that exceed 40 acres (range from 44 to 322 acres) in size and 1.1 miles of new road construction (USFS, *in litt.* 1998k). Within the Bluegrass Bound Environmental Assessment, it is indicated that the channel in the mid- and upper reaches of Grass Creek are out of dynamic equilibrium from past grazing, logging, and road activities, and display the greatest sensitivity to flood damage (USFS, *in litt.* 1998k). There is concern that these large regeneration cuts will potentially increase peak flows, which could result from rain-on-snow or rapid spring melt, and adversely impact the stream channel and fish habitat (IDFG, *in litt.* 1998d). The Bluegrass Bound project also proposes to incorporate 97 miles of road decommissioning, including installation of earthen barriers, removal of culverts, and restoration of streambeds to original grade, and 5 miles of road obliteration that involves the complete elimination of the road prism. These features are expected to improve conditions in the long-term.

The development of road systems in the Kootenai River drainage have contributed to extensive sediment input and poor channel conditions throughout the drainage. Road densities have been used to correlate the probability of a stream to support bull trout populations (Lee *et al.* 1997b in USFS, *in litt*. 1998e). Meaning, the higher the road densities, the lower the probability of finding strong bull trout populations. Baseline environmental conditions for road densities were considered good if densities were less than 0.7 m/m^2, moderate if densities were between 0.7 m/m^2 and 1.7 m/m^2, and poor if densities were greater than 1.7 m/m^2 (Lee *et al.* 1997b in USFS, *in litt*. 1998e). While these determinations were made for bull trout, they too can be used for assessing threats to WCT. It was determined that within the 16 HUCs the USFS and the Service are conducting bull trout consultation, road densities are considered poor all in 16 (USFS, *in litt*. 1998b). The range of road densities in these HUCs is 2.0-6.0 m/m^2. Until road densities are reduced significantly in this drainage, threats to WCT are considerable.

On December 10, 1998, the Federal Energy Regulatory Commission accepted the preliminary permit application for the Boundary Creek Water Power Project, FERC No. 11634 (FERC, *in litt.* 1998). The proposed “run of the river” project will be located on Boundary Creek and consist of a new diversion structure approximately 8 feet in height and 75 feet in length at elevation 3,080 MSL. Water will be diverted through a 60-inch-diameter steel penstock for approximately 26,900 feet (or 5.1 miles) into a powerhouse located at 1,780 MSL (Application for Preliminary Permit, Continental Lands, Inc., *in litt.* 1998). Westslope cutthroat trout are documented present in Boundary Creek and numerous tributaries to Boundary Creek. The U.S. Fish Wildlife Service, as well as the U.S. Forest Service and IDFG, have expressed concerns that the construction and operation of the project has the potential to create migration barriers, and destroy or degrade habitats of WCT, bull trout (listed threatened), interior redband trout, south arm (Kootenay Lake) kokanee, and burbot (USFWS, *in litt.* 1999; USFS, *in litt.* 1999e; IDFG, *in litt.* 1999).

The mainstem Kootenai River habitat has had dramatic changes beginning in the late 1800s. Attempts at diking began as early as 1892 in order to claim land for agricultural purposes (Northcote 1973 in Paragamian 1995). Today, approximately 30 miles of the Kootenai River have been diked. In 1966, construction of Libby Dam in Montana was initiated and impoundment of Lake Koocanusa and regulation of downstream flows began in 1972. From 1972 to the fall of 1975, while the turbine installation was being completed, water discharge was through the sluiceways or spillways (Partridge 1983) . The main purpose of Libby Dam is flood control; hydropower and recreation are secondary benefits. The annual flow regime of the Kootenai River has changed dramatically due to the operation of Libby Dam, and water temperatures have increased (Partridge 1983; Paragamian 1995). The river is now subject to highly variable peaking flows for power generation, resulting in daily fluctuations in water depth of one to several feet.

Following closure of Duncan Dam, Canada, in 1968 and Libby Dam in 1975, nutrients became limiting in Kootenay Lake. Based on limnological studies of Kootenay Lake, BC, Canada, Daley *et al.* (1981) concluded that Libby Reservoir is functioning as a nutrient sink that may adversely affect the forage base(s) for fish, thus reducing the carrying capacity for fish in the lower Kootenai River and Kootenay Lake.

B. Overutilization for commercial, recreational, scientific, or educational purposes

The harvest of WCT is allowed year around in the Kootenai River and most tributaries have a Memorial Day weekend opener (last weekend in May) and November 30, season closure (IDFG, *in litt*. 1998b). A 6-fish bag limit is allowed in most streams with the exception of a section of the Moyie River (2-fish bag limit). In many river drainages in northern Idaho, tributary streams and migratory corridors are closed to fishing until July 1, to prevent WCT harvest during spawning and post-spawning, and in early September to protect WCT that concentrate downstream during low-flow conditions. This protection is not afforded to WCT in this drainage and since WCT are vulnerable to angling, even relatively low fishing effort can produce high levels of exploitation (Rieman and Apperson 1989).

C. Disease or predation

Predation of WCT is known to occur by numerous native and introduced species, is an important source of mortality to WCT, and can act as a destabilizing force when habitat loss and overexploitation is experienced (Rieman and Apperson 1989).

The water source (Spring Creek) for the Clark Fork Hatchery is inhabited by brook trout that have Infectious Pancreatic Necrosis (IPN). The broodstock fish (including rainbow trout and WCT) from the Clark Fork Hatchery that are used for stocking lakes, rivers, and streams in this drainage (and all of the Idaho Panhandle region) are known to be infected with IPN (Horner, IDFG, *pers. comm.* 1999). This is a contagious virus that affects young fish, generally 80-90 mm in length, and may cause large losses (Van Duijn 1967; Horner, IDFG, *pers. comm.* 1999). The extent of this threat in this drainage is unknown. However, because Spring Creek is also used as a water source for the town of Clark Fork, Idaho, treating the brook trout and the stream to rid it of IPN is unlikely, and fish from the Clark Fork Hatchery with IPN will continue to be propagated in parts of this drainage (Horner, IDFG, *pers. comm.* 1999). Available information does not identify any other disease threats in this drainage.

D. The inadequacy of existing regulatory mechanisms

The Forest Service INFISH strategy has amended the Idaho Panhandle National Forests plan to allow no new net-loss of native trout habitat (USFS 1995). Overall, INFISH has worked to maintain degraded aquatic habitat and needs to be upgraded to restore degraded habitats (Roper, USFS, *pers. comm.* 1999). On the Idaho Panhandle National Forests, about 97 % of all actions are in compliance with INFISH .

The Aquatic Ecosystem Strategy (AES) adopted by the Idaho Panhandle National Forests is viewed as an affirmative direction to conduct watershed restoration and maintain native fish communities (USFS, *in litt.* 1994b). The AES is directed primarily to bull trout spawning and juvenile rearing areas, with a considerable amount of WCT not addressed. The application of the AES takes a "passive" approach in watersheds that are designated as "Focal" watersheds, in that the Forest Service tends to avoid management action in these areas that would degrade habitat (USFS, *in litt.* 1994b; Roper, USFS, *pers. comm.* 1999). In other watersheds, application of the AES is meant to take an "active" approach at restoring degraded habitat. However, restoration is not occurring as fast as it should because of funding constraints (Roper, USFS, *pers. comm.* 1999).

Forest practices on state and private lands are subject to minimum standards set forth in the Idaho Forest Practices Act (FPA). These standards are administered and enforced by the Idaho Department of Lands (IDL) and compliance in general is high (DuPont, IDL, *pers. comm.* 1999; Corsi, IDFG, *pers. comm.* 1998). There are approximately 24,076 acres of endowment land in this drainage administered by IDL. When determined to be inadequate to protect beneficial uses, standards in the FPA are amended (DuPont, *in litt.* 1998). A recent addition to the FPA is the Cumulative Watershed Effects process developed to ensure that cumulative impacts from two or more logging operations will not impair water quality (DuPont, *in litt.* 1998).

Standards set forth in the FPA for state and private lands are generally less than those on federal lands and in some cases are inadequate (Corsi, IDFG, *pers. comm.* 1998; Roper, USFS, *pers. comm.* 1999). While the FPA affords adequate standards to keep sediment out of the streams, in some cases it is inadequate in protecting the Stream Protection Zones by having minimal standards for long-term large woody debris and shade retention (Corsi, IDFG, *pers. comm.* 1998). The FPA was also found to be inadequate when considering road densities and the hydrologic impacts of clear cutting within rain-on-snow zones. While the standards set forth in the FPA are considered a step in the right direction, there are still holes that need to be addressed for protecting (Cleanwater Water Act) beneficial uses of streams administered by IDL (Corsi, IDFG, *pers. comm.* 1998).

On July 10, 1998, the Columbia River population of bull trout were listed as threatened under the Endangered Species Act. Section 7 (a) (2) of the ESA requires that any actions with Federal involvement that may affect bull trout go through the consultation process with the U.S. Fish and Wildlife Service. Where bull trout and WCT have overlapping ranges, consultation to minimize or eliminate adverse affects of the action on bull trout could be expected to minimize effects to WCT as well. However, within the Kootenai River drainage there are many tributary streams where bull trout are thought to be absent or individuals are most likely absent in most years and consultation on actions has not occurred. Using data generated by ICBEMP for the Kootenai River drainage, 43 HUCs compose this drainage, of which bull trout are known or predicted present in 17 HUCs, known or predicted absent in 22 HUCs, and unclassified in three HUCs. The ICBEMP data indicate that WCT are known or predicted present in 41 of these watersheds and unclassified in two HUCs. Therefore, in 22 HUCs, WCT may not receive adequate protection from ongoing and future actions as a secondary benefit of protecting bull trout.

Heavy metals released from past mining activities have been documented in the lower Kootenai River. Of those identified, copper appears to be the greatest concern biologically. Copper was found to have accumulated in oocytes of Kootenai River white sturgeon, water, and sediments from the lower Kootenai River (Apperson and Anders 1991, p. 22 and 52). Although sturgeon appeared to hatch normally, potential impacts to other aquatic biota have not been evaluated. Metals, including copper, accumulated in food chain items in the Clark Fork River have resulted in reduced growth, deformity and death in juvenile cutthroat trout (Woodward 1993). Water-quality monitoring conducted on the Kootenai River and several tributary streams by the Kootenai Tribe of Idaho showed that mercury, lead, and selenium violated EPA aquatic criteria at several sites and that arsenic, copper, and lead were found in the river sediment (USFS, *in litt.* 1998b).

Six streams in the Kootenai River drainage, Idaho, that have segments totaling 62.04 miles are now designated among the water-quality limited streams under section 303 (d) of the Clean Water Act, of which none has been restored (IDEQ, *in litt*. 1998). Sediment is identified as the primary pollutant responsible for designation on the list. Westslope cutthroat trout have been documented within all of the tributaries of these stream segments. Forest management and roads are the primary impact to these tributaries and associated watersheds.

E. <u>Other natural or manmade factors affecting the species' continued existence</u>

Stocking records dating back to 1925 from the IDFG indicate that numerous species of nonnative salmonids and various other exotic fishes have been stocked within the Kootenai River drainage (IDFG, *in litt*. 1998c). In this time frame, there have been thousands of separate stockings of various amounts ranging from a few fish to several hundred thousand. With the introduction of exotic fish species, competition, predation, and hybridization has increased (Rieman and Apperson 1989). Additional stocking of nonnative fishes occurred prior to 1925 by IDFG, sportsman groups, and private individuals (Hutchinson, IDFG, *pers. comm.* 1999).

Hybridization with coastal rainbow trout and interior redband trout continues to threaten WCT in the Kootenai River drainage of Idaho. Stocking of coastal rainbow trout and Yellowstone cutthroat trout in a majority of the streams and lakes in the Kootenai River drainage was common in the past and rainbow trout stockings still occurs to a lesser extent today (IDFG, *in litt*. 1998c). Where pure populations of WCT occupy headwater streams and hybrids or stocked nonnative fish occupy the lower portion of the same stream, if no migration barrier exists to prevent the movement upstream, the threat of hybridization to pure WCT stream populations is great (Perkinson, USFS, *pers. comm.* 1998). Compounding this threat is the stocking of high-mountain lakes. Even where upstream migration barriers exist to prevent hybridization, if high-mountain lakes are stocked with nonnative trout species, downstream migration from the lake is possible and hybridization may then be incurred throughout the stream.

Rieman and Apperson (1989) summarized that while competition between WCT and nonnative fish is minimized in streams by habitat segregation, the loss of suitable WCT habitat has allowed for nonnative fishes to expand into altered habitats. Brook trout tend to replace WCT where WCT have declined, whereas rainbow trout (once established and naturally reproducing) can displace WCT where the two overlap. The coexistence of rainbow trout and WCT likely results in extensive hybridization. These threats occur in the Kootenai River drainage, where rainbow trout and brook trout have been observed in many of the tributary streams surveyed. In addition, the stocking of catchable rainbow trout does not tend to displace WCT, but creates increased fishing pressure. This, along with the wide distribution and abundance of wild nonnative species, may aggravate the exploitation of WCT in the same waters.

Upper Columbia River Drainage, Washington

Methow River Watershed

A. The present or threatened destruction, modification, or curtailment of the species' habitat or range

In portions of the mainstem Methow River, habitat has been and continues to be adversely modified. Channelization or stream alteration has occurred along 35 miles, 22 % of the Methow River (Mullan *et al.* 1992). Sediment delivery is estimated to be about 10 % greater than natural background loading (Mullan *et al.* 1992). About 60 % of the private bottomlands in the Methow Valley are grazed and have erosion problems. The greatest rates of stream bank sloughing and cutting occur in these grazed areas (PNBRC 1977, in Mullan et al. 1992). Agricultural dewatering in the mainstem Methow River between RM 27 and RM 67 decreases natural average flows between 28 % in August and 79 % in October (Mullan *et al.* 1992). During 1987, Mullan observed salmonids isolated in pools in a 10-mile reach in the upper Methow River between September 1 and mid-September (Mullan *et al.* 1992). By November the pools had dried and the fish had died. Sediment loading from a huge fire in the Chewuck River drainage in 1929 is believed to have filled pools (fish habitat) in the lower Methow River (Molesworth, USFS, *pers. comm.* 1997). However, the extent of pools has increased in the lower Methow River in recent decades (McIntosh and Sedell 1994).

Past fires in the headwaters involving riparian habitat have exposed the stream to insolation and increased water temperatures (WDFW, *in litt.* 1995). Cattle grazing within wilderness remains a problem because of riparian vegetation reduction and stream bank degradation (Molesworth, USFS, *pers. comm.* 1997; WDFW, *in litt.* 1995).

The West Fork Methow River is naturally subject to flash floods and debris torrents. It is also subject to hot, relatively destructive fires. It receives some protection through designation as a Scenic Recreational Area and by inclusion as late successional reserve under the Northwest Forest Plan (Molesworth, USFS, *pers. comm.* 1997). Since 31 % of the fires in the Okanogan National Forest are man-caused, this land use management increases the area's vulnerability to fire, runoff rates and sedimentation (Mullan *et al.* 1992). The R. D. Merrill, Arrow Leaf Resort and destination community is planning to develop the mouth of West Fork Methow River, resulting in increased levels of human use of all types (Molesworth, USFS, *pers. comm.* 1997).

Presently, the reach of Lost River occupied by WCT is considered secure from man caused habitat alternation within the Pasayten Wilderness. The lower mile of the Lost River has been altered but connectivity with the Methow River remains (Molesworth, USFS, *pers. comm.* 1997). This lower reach has been partially channelized, and urbanization is occurring, but there are no significant water withdrawals.

The old-growth timber in the Early Winters drainage is vulnerable to high-intensity fire, with subsequent sediment loading and/or debris torrents (Molesworth, USFS, *pers. comm.* 1997). The upper drainage of Early Winter Creek is protected as a Scenic Recreational Corridor and as late successional reserve under the Northwest Forest Plan (Molesworth, USFS, *pers. comm.* 1997). However, the lower 0.5 to one mile of Early Winters Creek has been channelized and large woody debris removed. It has been targeted for development as a planned community of 600 homes, stores and a golf course in the flood plain spanning both banks near the mouth.

Goat Creek experienced extremely heavy timber harvest including logging in riparian zones, heavy roading, and log skidding in the stream during the 8 million board-feet (MBF) Panther sale that was to be completed in 1997. This sale involved clear-cuts in old growth and would not be allowed under current guidelines (Molesworth, USFS, *pers. comm.* 1997). The Forest Service recently awarded contract on a 3 MBF fire salvage sale in this drainage. A portion of this drainage, including a newly logged area thought to be fire resistant, recently burned (Molesworth, USFS, *pers. comm.* 1997) . Most of the stream banks in the Goat Creek drainage have been logged, exposing the waters to insolation and increasing temperature, but a small patch of intact riparian habitat remains above river mile 10 where logging did not occur on the stream banks (Molesworth, USFS, *pers. comm.* 1997; WDFW 1997; WDFW, *in litt.* 1995).

Fish passage is seasonally blocked where Goat Creek enters and submerges into an alluvial fan at its mouth from late July to October (Molesworth, USFS, *pers. comm.* 1997; WDFW 1997). Extreme timber harvest and roading may contribute increased bedload, alluvial fan formation, and reduced summer/fall flows.

Westslope cutthroat trout of the Methow River watershed are isolated in fragmented habitats created by natural barrier and/or habitat modifications (Molesworth, USFS, *pers. comm.* 1999). This presents an elevated risk to their survival in these tributaries in the instance of catastrophic events.

B. <u>Overutilization for commercial, recreational, scientific, or educational purposes</u>

Overutilization of resident WCT is not considered a notable threat in this drainage. Most WCT throughout the historic and introduced range occupy habitat that is not easily accessible to anglers and in general, the WCT are very small and not selected for by anglers (WDFW, *in litt.* 1998b). Near campsites and other recreation sites in downstream reaches, WCT may reach larger sizes, and harvest may increase. This as well is not considered to be a serious threat to WCT because recruitment from surrounding areas may be sufficient to resist over-exploitation. However, WCT are known to be susceptible to harvest and even low harvest levels can attenuate densities when habitat loss and competition are encountered (Rieman and Apperson 1989).

The fluvial WCT form occurs in very low numbers in the mainstem Methow River and is believed to have been decimated in the past from multi-species fisheries (WDFW, *in litt.* 1998a; Molesworth, USFS, *pers. comm.* 1999). In recent years, according to angler reports, the fluvial WCT have shown a positive response to selective gear rules, and regulations that closed waters to fishing for bull trout and steelhead (Williams, WDFW, *pers. comm.* 1999). Nonetheless, densities are still very low. However, 2 WCT over 12 inches can be harvested in the Methow, Chewuck, Lost, and Twisp Rivers, and 2 fish over 8 inches from tributaries beginning June 1 (WDFW, *in litt*. 1998b). This may leave post-spawn WCT that are still in or migrating out of tributary spawning areas susceptible to harvest.

C. Disease or predation

Predation of WCT is known to occur by numerous native and introduced species, is an important source of mortality to WCT, and can act as a destabilizing force when habitat loss and overexploitation are experienced (Rieman and Apperson 1989). Available information does not identify any disease problems in this drainage.

D. The inadequacy of existing regulatory mechanisms

The Northwest Forest Plan applies in the mainstem and west side tributaries of the Methow River and in the mainstem and west side tributaries of the Chewuck River, and PACFISH or INFISH applies in the remainder of the Methow River watershed. Both are viewed as no-net-loss of aquatic habitat guidance rather than affirmative and funded habitat restoration (recovery) direction (Molesworth, USFS, *pers. comm.* 1997). However, there has been a small net reduction in roads in the areas covered by the Northwest Forest Plan (Molesworth, USFS, *pers. comm.* 1997). State water law may provide a basis to evade installation of a fish screen on Wolf Creek in which WCT currently occupy. Some diversions are exempt from state regulation because of "grandfathering" provisions.

On July 10, 1998, the Columbia River population of bull trout was listed as threatened under the Endangered Species Act. The ESA requires that any actions with Federal involvement that affect bull trout go through the consultation process with the U.S. Fish and Wildlife Service. Where bull trout and WCT have overlapping ranges and consultation to eliminate adverse effects of the action on bull trout is completed, beneficial effects are expected for WCT. Within the Methow River watershed, WCT were believed to historically occupy 30.7 miles of habitat for spawning and early rearing, of which they currently utilize 22.7 miles. Bull trout are believed to currently occupy portions of the same habitats or occur in the same HUC, therefore WCT may receive adequate protection from ongoing and future actions as a secondary benefit of protecting bull trout. In addition, on March 24, 1999, spring chinook salmon were listed as an endangered species in the Methow River by the National Marine Fisheries Service, and summer steelhead were previously listed by the National Marine Fisheries Service. Measures implemented for the protection of these species are expected to benefit WCT as they occur in the same HUCs (G. Knott, USFS, *pers. comm.* 1999).

The following are Clean Water Act Section 303(d) water quality limited streams where WCT occupy some portion of the drainage: Methow River, Chewuck River, Wolf Creek, Early Winters Creek (WDE, *in litt*. 1999). All are limited by low instream flows. The Methow River is also temperature-limited. The Service is aware of no ongoing program that is now specifically removing these listed limitations. Some limitations involving agricultural water diversions may be exempt from regulation through "grandfathering" provisions. No TMDLs have ever been completed in the Methow drainage.

E. Other natural or manmade factors affecting the species' continued existence

Since the early 1900s, stocking programs have introduced nonnative trout into the Methow River watershed (WDFW, *in litt.* 1998a). The introduction of rainbow and brook trout has greatly increased the risk of competition, predation, and hybridization.

Rieman and Apperson (1989) summarized that while competition between WCT and nonnative fish is minimized in streams by habitat segregation, the loss of suitable WCT habitat has allowed nonnative fishes to expand into altered habitats. Brook trout tend to replace WCT where WCT have declined, whereas rainbow trout (once established and naturally reproducing) can displace WCT where the two overlap. These threats occur in the Methow River watershed with brook and rainbow trout observed in many of the tributary streams surveyed. Brook trout have replaced WCT in Eightmile Creek and the stocking of rainbow trout in tributaries that WCT occupy has resulted in some degree of introgression in almost all tributaries in this drainage (WDFW, *in litt.* 1998a; Williams, WDFW, *pers. comm.* 1998; Proebstel *et al.* 1997; USFS, *in litt.* 1998l). In addition, the wide distribution and abundance of nonnative species increases fishing pressure, which may aggravate the exploitation of WCT in the same waters (Rieman and Apperson 1989).

Lake Chelan Watershed

A. The present or threatened destruction, modification, or curtailment of the species' habitat or range

The construction of Lake Chelan Dam in 1928 raised the water level of the lake by 24 feet and inundated potentially important spawning habitat of adfluvial WCT at the mouths of tributary streams (USFS, *in litt.* 1999f; Brown 1984). Additional effects from dam construction include changes in the composition of materials deposited in stream deltas; riparian vegetation; and quality and quantity of water at these sites (USFS, *in litt.* 1999b).

Within the North Shore Watershed Analyses area, many riparian areas are lacking large trees, snags, and large woody debris that moderate water temperatures, and provide stability and habitat within the stream. The limiting factors for the lack of large woody debris are many, with management history such as logging, natural geomorphologic variables, and natural disturbances such as fire, having an impact on wood input (USFS, *in litt.* 1998d). Flood plains, particularly in the dissected mountain slope zone are no longer functioning properly because down cutting of the channel has dewatered the riparian area resulting in decreased levels of nutrient and woody debris being delivered to the stream channel during annual flood events (USFS, *in litt.* 1998d). In general, the resource use along the north shore has been moderate to intense with many alterations to the environment as a result of irrigation diversions, logging, grazing, orchard, residential and urban development, along with the compounding effects of fire suppression leading to larger and more damaging fires. These changes have occurred in an incremental fashion, building upon previous changes and alterations (USFS*, in litt.* 1998d).

Stream surveys of eight north shore tributaries from 1990-1993 indicated that none of the streams conformed to expected pool frequencies or the Forest Plan Standard for pools. Fine-sediment deposition in pools and embeddedness > 35 % was identified as a problem in many (6 of 8) of these tributaries. The amount of large woody debris (4 of 8 tributaries) and water temperature (3 of 8 tributaries) was also determined to not meet Forest Plan Standards in numerous tributaries (USFS*, in litt.* 1998d).

Early in the century, increased grazing by sheep and cattle was not well regulated and created watershed concerns. By the 1930s grazing began to decline, but continues today. Following wildfires in 1968 and 1970, cattle grazing increased to take advantage of abundant forage created by the fires (USFS*, in litt.* 1998d). These wildfires were large and severe. Recovery was observed to be swift, with the regrowth of shrubs and grasses occurring within a few months in areas that received little or no management. However, in areas that received increased levels of grazing and salvage logging, combined with high spring flows, the results were devastating. Extensive rehabilitation 20 years after the disturbance was required and it is estimated that it will take 50-100 years to restore the natural function of the system. High-intensity fires continue to be a be a threat in this drainage because of current vegetation and fuel conditions, combined with weather patterns and land type (USFS*, in litt.* 1998d).

B. <u>Overutilization for commercial, recreational, scientific, or educational purposes</u>

In about 1903, the State of Washington began operating a WCT fish hatchery at Stehekin, into which, until 1923, were taking 0.5 to1.5 million eggs annually (Buckner*, in litt.* 1977; WDFW.*, in litt.* 1998). Adult WCT were captured in 13 traps located in the sloughs on both sides of the Stehekin River (Buckner*, in litt.* 1977; Brown 1984) . In 1916, 1,697 female WCT were trapped and, in most years until 1923, between 500 to 1,300 females were taken for eggs. In 1927, only 9 female WCT were captured at the trap (Brown 1984). Very few of the eggs were returned to Lake Chelan or its tributaries but were planted elsewhere in the state. This level of egg take was not sustained for long and by 1927 the hatchery was closed because adult WCT were depleted and only 6,000 eggs were obtained (Buckner*, in litt.* 1977; Brown 1984).

Overutilization of resident WCT by anglers is not considered a threat in this drainage (WDFW*, in litt.* 1998a). Most WCT occupy habitat that is not easily accessible to anglers and, in general, the WCT are very small and not selected for by anglers. Near campsites and other recreation sites in downstream reaches, WCT may reach larger sizes, and harvest may increase. This as well is not considered to be a serious threat to WCT because recruitment from upper reaches is high. Overutilization of adfluvial WCT by anglers early in this century was significant, and while the current level of harvest is much less, it continues to contribute to the depressed status of WCT in this drainage, and even the slightest angling mortality could significantly affect escapement and recruitment of naturally produced fish (Brown 1984; USFS, *in litt.* 1998d). Westslope cutthroat trout are known to be susceptible to harvest, and even low harvest levels can attenuate densities when habitat loss and competition is encountered (Rieman and Apperson 1989).

In 1981 and 1982, creel census surveys estimated that anglers harvested 352 and 334 WCT, respectively. However, the effort in 1982 was almost double that in 1981. The WCT harvested in both years consisted primarily of females, with 43 of 54 that were identified to sex being females (Brown 1984).

C. Disease or predation

Predation on WCT is known to occur by numerous native (bull trout and northern pikeminnow) and introduced species (lake trout, rainbow trout, chinook salmon, and smallmouth bass). Predation is an important source of mortality in WCT, and can act as a destabilizing force when habitat loss and overexploitation occur (Rieman and Apperson 1989). Lake trout, first stocked in Lake Chelan in 1980, have established a naturally reproducing population and are known to be a significant predator to WCT (Mauser *et al.* 1988). Nonnative species continue to be stocked, with approximately 500,000 rainbow trout, 75,000 lake trout, and 200,000 chinook salmon propagated annually (Archibald, USFS, *pers. comm.* 1999).

Available information does not identify any disease problems confronting WCT in this drainage. However, in 1951, large numbers of sick and dying bull trout with a gray slime or fungus growth were observed along the shores near Stehekin. Few bull trout were observed after that time and were last documented in 1958 (USFS, *in litt.* 1999f).

D. The inadequacy of existing regulatory mechanisms

In 1994, the Northwest Forest plan amended the Wenatchee Land and Resource Management Plan, which had been signed in 1990 (USFS, *in litt.* 1998d). These plans are providing adequate protection to aquatic habitat and give preference to native species (Archibald, USFS, *pers. comm.* 1999). Habitat-restoration efforts have occurred in numerous tributaries but are limited in this drainage. The most profound restoration efforts have occurred in Mitchell Creek, where in 1970 a large fire in combination with high flows and excessive management had devastating affects on aquatic habitat and WCT were eliminated. The Forest Service has done considerable road work, riparian restoration, vegetation planting, upslope repair, and erosion-control efforts in this drainage to stabilize the system. Recent water-temperature data indicated that Mitchell Creek now is one of the only streams that does not exceed the 61 F maximum water-quality criterion. This, along with improved physical habitat from restoration efforts, now makes Mitchell Creek capable of supporting WCT (Archibald, USFS, *pers. comm.* 1999). Culvert repair has also occurred in several tributaries and no new road systems have been built in this drainage. Road obliteration is occurring annually, with approximately 20 miles of the Grade Creek road restored since 1990.

On July 10, 1998, the Columbia River population of bull trout was listed as threatened under the Endangered Species Act. Section 7 (a) (2) of the ESA requires that any actions that involve federal agencies and may affect bull trout go through the consultation process with the U.S. Fish and

Wildlife Service. Where bull trout and WCT have overlapping ranges, consultation to minimize or eliminate the adverse effects of the action on bull trout could be expected to minimize such effects on WCT as well. However, within the Lake Chelan watershed, bull trout are thought to be extirpated and consultation on actions does not occur. Therefore, the benefit of bull trout consultation does not apply in this drainage.

Lake Chelan and five tributary streams in this drainage appear on the 303 (d) list of the Clean Water Act (WDE, *in litt*. 1996). Westslope cutthroat trout are known to occur in Lake Chelan and within four of the tributaries on the list. Parameters for listing these streams include elevated levels of arsenic, pH, and pesticides. To date, none has been addressed through TMDLs.

E. <u>Other natural or manmade factors affecting the species' continued existence</u>

Since the early 1900s and continuing today, hatchery stocking programs have introduced nonnative trout and other exotic species (rainbow trout, kokanee, lake trout, chinook salmon, brook trout, and small mouth bass) into the Lake Chelan watershed (WDFW, *in litt.* 1998a, USFS, *in litt.* 1998d; Brown 1984). These introductions have greatly increased the risk of competition, predation, and hybridization. Lake trout, which are known to be a significant predator to WCT, were first stocked into the lake in 1980, have established a naturally reproducing population. Where WCT and rainbow trout occur together in this drainage, rainbow trout densities were reported to be 7.3 times greater than WCT (Brown 1984 in USFS, *in litt.* 1999b). Lake trout, rainbow trout, chinook salmon, and kokanee are the emphasis of the nonnative fishery in the lake (USFS, *in litt.* 1999b; 1998d). In addition to nonnative fish species, mysid shrimp were introduced into Lake Chelan as a food source for kokanee in 1967, and were established by 1975 (Brown 1984).

Up to 700,000 Yellowstone cutthroat trout eggs were received at the Chelan State Fish Hatchery between 1930 and 1941 (Varley 1979 in Proebstel *et al.* in draft). Most stockings of Yellowstone cutthroat trout occurred in high-mountain lakes, where successful establishment of reproducing populations was limited (Williams, WDFW, *pers. comm.* 1999). Another stocking program in Washington, starting around 1912, propagated WCT X rainbow trout hybrids from Dumphkey Lake (Behnke 1992; Brown 1984). These hybrids, a result of young steelhead stocked in 1904 and WCT from Lake Chelan in 1906, were used in an egg-taking operation and eventually stocked in many streams in Washington. However, stocking records do not exist for these operations and distribution of this fish is unknown (Crawford 1979 in Behnke 1992; Cranford 1912 in Behnke 1992).

Rieman and Apperson (1989) summarized that while competition between WCT and nonnative fish is minimized in streams by habitat segregation, the loss of suitable WCT habitat has allowed for nonnative fishes to expand into altered habitats. Brook trout tend to replace WCT where WCT have declined, whereas rainbow trout (once established and naturally reproducing) can displace WCT where the two overlap. Other nonnative fish species, such as chinook salmon, kokanee, and lake trout, can affect WCT through competition and predation. These threats occur in the Lake Chelan watershed, where rainbow trout have been observed in many of the tributary streams surveyed. The wide distribution and abundance of rainbow trout in this drainage has likely resulted in hybridization and genetic dilution where they coexist with WCT (Brown 1984;). In addition, the stocking of catchable trout does not tend to displace WCT but creates increased fishing pressure. This, along with the wide distribution and abundance of wild nonnative species, may aggravate the exploitation of WCT in the same waters (Rieman and Apperson 1989). Brown (1984) postulated that while WCT are highly desired by anglers, the WCT fishery is mostly incidental to kokanee and rainbow trout angling.

Clearwater River Drainage

A. The present or threatened destruction, modification, or curtailment of WCT habitat or range

Timber management and grazing are the primary land uses occurring in the Clearwater River drainage. Most of the WCT habitat in the drainage is under the management jurisdiction of the Clearwater National Forest and the Nez Perce National Forest. Land management on these National Forests may have adversely affected WCT habitat in the past. For example, Jones and Espinosa (1992) determined that 71 percent of the stream or watershed areas in the managed portion of the Clearwater National Forest did not meet Land Resource Management Plans (LRMP) standards. However, this figure is apparently outdated (Bosworth, USFS, *in litt.* 1998). Similarly, 67 percent of the non-wilderness portion of the Nez Perce National Forest did not meet LRMP standards, and streams in the most degraded category increased 12 percent over a five year period between 1987 and 1992 (Gloss and Gerhardt 1992). Davis and Horner (1995), however, did not find an association between timber harvest or stream habitat and cutthroat trout density in six stream in the Little North Fork Clearwater River watershed.

Much of the Selway River and Lochsa River watersheds are within the boundaries of the Selway-Bitteroot Wilderness Area, and aquatic habitat is largely unaltered by timber management. In addition, large, unaltered roadless tracts occur in the upper North Fork Clearwater River and Lochsa River watersheds, which have been proposed for wilderness inclusion since the late 1980s.

In addition to the mainstem Clearwater River, several tributaries to the South Fork Clearwater River have been affected by road construction, dredge mining, logging, grazing and stream channel alterations in the past (CBBTTAT 1998c). Tailing piles from dredge mining activities between 1920 and 1950 are a common occurrence in parts of the Newsome Creek, American River, and Crooked River flood plains (Gearhardt, *pers. comm.* 1997). Moynan and Paradis (1996) recognized the need for restoration in this drainage since the early 1980s, and demonstrated how BPA, Nez Perce National Forest, other agencies, and concerned user groups have been coordinating efforts since that time to restore aquatic habitat. They also recognized that many of the negative effects, primarily those associated with mining and up-slope management remain problematic. The loss of riparian function and vegetation is chronic in areas where past dredge mining activities have inundated the flood plains with dredge tailing piles, but past efforts to rehabilitate these sites have been obstructed by the preservation of the tailing piles as a culturally significant resource (Gearhardt, *pers. comm.* 1997). The effects from past land management in this drainage is expected to continue for many years to come.

In the lower Clearwater River watershed, the Clearwater Basin Bull Trout Technical Advisory Team (CBBTTAT 1998a) reported threats to bull trout (which may also be applicable to WCT) that included legacy effects of timber harvest, roads, agriculture and livestock grazing, ongoing mining, and urbanization. In the North Fork Clearwater River and South Fork Clearwater River watersheds, the CBBTTAT (1998b; 1998c) reported threats to bull trout resulting from ongoing timber harvest, roads, agriculture and livestock grazing, and mining, and, in the North Fork Clearwater River watershed, legacy effects of intense fire. In the Lochsa River watershed, the

CBBTTAT (1998d) reported that Highway 12 has encroached on the main river, roads in the Squaw Creek area are a constant source of sediments and a culvert is an impassable barrier to WCT. Although some logging and road construction have been conducted in the Selway River watershed, much of the watershed is in a designed wilderness area. A culvert on Boyd Creek and dam on Johnson Creek may be barriers to fish movement (CBBTTAT 1998d).

B. Overutilization for commercial, recreational, scientific, or educational purposes

Angling regulations for westslope cutthroat trout in the Clearwater River basin currently specify catch-and-release or, in areas open to harvest, two fish per day with a 14-inch size limit (IDFG, *in litt.* 1998a). Hunt and Bjornn (1991) found higher densities of cutthroat in the North Fork Clearwater River watershed and Lochsa River watershed in areas open to catch-and-release angling than areas open to harvest. However, the response of westslope cutthroat trout to fishing regulations may be dependent on stream habitat conditions (IDFG, *in litt.* 1998a). The CBBTTAT (1998d) reported that fishing pressure is high at accessible areas in the Selway River watershed.

C. Disease or predation

Whirling disease, caused by a protozoan parasite that requires an oligochaete as its intermediate host, has been documented in Idaho. Whirling disease may pose a threat to WCT where WCT coexist with both the protozoan and its intermediate host. In the Clearwater River basin, adult rainbow trout infected with the parasite were detected in the American River (University of Idaho, *in litt.* 1998).

Predation on WCT by native species (e.g., bull trout and northern pikeminnow) and introduced species is a source of mortality to WCT, and the effects of predation can be exacerbated for WCT that are over-exploited or inhabit degraded habitats (Rieman and Apperson 1989). We are unaware of the degree of threat disease and predation poses to WCT in the Clearwater River basin.

D. The inadequacy of existing regulatory mechanisms

A variety of state and federal laws and regulations, if properly administered, protect aquatic habitats and reduce threats to WCT in the Clearwater River drainage. For example, Idaho has adopted a Forest Practice Act (FPA) consisting of rules and regulations addressing forest management. In general, the legislation establishes best management practices (BMPs) to be implemented on forests, such as regulations for activities allowed in riparian areas, restrictions on harvest adjacent to streams, and location of road construction. Although audits show that compliance with BMPs is high in Idaho (Malany, Idaho Forest Practice Act Advisory Committee Member, *in litt.* 1997), the Service is not aware of specific evaluations of various BMPs relative to the protection of WCT habitat and processes affecting water quality, such as water temperature, recruitment of woody debris, and bank stability. In Idaho, half of timber sales audited resulted in contributions of sediment to streams, largely from inadequately maintained roads (Zaroban *et al.* 1997). Even with high implementation rates, Idaho's forestry BMPs have been ineffective at maintaining beneficial uses, including coldwater biota (McIntyre 1993). In addition to the Idaho

FPA, the Stream Channel Protection Act and Idaho Code 36-906 require unrestricted fish passage at road crossings on fish-bearing streams.

Federal regulations that protect WCT habitat include the Clean Water Act (including sections 401 and 404 permits), which regulates discharge or placement of dredge or fill material in to U.S. waters. However, several bodies of water in the Clearwater River basin were identified on the 1996 303(d) list for not fully supporting beneficial uses. These included 41 in the lower Clearwater River (CBBTTAT 1998a), 41 in the North Fork Clearwater River (CBBTTAT 1998b), 56 in the South Fork Clearwater River (CBBTTAT 1998c), and 13 and 25 for the Selway and Lochsa rivers, respectively (CBBTTAT 1998d). Sediment was the most common reason for water bodies to appear on the list. A cursory inspection of the draft 1998 303(d) list indicated that at least 14 listed water bodies correspond to streams inhabited by WCT.

Numerous management programs and other actions are being implemented to eliminate or ameliorate the adverse effects on WCT of past, present, and proposed forestry practices in the Clearwater River basin. The Interim Strategies for managing Anadromous Fish-producing Watersheds in Eastern Oregon and Washington, Idaho and Portions of California, known as PACFISH, and INFISH, both of which include riparian and stream habitat management guidance, are being applied to federal lands in the Clearwater River basin. Because WCT distribution overlaps with listed fish species (e.g., chinook salmon, steelhead, and bull trout) in the basin, consultations conducted under section 7 of the ESA will likely afford benefits to WCT.

On private lands in the Clearwater River basin, Plum Creek Timber Company is developing a Native Fish Habitat Conservation Plan that includes provisions for the conservation of WCT on their lands (M. Jostrom, Plum Creek Timber Company, *in litt.* 1998). Applicable areas are primarily in the Lochsa River drainage. The Potlatch Corporation has recently contacted the Service about their work to develop a Stewardship Plan for WCT on their lands, which include 675,000 acres in the Clearwater River and St. Joe River basins (T. Cundy, Potlatch Corporation, *pers. comm.* 1999).

E. <u>Other natural or manmade factors affecting the continued existence of WCT</u>

Habitats in streams in the Clearwater River basin were adversely affected by high-flow events during 1995-1996, which triggered land slides. Many slides were associated with high densities of logging roads (McLaud, Idaho Conservation League, *in litt.* 1997). The continued existence of these roads will cause a chronic sediment source to habitats and may affect survival of early life-history stages of WCT.

Hybridization, introgression, and interactions with introduced fishes poses a threat to WCT. Cochnauer *et al.* (1996) reported abundant brook trout populations in two lakes and natural reproduction of stocked rainbow trout in another lake, all in the North Fork Clearwater watershed, and stocking of catchable rainbow trout in tributaries of the lower Clearwater River and South Fork Clearwater River. The CBBTTAT (1998a; b) reported that 15 species of fish have been introduced in Dworshak reservoir (North Fork Clearwater River watershed) and may occur downstream in the lower Clearwater River, and that 10,000 lbs. of rainbow trout are stocked annually into the reservoir. The CBBTTAT (1998c; d) reported that brook trout occur in the South Fork Clearwater, Lochsa, and Selway rivers.

Salmon River Drainage

A. The present or threatened destruction, modification, or curtailment of WCT habitat or range

The majority of the Salmon River drainage is in Federal ownership under the jurisdiction of six National Forests and the Bureau of Land Management. The Frank Church-River of No Return and Gospel Hump wilderness areas encompass over 2.3 million acres along the mainstem Salmon, lower reaches of the South Fork Salmon, and almost all of the Middle Fork Salmon River basins. Aquatic habitats in these areas are protected from the effects of many activities. However, activities occurring higher in the drainage (e.g., in the South Fork Salmon River, Bear Valley Creek, Panther Creek, and the upper Salmon River watershed, including the Pahsimeroi and Lemhi rivers) may affect habitat in designated wilderness areas downstream. Evidence from upstream activities has been observed in the designated wilderness from mining (Thurow 1985), irrigation withdrawals in the Lemhi River (Dorratcaque 1986), timber harvest in the South Fork Salmon River (Chapman *et al.* 1991), and livestock grazing in Bear Valley (Thurow 1985).

In the Little Salmon River watershed, livestock grazing in riparian areas adjacent to Rapid River was identified as a potential problem, and in 1993, the Payette National Forest proposed to modify those grazing allotments associated with the Rapid River (NMFS 1993). The proposed grazing allotment changes were implemented in 1994, along with modifications of several other allotments to benefit chinook salmon (Uberagua, *pers. comm*. 1997) . In Boulder Creek drainage, near Rapid River, land management is more intensive than that occurring in the Rapid River drainage, and as a result, habitats are in poorer condition. Past timber management activities have harvested riparian stands in addition to reducing in-stream large woody debris, and the effects from this are still evident (Overton *et al.* 1993). Additional activities in Boulder Creek include roading, grazing, water diversion, recreation, and fuelwood gathering (Overton *et al.* 1993). The Yantis Ditch diverts a substantial amount of water (estimated at 80-90 % of the main flow of Boulder Creek) out of the Little Salmon watershed, and into the Wieser River watershed (Overton *et al.* 1993; NMFS 1993).

Several diversions near the mouth of Thompson Creek in the upper mainstem Salmon drainage dewater the creek during irrigation season (SBBTTAT 1998). Water diversion also affects habitat in other areas of the Salmon River basin, such as in the Pahsimeroi and Lemhi rivers (SBBTTAT 1998). Recent actions, however, have been undertaken by the Bureau of Reclamation for water conservation at irrigation diversions in the mainstem Salmon and Lemhi rivers (McClendon, *in litt.* 1997).

Most of central and north-central Idaho, including the Salmon River drainage, is in a geographic region known as the Idaho Batholith. This area is typically characterized as a granitic soil composition with extremely high erosion potential and poor slope stability. Recovery potential of disturbed sites is poor due to thin organic horizons. Salvage logging of fire-damaged trees in the South Fork Salmon watershed from the 1940s to 1960s caused mass movements of unstable soils, and long-term damage to aquatic habitat (Thurow 1987). Logging activities continue today in the watershed.

The Idaho Batholith is also rich in mineral deposits, and as a result, mining is a common land use in much of the drainage. Mining has and continues to occur in several locations, such as in the South Fork Salmon River watershed (Schuld and Apperson 1998). Mines such as the Cinnabar and Stibnite mines, located in Sugar and Meadow creeks in the East Fork of the South Fork Salmon River, may also be negatively affecting fish, including WCT, in the watershed. Efforts to rehabilitate abandoned mines have been attempted with little success except for Bear Valley Creek (Middle Fork Salmon watershed) and the Yankee Fork (tributary to the mainstem Salmon), where efforts were undertaken to improve ESA-listed chinook salmon habitat (Esch and Hallock undated).

In the Middle Fork Salmon River watershed, Grunder *et al.* (1990) reported that mining continues to be a major source of concern in the Big Creek drainage. Also in the Middle Fork Salmon River watershed, Idaho Department of State Lands (IDSL) *et al.* (1998) reported that although the watershed is almost entirely in the Frank Church River of No Return Wilderness, mining, grazing, and recreational use has locally contributed to sedimentation and bank instability. Roads have encroached on riparian areas in upper Big Creek, Smith Creek, Logan Creek, and portions of Monumental Creek. In 1983, there was a large sludge spill from a settling pond at the Dewey Mine in Mule Creek (tributary to Monumental Creek) resulting in substantial embeddedness by fine substrate, which is continuing to degrade habitat. Trampled stream banks and impaired riparian vegetation due to grazing was reported for an area of Camas Creek. Extensive placer and surface mining occurred throughout the Middle Fork watershed historically and abandoned mine waste may affect streams. Timber harvest was historically extensive in areas near mines, and treeless hillsides surround Cornish Creek near the Thunder Mountain mining areas. There is road access to only 5 % of the watershed (e.g., in Big, Loon, Monumental, Camas creeks, and Rapid River). In reviewing factors affecting bull trout in the Bear Valley watershed, Lamansky and Grunder (1998) noted that the primary legacy effects on aquatic habitat is from logging, grazing, and road construction and maintenance, and numerous culverts suspected to be barriers to fish movement are present. These same factors are likely to also be affecting WCT.

In the South Fork Salmon River watershed, Schuld and Apperson (1998) reported that high levels of fine sediment limit spawning success of bull trout in areas of all subwatersheds and embeddedness exceed forest plan objectives in many areas, including in the wilderness. Fine sediment may also affect WCT. Summer-home development within the flood plain of the Secesh River is threatening off-channel habitat in some areas. There are localized areas of elevated metal concentrations due to mining, and there is large-scale mining at Stibnite Mine and small mining claims scattered throughout the watershed. The upper East Fork Salmon River has the most severe habitat alterations due to large-scale mining and associated roads.

In the Pahsimeroi River watershed, the SBBTTAT (1998) reported that Big Creek (the primary tributary) has many water diversions and is dewatered; in the Lemhi there are many storage reservoirs on tributaries and the river has a highly altered hydrologic regime.

In the Middle Salmon River area, the IDSL reported that placer mining and roads have affected riparian habitats and there has been some channelization (IDSL *et al.* 1998). In addition, many streams in the Round and Stanley areas of the upper Salmon River watershed have been extensively channelized. The North Fork Salmon River watershed has several areas that were formerly placer mined. The CBBTTAT (1998e) noted the legacy effects of logging and presence of many old roads in the mid-reaches and tributaries of the main Salmon River.

B. Overutilization for commercial, recreational, scientific, or educational purposes

Angling regulations for westslope cutthroat trout in the Salmon River basin specify catch-and-release or, in areas open to harvest, two fish per day with a 14-inch size limit (IDFG, *in litt.* 1998a). In the Middle Fork Salmon River watershed, Liter and Lukens (1994) noted that catch-and-release regulations were instituted in 1972 for WCT; WCT numbers increased and peaked in the early to mid-1980s, and have since declined. They attributed the decline to either 7 years of drought when they sampled in the early 1990s or that fish migrating to the main Salmon River may be lost to intense catch-and-release steelhead fishing there or inadequacy of the protected area, or non-compliance of anglers. Therefore, the response of westslope cutthroat trout to fishing regulations may be dependent on stream habitat conditions (IDFG, *in litt.* 1998a) or other factors. Grunder *et al.* (1990) reported that mean length and catch rates of cutthroat increased in Big Creek, Middle Fork Salmon River watershed, after catch-and-release regulations were instituted. The IDSL *et al.* (1998) reported that restrictive harvest regulations implemented in 1964 had resulted in increased numbers and size of cutthroat trout in the Middle Fork Salmon River watershed.

C. Disease or predation

Whirling disease, caused by a protozoan parasite that requires an oligochaete as its intermediate host, has been documented in Idaho. Whirling disease may pose a threat to WCT where WCT coexist with both the protozoan and its intermediate host. In the Salmon River basin, fish infected with the parasite were detected at hatcheries (University of Idaho, *in litt.* 1998).

Predation on WCT by native species (e.g., bull trout and northern pikeminnow) and introduced species is a source of mortality to WCT, and the effects of predation can be exacerbated when WCT are over-exploited or inhabit degraded habitats (Rieman and Apperson 1989). We are unaware of the degree of threat disease and predation pose to WCT in the Salmon River basin.

D. The inadequacy of existing regulatory mechanisms

A variety of state and federal laws and regulations, if properly administered, protect aquatic habitats and reduce threats to WCT in the Salmon River basin. For example, Idaho has adopted a Forest Practice Act (FPA) consisting of rules and regulations addressing forest management. In general, the legislation establishes best management practices (BMPs) to be implemented on forests, such as regulations of activities allowed in riparian areas, restrictions on harvest adjacent to streams, and location of road construction. Although audits show that compliance with BMPs is high in Idaho (Malany, Idaho Forest Practice Act Advisory Committee Member, *in litt.* 1997), the Service is not aware of specific evaluations of various BMPs relative to the protection of WCT habitat and processes affecting water quality, such as water temperature, recruitment of woody debris, and bank stability. In Idaho, half of timber sales audited resulted in contributions of sediment to streams, largely from inadequately maintained roads (Zaroban *et al.* 1997). Even with high implementation rates, Idaho's forestry BMPs have been ineffective at maintaining beneficial uses, including coldwater biota (McIntyre 1993). In addition to the Idaho FPA, the Stream Channel Protection Act and Idaho Code 36-906 require unrestricted fish passage at road crossings on fish-bearing streams.

Federal regulations that protect WCT habitat include the Clean Water Act (including sections 401 and 404 permits), which regulates discharge or placement of dredge or fill material into U.S. waters. However, several bodies of water in the Salmon River basin were identified on the 1996 303(d) list for not fully supporting beneficial uses. Water bodies for which TMDLs have been completed or were discussed in problem assessments for bull trout, a species whose distribution overlaps with WCT, include 24 water bodies in the lower Salmon River and 8 in the Little Salmon River (CBBTTAT 1998e), and 8 in the main Salmon River (CBBTTAT 1998f). Sediment was the most common reason for water bodies to appear on the list. A cursory inspection of the draft 1998 303(d) list indicated that at least 27 listed water bodies correspond to streams inhabited by WCT.

Numerous management programs and other actions are being implemented to eliminate or ameliorate the adverse effects on WCT of past, present, and proposed forestry practices in the Salmon River basin. The Interim Strategies for managing Anadromous Fish-producing Watersheds in Eastern Oregon and Washington, Idaho and Portions of California, known as PACFISH and include riparian and stream habitat management guidance, are being applied to federal lands in the Salmon River basin. Because WCT distribution overlaps with listed fish species (e.g., chinook salmon, steelhead, and bull trout) in the basin, consultations conducted under section 7 of the ESA will likely afford benefits to WCT.

E. <u>Other natural or manmade factors affecting the continued existence of WCT</u>

Nonnative fishes introduced into the Salmon River basin that are most likely to negatively affect WCT include brook trout and various nonnative strains of rainbow trout. Brook trout are present in many lakes and tributaries in the basin. Brook trout were widely stocked in the upper Salmon River, Lemhi River, and Pahsimeroi River watersheds during the 1920s-1950s (SBBTTAT 1998), and they are currently found in these areas. Brook trout were the most prevalent nonnative fish in the South Fork Salmon River watershed (Schuld and Apperson 1998) and surveys found brook trout in Big and Loon creeks within the Middle Fork Salmon River watershed (IDSL *et al.* 1998).

Rainbow trout have also been stocked in the Salmon River basin. Fingerlings of the Kamloop strain were stocked in the upper Salmon River during 1989-1991, but this practice was discontinued due to apparent low survival. Lukens and Davis (1989) reported that about 50,000 catchable rainbow trout were stocked in five reaches of the upper river. The strains of these stockings were not given. In the South Fork Salmon River watershed, Janssen and Anderson (1994) reported that 15,000 rainbow trout were planted in Warm Lake in 1991. Rainbow-cutthroat trout hybrids were reported by the Schuld and Apperson (1998). Brown trout have been stocked in lakes within the Little Salmon River watershed (Grunder and Anderson (1991).

John Day River Drainage

A. <u>Present or threatened destruction, modification, or curtailment of the species' habitat or range</u>

Upper John Day River Watershed.--Kostow (1995) reported mainstem John Day River drainage habitat modifications due to changes in stream channel structure, loss of riparian vegetation, dewatering, and changes in the hydrographs of the mainstem and major tributaries. These habitat modifications were caused by agricultural development, irrigation diversions, livestock grazing, and timber harvest. In the majority of occupied tributary streams, habitat modifications, especially on private lands, have probably shifted WCT distribution to upstream reaches, further exacerbating geographic isolation (Gray, *in litt.* 1998). However, in tributaries where WCT co-exist with bull trout, WCT have a greater downstream distribution, possibly indicating greater WCT tolerance than bull trout to modified habitat conditions.

Aforementioned habitat modifications have effectively isolated WCT in certain tributary systems for at least the warmer months due to warm water and low stream flows (Kostow 1995). While seasonally impassable physical barriers to WCT passage (i.e. irrigation diversion dams) often occur in the mainstem John Day River, occupied tributary streams do not exhibit WCT physical passage barriers, except for Strawberry Creek (Gray, *in litt.* 1998). A total of 62 water diversions with associated fish screens and passage features are present within occupied resident or migratory WCT habitat in the upper mainstem John Day River key watershed (Pence, *in litt. 1998*). It is unknown how many additional diversions without fish screening facilities exist in this key watershed, or how effective existing fish-screening and passage features are at allowing unhindered fish movement during periods of operation. Pence (*in litt.* 1998) does not indicate the existence of a fish screen/passage feature on any diversions present on Strawberry Creek, the only stream that Gray (*in litt.* 1998) cited as having a physical passage barrier.

WCT in the upper mainstem headwaters area (Graham, Roberts, Call, Rail, Reynolds, Deardorff creeks) exist within a "checkerboard" of public (Malheur National Forest) and private (mostly commercial timberlands, with some stream-bottom pasture lands) land ownership. Due to this land-ownership pattern, Gray (*in litt.* 1998) considered harvest on private timberlands to threaten WCT in this area of the watershed; however, the highly connected streams of this portion of the watershed would allow for rapid WCT recolonization.

Upper North Fork John Day River Watershed.--A dirt road parallels the lower portion of WCT occupation along Clear Creek, and a road system accesses Olive Lake on Lake Creek near the lower portion of WCT occupation. Mines and access roads are located at the headwaters of tributaries to South Fork Desolation and West Fork Clear creeks (Hirsch, *in litt.* 1998). No other occupied WCT reach in this drainage is readily accessible to motorized travel. A map provided by Hirsch (*in litt.* 1998) also indicates at least one diversion, for placer mining purposes, on East Fork Clear Creek. Two reservoirs (Olive Lake and Upper Reservoir) are located on Lake Creek; WCT distribution occurs above, between, and below these two reservoirs. No upstream passage is provided at these reservoirs. Extensive mining sites (placer and hard rock) historically and currently occur on or near several occupied tributaries. A majority of occupied WCT habitat in this drainage (85 %, approximately 20 miles) is completely surrounded by, or has one stream bank directly adjacent to, either the Vinegar Hill - Indian Rock Scenic Area or North Fork John Day Wilderness Area.

B. Overutilization for commercial, recreational, scientific, or educational purposes

Upper John Day River Watershed.--Gray (, *in litt.* 1998) indicates a lack of a "targeted" WCT fishery, due to a combination of small size of resident WCT and land-ownership patterns/topographic features restricting or precluding angler access. In addition, ODFW stocking programs and angling regulations are currently designed to emphasize lake and pond fisheries, further minimizing possible over harvest of exclusively stream-resident WCT.

Upper North Fork John Day River Watershed.--Granite Creek and most of its tributaries are currently closed to angling to protect chinook salmon (Hirsch, *in litt.* 1998). However, Lake Creek and South Fork Desolation Creek are open to angling and are managed under a 5-fish daily bag, 8-inch minimum-size limit (Gray, *in litt.* 1998).

C. Disease or Predation

Upper John Day River Watershed.--Due to range overlap, bull trout may prey upon smaller WCT. Hatchery rainbow trout stocking was discontinued in the upper mainstem John Day River in 1997 (Gray, *in litt.* 1998). Hatchery rainbow trout may have been vectors of diseases that affect WCT (Gray, *in litt.* 1998) .

Upper North Fork John Day River Watershed.--Introduced brook trout, found in lower South Fork Desolation Creek and below Olive Lake on Lake Creek, may be vectors of diseases that affect WCT. Other species have been introduced into Olive Lake, including at least kokanee, rainbow, and Lahontan cutthroat trout (Hirsch, *in litt.* 1998). Due to range overlap in South Fork Desolation Creek and Clear Creek and its tributaries, bull trout may prey upon smaller WCT.

D. The inadequacy of existing regulatory mechanisms

Upper John Day River Watershed.--All activities on National Forest lands are to be in compliance with the respective National Forest's Forest Plan, as amended by PACFISH (1995). PACFISH (1995) provides guidance to Forests regarding protection of watershed functions and properties, resulting in more environmentally compatible land-use activities. Forest practices on private lands, however, are subject to review and regulation under the Oregon Forest Practices Act (1995 amendment), which allows significantly more entry into riparian areas, including activities such as harvest, stream crossings, road building, and site restoration.

The ODFW has provided fish screens at most diversions within WCT habitat. However, Oregon State law requiring fish screening at water diversion facilities is not well enforced. Maintenance of these facilities is the responsibility of ODFW, not the private landowner.

ODFW angling regulations have recently been altered to reduce angling impacts to stream-resident fish. Current ODFW angling regulations in the upper mainstem John Day key watershed include a minimum 8-inch size limit for trout and reduced daily bag limit of five fish per day (Gray 1998, *in litt.*).

Sections of a total of 16 of 43 streams identified as occupied by WCT (Pence, *in litt.* 1998) are listed on the Oregon Department of Environmental Quality's (ODEQ) 1998 Section 303(d) list of water-quality limited (by elevated water temperatures) streams. ODEQ and Oregon Department of Agriculture are developing water-quality management plans for 303(d) listed stream segments; however, due to the magnitude of workload, plans will take time to develop and many years to implement (ODEQ 1998).

Upper North Fork John Day River Watershed.--All activities on National Forest lands are to be in compliance with the respective National Forest's Forest Plan, as amended by PACFISH (1995). PACFISH (1995) provides guidance to Forests regarding protection of watershed functions and properties, resulting in more environmentally compatible land-use activities. However, mining activities are difficult to regulate and occur within WCT occupied habitat in this watershed.

A section of one of eight streams identified as occupied by WCT (Hirsch, *in litt.* 1998) is listed on the Oregon Department of Environmental Quality's (ODEQ) 1998 Section 303(d) list of water quality limited (by elevated temperatures) streams. The ODEQ and Oregon Department of Agriculture are developing water-quality management plans for 303(d)-listed stream segments; however, due to the magnitude of workload, plans will take time to develop and many years to implement (ODEQ 1998).

E. <u>Other natural or manmade factors affecting the species' continued existence</u>

Upper John Day River Watershed.--Distributions of WCT and redband trout overlap significantly in the upper mainstem John Day River key watershed (Gray, *in litt.* 1998). Westslope cutthroat trout and redband trout readily hybridize; nominal genetic studies reported in Gray (*in litt.* 1998) and Kostow (*in litt.* 1998) indicate hybridization, and subsequent backcrossing, are occurring in this watershed where these native species' ranges overlap. DNA analysis of WCT samples from Dixie and Roberts creeks by Spruell (*pers. comm*. 1998, as cited in Hemmingsen and Gray 1999 draft) indicated predominantly pure WCT in the upper reaches of these streams, with some hybridization between WCT and redband trout in lower reaches. Behnke (*pers. comm*. 1990, as cited in Hemmingsen and Gray 1999 draft) found 2 of 31 WCT collected in the upper mainstem John Day River were hybridized. Kostow (*in litt.* 1998) indicated approximately 25 % of WCT sampled were hybrids with redband trout. During 1998, ODFW field crews began an investigation to define the "zone of sympatry" between WCT and redband trout in several upper mainstem John Day tributaries (Hemmingsen and Gray 1999 draft). Stocking of hatchery rainbow trout, a species that can hybridize with WCT, was discontinued in the upper mainstem John Day River by 1997 (Gray, *in litt.* 1998).

Upper North Fork John Day River Watershed.--WCT and redband trout coexist in this major drainage. The extent of hybridization that has occurred between these species is unknown. In addition, other cutthroat trout subspecies (Lahontan and possibly Yellowstone cutthroat trout) have previously been introduced into the Lake Creek and South Fork Desolation Creek watersheds.

VI. Ongoing Regulatory and Conservation Actions

Montana

Numerous management programs and other actions are being implemented to eliminate or ameliorate the adverse effects on WCT of past, present, and proposed land-management activities in Montana. On non-federal lands in the state, several mechanisms are being implemented to protect WCT, their habitat, and other aquatic resources. Forestry "Best Management Practices" (BMPs; Logan and Clinch 1991) are being implemented on Montana State Forests to maintain water quality and reduce sediment input; audits of forestry practices indicate a high degree of compliance (MTFWP, *in litt.* 1999). Grazing BMPs have also been developed and are being implemented on state grazing lands (MTFWP, *in litt.* 1999).

Montana has several laws and regulations directed toward protection of aquatic habitats that, if properly applied and enforced, reduce threats to WCT throughout the state (MTFWP, *in litt.* 1999). The Montana Stream Protection Act requires a permit for any project that may affect the natural and existing shape and form of any stream or its banks or tributaries; the Streamside Management Zone Law permits only selective logging and prohibits clear cutting and heavy equipment operation within 50 feet of any lake, stream, or other body of water; the Montana Natural Streambed and Land Preservation Act requires private, non-governmental entities to obtain a permit for any activity that physically alters or modifies the bed or banks of a perennially flowing stream; and the Montana Pollutant Discharge Elimination System requires permits for all discharges to surface water or groundwater, including discharges related to construction, dewatering, suction dredges and placer mining. Before permits allowing activities covered under these regulations are issued, applications are reviewed by Montana FWP, Montana Department of Natural Resources and Conservation, and the Montana Department of Environmental Quality (Montana DEQ). Recommendations to limit impacts to WCT and their habitat are mandated through the permitting process.

In 1997, the Montana Legislature passed House Bill 546, which strengthened the state's authority to develop Total Maximum Daily Loads (TMDLs) for Montana waters. Under this legislation, Montana DEQ is directed to identify impaired water bodies, identify the causes of impairment, and develop corrective actions. Montana DEQ's goal is to correct all impairments within the next 10 years. Such corrective actions will improve water quality in many streams and should result in enhancement of habitat for WCT (MTFWP, *in litt.* 1999).

Federal regulations that protect WCT habitat in Montana include the Clean Water Act (including Sections 401 and 404 permits), which regulates discharge or placement of dredged or fill material into waters of the United States; the Federal Land Management Protection Act (FLPMA); and internal agency management guidelines and policies, such as National Forest Management Plans. All activities that may affect WCT on federal lands will continue to undergo review under the

National Environmental Protection Act (NEPA) and may thus be modified, when necessary, to minimize adverse effects on WCT.

Of the approximately 12,896 linear miles of stream occupied by WCT in Montana, 7,210 miles (55.9 %) occur on federal lands (Appendix Table 4). Among the nearly 42 million acres of land that constitute the watersheds occupied by WCT in Montana, 36.6 % are administered by the U.S. Forest Service, 4.1 % by the BLM, and 2.7 % by the National Park Service and U.S. Fish and Wildlife Service. Many of the lakes that are habitat for WCT are in Glacier National Park, where National Park Service policies preclude modification of WCT habitat and introduction of nonnative species.

On lands administered by the Forest Service and BLM in the Columbia River basin, where 5,253 (72.9 %) of the 7,210 stream miles occupied by WCT on federal lands in Montana occur, numerous management programs and other actions are being implemented to minimize or ameliorate the adverse effects on WCT of past, present, and proposed forestry practices. The Inland Native Fish Strategy (INFISH), adopted by the U.S. Forest Service and U.S. Bureau of Land Management (BLM) in 1995, amended National Forest Plans and Regional Guides to include interim direction for riparian management objectives, standards and guidelines, and monitoring in the Columbia River basin (USFS 1995). Among other things, INFISH requires that 300' buffers be maintained along all streams. INFISH standards, which can only be modified following a watershed analysis or site-specific evaluation, are being implemented on U.S. Forest Service and BLM lands to minimize or eliminate present or potential destruction of WCT habitat and other aquatic resources. Upon its completion, the Interior Columbia Basin Ecosystem Management Project (ICBEMP) will supercede INFISH and establish aquatic ecosystem management standards on these federal lands in the basin.

Additional land-use restrictions and protections that benefit WCT on federal lands in Montana will result from the June 10, 1998 listing of bull trout in the Columbia River basin as a threatened species under the Endangered Species Act (63 FR 31647). Because the general distribution of bull trout overlaps that of WCT in the basin, Endangered Species Act Section 7 actions directed toward the protection of bull trout and their habitats will also afford benefits to WCT.

In addition to those administrative protections, the National Forests in Montana reported a total of 234 projects directed toward the protection and restoration of WCT and their habitats on forest lands (Bosworth, *in litt.* 1998). Similarly, the Montana FWP reported about 500 projects (MTFWP, *in litt.* 1998) and the National Park Service, Yellowstone National Park, reported 12 projects (Finley, *in litt.* 1998)--all directed toward the protection and restoration of WCT and their habitats.

Extensive research is being conducted to determine the distribution of whirling disease in Montana, the susceptibility of WCT to whirling disease, and possible means to control the disease. Montana FWP has implemented policies and regulations to prevent the human transfer of potentially diseased fishes (or water that contains the protozoan that causes whirling disease) among streams and lakes (MTFWP, *in litt.* 1999).

On private lands in Montana's Columbia River basin, Plum Creek Timber Company is working closely with the U.S. Fish and Wildlife Service to develop a Native Fish Habitat Conservation Plan that includes provisions for the conservation of WCT on 1.5 million acres of Plum Creek property (Jostrom, *in litt.* 1998). Restoration activities underway as part of the Blackfoot Challenge, a cooperative endeavor between private landowners and public agencies to restore and conserve streams and riparian environments in the Blackfoot River valley, include removal of fish-passage barriers; screening of irrigation diversions to prevent the loss of fish to canals; and general improvement of instream fish habitat (MBTRT 1997). The Blackfoot Challenge also works to acquire conservation easements.

Montana FWP recently completed a "Memorandum of Understanding and Conservation Agreement for Westslope cutthroat trout (*Oncorhynchus clarki lewisi*) in Montana" (MTFWP 1999). The agreement has been signed by representatives of the principal state and federal natural resources management agencies concerned with the protection and management of WCT in Montana, as well as representatives of other groups. The goal of the agreement is "to ensure the long-term, self-sustaining persistence of the subspecies within each of the five major river drainages they historically inhabited in Montana." The agreement's primary objective is the protection of all genetically pure stocks of WCT in Montana. The 1999 Montana Legislature passed a bill that provided $0.75 Million to Montana FWP to implement the management plan for WCT, and to accomplish similar work with bull trout.

Idaho

Federal regulations that protect WCT and their habitat in Idaho include the Clean Water Act (CWA); National Environmental Protection Act (NEPA); the Federal Land Management Protection Act (FLPMA); INFISH and PACFISH; and internal federal agency management guidelines and policies, such as National Forest Management Plans. In addition, Endangered Species Act Section 7 actions directed toward the protection of listed bull trout and Pacific salmon and their habitats will also afford benefits to WCT. The BLM and Forest Service have conducted habitat projects for fish in the past, such as the installation of habitat structures in the South Fork Clearwater River during the 1980s (CBBTTAT 1998c). Watershed restoration projects have or are also being implemented, such as those planned for the South Fork Clearwater River beginning in 2000 (Mayes, *pers. comm*. 1998).

The Idaho FPA regulates activities allowed in riparian areas, timber harvest adjacent to streams, and location of road construction. Unrestricted fish passage at road crossings is required by the Stream Projection Act and Idaho Code 36-906.

Plum Creek Timber Company is working closely with the U.S. Fish and Wildlife Service to develop a Native Fish Habitat Conservation Plan that includes provisions for the conservation of WCT on Plum Creek property (Jostrom, *in litt.* 1998). Potlatch Corporation intends to develop a Stewardship Plan for WCT on 675,000 acres of their property in Idaho (Cundy, *pers. comm*. 1999).

Washington

Federal regulations that protect WCT and their habitat in Washington include CWA; NEPA; FLPMA; INFISH and PACFISH; and National Forest Management Plans. In addition, Endangered Species Act Section 7 actions directed toward the protection of listed bull trout and Pacific salmon and their habitats will also afford benefits to WCT.

Oregon

Federal regulations that protect WCT and their habitat in Oregon include CWA; NEPA; FLPMA; INFISH and PACFISH; and National Forest Management Plans. In addition, Endangered Species Act Section 7 actions directed toward the protection of listed bull trout and mid-Columbia River steelhead and their habitats will also afford benefits to WCT.

In the John Day River drainage, ODFW surveys have been conducted since 1990 for WCT (Gray, *in litt.* 1998). These data are beneficial in ODFW, USFS, USFWS, and others' analyses of project impacts to WCT. Bonneville Power Authority funding has been provided for ongoing fish-screen maintenance activities and has assisted in riparian and in-water habitat restoration activities along the mainstem John Day River, above the town of John Day (Gray, *in litt.* 1998).

Bull trout, listed as a threatened species in 1998, provide additional Endangered Species Act protection to aquatic habitats co-occupied by bull trout and WCT. Within the mainstem John Day River drainage, a total of 24 % (47.5 miles) of resident WCT distribution and 45 % (42 miles) of seasonal WCT distribution is sympatrically occupied by either resident or migratory bull trout (Pence, *in litt.* 1998). A total of 56 % (13 miles) of WCT distribution in the North Fork John Day River watershed overlaps with bull trout (Pence, *in litt.* 1998). Gray (*in litt.*1998) reports that listing of bull trout has resulted in additional awareness and diligence on the part of numerous agencies, including USFS, BLM, ODFW, Oregon Department of Forestry, and Oregon Division of State Lands.

Westslope cutthroat trout occupy several protected areas, including the Strawberry and North Fork John Day Wilderness Areas, and the Vinegar Hill-Indian Rock Scenic Areas. A total of approximately 44 miles of stream is within these protected areas, representing approximately 20 % of current resident habitat in these two watersheds (approximately 20 miles [85 %] in protected areas for North Fork John Day watershed; approximately 24 miles [12 %] in protected areas for mainstem John Day River drainage).

VII. Conclusions

Distribution of Westslope Cutthroat Trout

Information provided primarily by state game and fish departments in Montana, Idaho, Washington and Oregon, and presented and summarized in this document, indicates WCT presently occur in about 4,275 tributaries or stream reaches that collectively encompass more than 23,000 linear miles of stream habitat. These WCT stocks are distributed among 12 major drainages and 62 component watersheds in the Columbia, Missouri, and Saskatchewan River basins (Appendix Table 2). In addition, WCT are known to occur naturally in 6 lakes in Idaho and Washington that total about 180,000 surface acres and at least 20 lakes that total 5,347 surface acres in Glacier National Park, Montana.

Among watersheds in the Columbia River basin, there was a strong, positive association ($r = 0.87$, $P < 0.01$, $N = 36$) between the total length of all streams occupied by WCT reported by the state game and fish departments and the number of ICBEMP HUCs that had known or predicted WCT stocks (Appendix Table 2). Thus, the data from these two independent sources provided notably similar images of the overall distribution of WCT in the Columbia River basin, as well as assurance that the apparent distribution of WCT in the basin is reasonably accurate. Clearly, WCT is a wide-ranging subspecies that persists as numerous, self-sustaining stocks.

Most linear miles of stream habitat occupied by WCT stocks are in Montana's Clark Fork River drainage (5,166 stream miles) and Idaho's Salmon River drainage (4,078 stream miles; Appendix Table 2). Among watersheds in the Columbia River basin, where ICBEMP data are available, most HUCs with WCT stocks that are considered strong or predicted strong are in Idaho's Salmon River (150 HUCs) and Clearwater River (121 HUCs) drainages and Montana's Clark Fork River (79 HUCs) and Flathead River (55 HUCs) drainages (Appendix Table 2).

Also among drainages in the Columbia River basin, the percentage of HUCs known or predicted to be inhabited by WCT stocks that were known or predicted to be strong was largest in Idaho's Clearwater River (46.7 %) and Salmon River (35.0 %) drainages (Appendix Table 2). (Although Washington's upper Columbia River drainage had the highest percentage of HUCs known or predicted to be inhabited by WCT stocks that were known or predicted to be strong [79.2 %; Appendix Table 2], those data include WCT stocks that were introduced outside the historic range of the subspecies. Because we were unable to separate the introduced from the natural stocks, Washington's upper Columbia River drainage was not included in this summary.)

In contrast, the percentage of HUCs known or predicted to be inhabited by WCT stocks that were known or predicted to be depressed was largest in Oregon's John Day River drainage (100 %), Idaho and Washington's Pend Oreille River drainage (93.4 %), Idaho's Spokane River (92.2 %) and Kootenai River (90.2 %) drainages, and Montana's Kootenai River drainage (91.4 %). The ICBEMP considered these WCT stocks depressed or predicted depressed because one or more of the WCT life-history forms (e.g., adfluvial or fluvial) that occurred in the HUC historically has been lost, there may be a declining trend in WCT abundance, or current WCT abundance is considered low.

Genetic Characteristics of WCT Stocks

The most comprehensive data available on the genetic characteristics of extant WCT stocks are from Montana, where those data have been used to estimate the total linear miles of stream known to be occupied by genetically pure WCT in each of 36 watersheds in the Columbia and Missouri River basins (Appendix Table 3). Also estimated are the total linear miles of stream known to be occupied by WCT that show genetic introgression with other fish species or subspecies. Although there are no comprehensive data on the genetic characteristics of WCT across the historic range of the subspecies, the extensive data base from Montana provides a useful example of the problem of assessing the genetic characteristics of extant WCT stocks throughout the historic range.

Among the 36 Montana watersheds for which data on genetic characteristics are available (Appendix Table 3), the mean percentage of stream miles occupied by genetically pure WCT as a percentage of all stream miles occupied by WCT stocks within each watershed is 23.8 % (range, 0 to100 %). However, the genetic characteristics of WCT stocks in most miles of occupied stream in each watershed (mean, 62.7 %; range, 0 to100 %) have not been determined through laboratory analyses. Consequently, while genetically pure WCT stocks are known to occupy 2,633 miles of stream in Montana, they would occupy as many as 11,079 miles if all of the WCT stocks that have not been analyzed genetically are pure.

It is more likely, however, that at least some of the WCT stocks in Montana that have not yet been analyzed genetically are not genetically pure. Genetic testing in Montana has revealed that WCT that occupy 813 linear miles of stream are 90.0 to 99.9 % genetically pure and WCT in 1,004 miles of stream are less than 90.0 % pure (Appendix Table 3). Available data, however, do not allow us to distinguish between the WCT stocks that have not been analyzed genetically but are pure and those that are not pure. Although linear regression analysis revealed a significant association (r = 0.47, $P < 0.01$, N = 35) between the percentage of occupied stream miles that were known to be occupied by genetically pure WCT within watersheds and the percentage of the genetic samples (a sample being a group of fish from a single location) collected from the watershed that were genetically pure, the relation was statistically weak (i.e. $r^2 = 0.22$ or only 22 % of the total variation was explained by the relation). Thus, within watersheds, the percentage of genetically pure samples alone is not a definitive indicator of the percentage of occupied stream miles that have genetically pure WCT.

In conclusion, although genetically pure WCT stocks and stocks with varying degrees of genetic purity are known to occur across the subspecies' range, there is presently no definitive information on the genetic characteristics of most WCT stocks. Even in Montana, where an extensive data base on the genetic characteristics of WCT exists, the precise genetic characteristics of most WCT stocks are unknown.

Timing of the Principal Decline in the WCT Population

In the context of the ESA, the term "threatened species" means any species (or subspecies or DPS for vertebrate organisms) which is likely to become an endangered species within the foreseeable future throughout all or a significant portion of its range. The term "endangered species" means any species which is in danger of extinction throughout all or a significant portion of its range. The ESA does not indicate threshold levels of historic population size at which–as the population of a species declines–listing as either "threatened" or "endangered" becomes warranted.

Instead, the principal considerations in the determination of whether or not a species warrants listing as a threatened or endangered species under the ESA are for the threats that currently confront the species and the likelihood that the species will persist in “the foreseeable future.” Thus, listing of a species may be warranted when the species still occupies much of its historic range but confronts threats that are widespread, significant, and operating unabated. In contrast, if not confronted by significant threats, a species occupying only a small portion of its historic range many be neither “threatened” nor “endangered.”

Although the ESA does not speak to threshold levels of historic population size at which listing of a species is warranted, the ESA clearly implies that the rate of decline in the population at the time listing is being considered is important. If the rate of decline is rapid, persistence into “the foreseeable future” may be questionable. Alternatively, if the present rate of decline is slow, future persistence may be much more likely. Thus, in the case of WCT, it is important that we understand how rapidly the present rate of decline may be leading the WCT population toward extinction.

Figure 2 provides three possible population trajectories for WCT during the twentieth century, each of which ends at the same, reduced, present population. Although still other trajectories (or combinations of trajectories) are possible for WCT, the trajectories shown in Figure 2 capture the important differences among the suite of possible trajectories. For the Type-1 trajectory, the decline in population was most rapid during the last half of the century. For the Type-2 trajectory, a constant number of WCT was lost from the population each year. For the Type-3 trajectory, the decline in population was most rapid during the first half of the century.

In order for us to understand which of these trajectories might best describe the decline of WCT, we need historic information on the abundance of the subspecies. In the upper Missouri River basin, some of the best historic information on WCT comes from Yellowstone National Park. In 1889, the U.S. Fish Commission conducted the initial scientific exploration of fishes in the Yellowstone region. Led by Dr. David Starr Jordan, that exploration revealed (Jordan 1891) what we now know as WCT were abundant in the Madison River and its principal tributaries, upstream

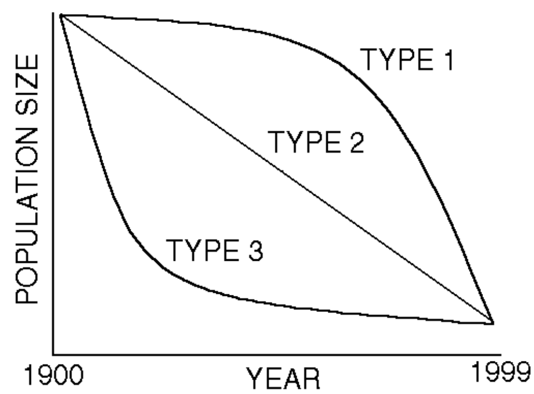

Figure 2.--Three possible population trajectories for WCT during the twentieth century, each of which ends at the same, reduced, present population.

to barrier falls on the lower Firehole and Gibbon rivers. Studies conducted between 1953 and 1957, however, revealed WCT no longer occurred in the Madison River or its principal tributaries in the park (Benson *et al.* 1959). The WCT in the Madison River had apparently been entirely replaced by nonnative rainbow and brown trout, which began to be periodically stocked into the Madison River system in 1889. Today, the few WCT in Yellowstone National Park, where none of the usual human-caused changes in physical habitat or water quality that negatively affect salmonid fishes elsewhere have occurred to a measurable degree and angling has been closely regulated for many decades, are found only in headwater streams that have not been colonized by nonnative fishes. A similar pattern of decline in WCT is evident in the Missouri River basin of Montana, where what we now know as WCT were abundant late in the nineteenth century (Evermann 1893), those same nonnative fishes were introduced, and WCT had become restricted primarily to headwater streams by the 1950s (Hanzel 1959). Today, extant WCT stocks in the Missouri River basin of Montana remain confined to headwater streams that have not been extensively colonized by nonnative fishes (Shepard *et al.* 1997).

The preceding data indicate that, at least for WCT in the Madison River drainage in Yellowstone National Park and the Missouri River basin in Montana, the decline in WCT population during the twentieth century followed a Type-3 trajectory, i.e. the decline was most rapid early in the century. Decline along a Type-3 trajectory would be expected if it resulted from rapid, abundant colonization of mainstem rivers and their principal tributaries (where the natural stocks of WCT were large, compared to those in headwater areas) by one or more introduced, nonnative fish species that had adverse effects on WCT. By the 1950s, both rainbow and brown trout had established abundant, self-sustaining stocks in the Madison River of the park (Benson *et al.* 1959) and in the principal rivers and streams of the Missouri River basin of Montana (Hanzel 1959).

Throughout the inland, western U.S. today, stocks of various subspecies of indigenous cutthroat trout often persist in high-elevation, high-gradient, headwater streams, where they appear to have a competitive advantage over nonnative fishes (Fausch 1988, 1989). Researchers have observed, for example, that cutthroat trout often inhabit faster water than brook trout (Griffith 1988) and may be better suited to the higher-velocity, higher-gradient streams found in headwater areas (Fausch 1989). Thus, the headwater streams inhabited by many extant WCT stocks may be relatively secure from colonization by nonnative fishes. In addition, because they occur in high-elevation areas, those headwater streams are relatively secure from the adverse effects of human activities.

Viability of Small WCT Stocks

Many of the remaining WCT stocks are restricted to small, headwater streams in mountainous areas, where the adverse effects of human activities on WCT and its habitat have often been negligible. This is especially true for many of the remaining, genetically pure WCT stocks (e.g., Shepard *et al.* 1997). Such spatial separation precludes natural movement and interbreeding among stocks, however, thereby increasing the likelihood that some stocks will become extinct due to limited genetic variability. In addition, the probable small sizes of these individual WCT stocks and the short stream reaches that they might inhabit, make individual stocks more vulnerable to extirpation due to natural catastrophes such as floods, landslides, wild fires and other stochastic environmental effects. Remaining WCT stocks in the Lower Missouri River and Upper Columbia River (Washington) drainages, for example, occupy stream reaches that average 2.9 and 3.4 miles long, respectively (Appendix Table 2).

Despite the probable small sizes of the WCT stocks that inhabit these confined stream reaches, however, evidence of inbreeding depression in extant WCT stocks has not been found (R. Leary, *pers. comm*. 1998). Inbreeding depression would be anticipated if the effective population size (i.e. the number of breeding-age adults) of a WCT stock was too small and repeated inbreeding occurred, leading to accumulation and dominance of certain alleles (i.e. phenotypic expressions of a gene) and loss of genetic diversity. Thus, there is no evidence that the probable small effective population size of some WCT stocks is resulting in genetic changes that could have adverse effects on stock viability.

Similarly, although the probable small sizes of these individual WCT stocks and the short stream reaches that they might inhabit make individual stocks more vulnerable to extirpation due to floods, landslides, wild fires and other stochastic environmental effects, this review found no evidence that contemporary WCT stocks have been lost as the result of such natural catastrophes.

VIII. Findings

The Service has compiled and analyzed the available data on WCT to the extent possible within the time frame for preparation of this status review prescribed by the ESA. We found no compelling evidence in support of recognizing distinct population segments for WCT. Instead, a single WCT population was recognized for purposes of the status review. Westslope cutthroat trout presently occur in about 4,275 tributaries or stream reaches that collectively encompass more than 23,000 linear miles of stream habitat, distributed among 12 major drainages and 62 component watersheds in the Missouri, Columbia and Saskatchewan River basins. In addition, WCT are known to occur naturally in 6 lakes in Idaho and Washington and at least 20 lakes in Glacier National Park, Montana. Although WCT stocks that formerly occupied large, mainstem rivers and lakes and their principal tributaries are reduced from their historic levels, to a degree that cannot be determined precisely because definitive historic data are limited, we found that viable, self-sustaining WCT stocks remain widely distributed throughout the historic range of the subspecies, most notably in headwater areas. This conclusion is similar to that of Thurow *et al.* (1997), who estimated that WCT remained in 85 % of their current potential range in the Columbia River basin and WCT stocks were robust in 22 % of that range.

This status review revealed that most of the habitat for extant WCT stocks lies on lands administered by federal agencies, particularly the U.S. Forest Service. Moreover, many of the strongholds for WCT stocks occur within roadless or wilderness areas or national parks, all of which afford considerable protection to WCT. In addition, INFISH and PACFISH standards and guidelines protect WCT and their habitats on Forest Service and BLM lands in the Columbia River basin. The Service is also encouraged by ongoing and planned state and local programs, most notably those in Montana, to protect and restore WCT within its historic range. The U.S. Forest Service, state game and fish departments, and National Park Service reported more than 700 ongoing projects directed toward the protection and restoration of WCT and their habitats. Finally, WCT also accrue some level of protection from ESA Section 7 consultations in areas where WCT distribution overlaps with the distributions of one or more ESA-listed fish species, specifically, bull trout, steelhead, and Pacific salmon species and their habitats on federal lands in the Columbia River basin.

There are numerous federal and state regulatory mechanisms that, if properly administered and implemented, protect WCT and their habitats throughout the range of the subspecies. However, effective implementation of those regulatory mechanisms depends largely upon the appropriation of adequate funding and, ultimately, commitment on the part of the management or regulatory agencies to fulfill their respective responsibilities. Where these responsibilities are not being fulfilled, WCT may be adversely affected by ongoing or planned alteration of their habitat or by chronic, adverse effects that remain unabated. It is incumbent upon management agencies to fulfill their management responsibilities, including those that involve the protection of native species like WCT, and to seek funding adequate to meet agency needs.

Evidence from the Missouri River basin indicated that a conspicuous decline in the WCT population occurred early in the twentieth century. That decline was largely attributed to rapid, abundant colonization of mainstem rivers and their major tributaries by one or more introduced, nonnative fish species that had adverse effects on WCT. Our analysis showed that the rate of decline in the WCT population is much lower today than it was earlier in that century. There is also evidence that many of the headwater streams inhabited by extant WCT stocks are relatively secure from colonization by nonnative fishes, primarily brook, brown and rainbow trout, because those headwater streams are not suitable habitat for the nonnative trout. Nonetheless, the Service believes additional actions (e.g., selective placement of barriers to prevent the upstream movement of nonnative fishes) should be taken to further protect extant WCT stocks throughout their historic range from the adverse effects of nonnative fishes, considered by many fisheries scientists to be the major threat to WCT. These adverse effects include predation, competition, and interbreeding and subsequent genetic introgression. The genetic characteristics of most extant WCT stocks are unknown and the genetic purity of some stocks could be threatened by interbreeding with nonnative fishes.

On the basis of the available information, the Service concluded that the WCT is not likely to become a threatened or endangered species within the foreseeable future. Therefore, listing of the WCT as a threatened or endangered species under the ESA is not warranted at this time. That conclusion was based solely on information on WCT stocks within the historic range of the subspecies, as reported and summarized in this document. The Service remains concerned regarding the apparent high proportion of WCT stocks that the ICBEMP considered depressed or predicted depressed in Oregon's John Day River drainage, Idaho and Washington's Pend Oreille River drainage, Idaho's Spokane River drainage, and Idaho and Montana's Kootenai River drainage. The Service also acknowledges that numerous WCT stocks have been established outside the historic range of the subspecies in Washington (WDFW, *in litt.* 1998a). Although outside the historic range of WCT and therefore not considered in reaching the aforementioned conclusion, those introduced stocks help to assure that WCT will persist in the foreseeable future.

Results of this status review define baseline conditions for the population of WCT across its historic range in the U.S., detailed in the Administrative Record for this action and summarized in the Appendix Tables of this document, to which future population assessments may be compared. Such comparisons would be important not only to determining the efficacy of ongoing and planned actions to protect and restore WCT stocks, but to future reassessments of the status of WCT from the perspective of possible ESA listing. The Service strongly recommends that state game and fish departments, federal land-management agencies, tribal governments, private groups, and other concerned entities continue to work individually and cooperatively to develop and implement programs to protect and restore stocks of WCT throughout the historic range of the subspecies.

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Telephone Conversation record dated January 11 1999, from Scott Deeds, USFWS to **Ned Horner**, IDFG. Subject: Westslope cutthroat trout management.

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Personal communication with. **P. Murphy** (Clearwater National Forest fisheries biologist) on 8/7/1995.

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Telephone Conversation record dated March 2, 1999, from Scott Deeds, USFWS to **Ken Williams**, WDFW. Subject: Westslope cutthroat trout in Washington.

Personal Communication between Bob Hallock, USFWS and **Paul Woods**, USGS in 1993, Specific citation is unknown as referenced material was taken from the bull trout administrative record.

X. Appendix Tables

Appendix Table 1.–List of persons who provided information used in the status review for westslope cutthroat trout.

Appendix Table 2.–Total number of stream miles and tributaries or stream reaches occupied by westslope cutthroat trout (WCT) in the historic range of the subspecies.

Appendix Table 3.–Total number of stream miles occupied by westslope cutthroat trout (WCT) that are genetically pure, 90-99.9 % pure, less than 90 % pure, and with unknown genetic characteristics.

Appendix Table 4.–Land ownership in watersheds occupied by westslope cutthroat trout (WCT), the percentage of occupied habitat administered by federal agencies, and the administrative protections and conservation efforts affecting WCT in these watersheds.

Appendix Table 5.–Threats to westslope cutthroat trout throughout the historic range of the subspecies.

Appendix Table 1.–List of persons who provided information used in the status review for westslope cutthroat trout.

No.	Name	Affiliation	Dated	Received
1	Bob D. Anderson	Washington Water Power	10/09/98	10/09/98
2	Jason Campbell	Montana Stockgrowers Association	10/09/98	10/09/98
3	F. Al Espinosa	Espinosa Consulting	10/01/98	10/05/98
4	Christopher Frissell	University of Montana	10/10/98	10/10/98
5	Judith Brawer	American Wildlands	no	10/10/98
6	David W. Mayhood	Freshwater Research Ltd.	10/09/98	10/09/98
7	Larry McLaud	Idaho Conservation League	10/08/98	10/13/98
8	James Olsen	Friends of the Bitterroot	10/08/98	10/13/98
9	Mary Crowe Mitchell	Rock Creek Alliance	10/09/98	10/13/98
10	Diane Williams	The Cabinet Resource Group	10/09/98	10/13/98
11	Donald Johnson	Idaho Watersheds Project (petitioner)	10/08/98	10/13/98
12	Buell Hollister	Kootenai Environmental Alliance	10/08/98	10/14/98
13	Shirley Torkelson	private citizen	10/08/98	10/14/98
14	Leonard Walsh	private citizen	10/09/98	10/17/98
15	Glenn Hockett	Gallatin Wildlife Association	10/08/98	10/10/98
16	Wes Hanson	private citizen	10/07/98	10/10/98
17	Jason Furgala	private citizen	10/09/98	10/09/98
18	David & Kathy Richmond	private citizens	10/08/98	10/09/98
19	Ann L. Christensen	private citizen	10/10/98	10/10/98
20	Dana Jensen	The Ecology Center, Inc.	10/07/98	10/09/98
21	Steve Bradburn	private citizen	10/07/98	10/09/98
22	Guy A. Bailey	Selkirk-Priest Basin Association, Inc.	no	10/09/98
23	Lupito Flores	Idaho Conservation League	10/07/98	10/09/98
24	Nancy Lynne	private citizen	10/07/98	10/09/98
25	Frank D. Slider	private citizen	10/02/98	10/06/98
26	Mr. & Mrs. Alfred Sharon	private citizen	10/03/98	10/07/98
27	Timothy J. Coleman	Kettle Range Conservation Group	10/05/98	10/07/98
28	Marv Hoyt	Greater Yellowstone Coalition	10/05/98	10/07/98
29	Andre Bouchard	Native Forest Network	10/05/98	10/07/98
30	Marilyn Dinger	private citizen	10/08/98	10/08/98
31	Kathy Lloyd/Drake Barton	private citizen	10/08/98	10/08/98
32	Robert J. Lance	private citizen	09/26/98	09/29/98
33	George & Rhonda Ostertag	private citizens	09/26/98	09/30/98
34	D. W. Johnson	Natural Resource Consultants	09/21/98	09/21/98
35	Kathy Richmond	Friends of the West	08/24/98	08/28/98
36	Wendell M. Stark	private citizen	09/03/98	09/11/98
37	Win Green	private citizen	09/03/98	09/03/98
38	Courtney Ernst	private citizen	08/17/98	08/19/98
39	Edward G. Brown	private citizen	08/17/98	08/18/98
40	Paul Richards	Deerlodge Forest Defense Fund	08/14/98	08/14/98
41	Steve Mazur	private citizen	08/13/98	08/17/98
42	Henry Townshend	private citizen	08/14/98	08/17/98
43	Joe Gutkoski	Montana River Action Network	08/11/98	08/12/98
44	Frank Priestley	Idaho Farm Bureau Federation	08/04/98	08/10/98
45	Deborah Kmon	Alliance for the Wild Rockies	07/30/98	08/03/98
46	Curtis Kruer	consultant	07/21/98	07/27/98
47	Robert J. Behnke	Colorado State University	06/16/98	06/22/98
48	Harmon J. Ranney	McDonald Gold Project	06/08/98	06/10/98
49	Arlene Montgomery and Keith Hammer	Friends of the Wild Swan	10/08/98	10/10/98
50	Patrick J. Graham	Montana Department of Fish, Wildlife and Parks	10/08/98	10/09/98
51	Virgil K. Moore	Idaho Game & Fish Department	10/02/98	10/06/98
52	Dale N. Bosworth	U.S. Forest Service, Region 1	10/05/98	10/08/98
53	Michael D. Jostrom	Plum Creek Timber Company, L.P.	09/30/98	10/08/98
54	Deborah Austin	Beaverhead-Deerlodge NF	10/27/98	10/28/98
55	Michael Finley	National Park Service, Yellowstone NP	11/05/98	11/06/98
56	Bruce Crawford	Washington Department of Fish and Wildlife	12/31/98	01/04/99

Appendix Table 2. Total number of stream miles and tributaries or stream reaches occupied by westslope cutthroat trout (WCT) in the historic range of the subspecies. Trend is given as unknown (U), declining (D), or stable (S). Also shown are ICBEMP data that give status of WCT in 6th-field HUCs in the Columbia River basin. Data are given as the number of 6th-field HUCs in which WCT stocks are strong (S), depressed (D), absent (A), predicted strong (PS), predicted depressed (PD), or predicted absent (PA). In the Pend Orielle and Upper Columbia drainages, occupied river miles and tributaries are given as both historic (h) and current (c).

BASIN	Major Drainage	Watershed	4th-field HUC	No. of 6th-field HUCs	Number of Occupied Miles: Abundant	Rare	Total	Occupied Tributaries or Reaches	Trend	ICBEMP Data: S	D	A	PS	PD	PA	Total
SASKATCHEWAN (Montana)	OLDMAN	Belly	10010001						U							
		Saint Mary	10010002						U							
		COMBINED OLDMAN							U							
MISSOURI (Montana)	MISSOURI HEADWATERS	Red Rock River	10020001		334	148	482	47	U							no data
		Beaverhead River	10020002		150	72	222	21	U							no data
		Ruby River	10020003		150	101	251	38	U							no data
		Big Hole River	10020004		193	503	696	122	U							no data
		Jefferson River	10020005		17	42	59	8	U							no data
		Boulder River	10020006		2	48	50	6	U							no data
		Madison River	10020007		93	217	310	47	U							no data
		Gallatin River	10020008		62	147	209	51	U							no data
		COMBINED HEADWATERS			1001	1278	2279	340	U							
	LOWER MISSOURI	Upper Missouri River	10030101		127	145	272	66	U							no data
		Upper Mis.-Dearborn River	10030102		53	60	113	20	U							no data
		Smith River	10030103		140	330	470	118	U							no data
		Sun River	10030104		42	119	161	271	U							no data
		Belt Creek	10030105		78	106	184	40	U							no data
		Two Medicine River	10030201		113	103	216	40	U							no data
		Teton River	10030205		29	81	110	22	U							no data
		Arrow Creek	10040102		2	11	13	0	U							no data
		Judith River	10040103		70	122	192	34	U							no data
		Up. Musselshell River	10040201		15	31	46	4	U							no data
		Flat Willow Creek	10040203		8	0	8	1	U							no data
		Box Elder Creek	10040204		6	0	6	1	U							no data
		COMBINED LOWER MISSOURI			683	1108	1791	617	U							
COLUMBIA (Montana)	KOOTENAI	Upper Kootenai River	17010101	89	512	162	674	122	U	6	69	5	0	9	0	89
		Fisher River	17010102	33	97	76	173	48	U	0	25	4	0	4	0	33
		Yaak River	17010103	22	125	79	204	53	U	5	12	2	0	3	0	22
		Lower Kootenai River	17010104	35	0	0	0	3	U	2	19	0	0	12	0	33
		Moyie River	17010105	8	0	0	0	1	U	2	6	0	0	0	0	8
		COMBINED KOOTENAI		187	734	317	1051	227	U	15	131	11	0	28	0	185
	CLARK FORK	Upper Clark Fork River	17010201	67	542	37	579	123	U	10	30	11	0	9	7	67
		Flint-Rock Creek	17010202	49	489	140	629	148	U	27	9	2	1	4	6	49
		Blackfoot River	17010203	92	638	381	1019	230	U	5	54	8	0	23	2	92
		Middle Clark Fork River	17010204	67	479	388	867	222	U	10	39	1	1	16	0	67
		Bitterroot River	17010205	98	1109	256	1365	399	U	10	77	2	0	9	0	98
		Lower Clark Fork River	17010213	101	474	233	707	169	U	15	59	3	0	24	0	101
		COMBINED CLARK FORK		474	3731	1435	5166	1291	U	77	268	27	2	85	15	474
	FLATHEAD	North Fork Flathead River	17010206	37	266	178	444	111	U	4	27	1	0	4	0	36
		Middle Fork Flathead River	17010207	42	246	225	471	135	U	0	36	1	0	5	0	42
		Flathead Lake	17010208	33	70	67	137	19	U	0	12	14	0	7	0	33
		South Fork Flathead River	17010209	73	559	50	609	148	U	38	9	0	13	13	0	73
		Stillwater River	17010210	32	261	185	446	135	U	0	25	3	0	4	0	32
		Swan River	17010211	29	126	179	305	103	U	0	26	0	0	3	0	29
		Lower Flathead River	17010212	67	185	12	197	25	U	0	42	15	0	7	3	67
		COMBINED FLATHEAD		313	1713	896	2609	676	U	42	177	34	13	43	3	312
COLUMBIA (Idaho)	PEND ORIELLE	Pend Orielle Lake/River	17010213-14	51			344	35	U	3	46	2				51
		Priest Lake/River	17010215	36			212	23	U	5	23	1	0	7	0	36
		Pend Orielle River, WA	17010216	40			205-h,250-c	51-h,61-c	U	0	0	2	0	38	0	40
		COMBINED PEND ORIELLE		127												
	SPOKANE	Coeur d'Alene Lake/River	17010301-05	101			790	105	D	2	90	0	0	9	0	101
		St. Joe River	17010304	65			743	78	D	10	54	0	1	0	0	65
		COMBINED SPOKANE		166			1533	183								
	KOOTENAI	Lower Kootenai River	17010104	35			324	27	U	2	19	0	0	12	0	33
		Moyie River	17010105	8			65	6	U	2	6	0	0	0	0	8
		COMBINED KOOTENAI		43			389	33								
	UPPER COLUMBIA	Methow River	17020008	61			31-h,202-c	7-h,60-c	U	0	0	16	27	2	16	61
		Lake Chelan	17020009	32			86-h,150-c	43-h,43-c	U	2	0	1	13	9	6	32
		COMBINED UPPER COLUMBIA		93												
	CLEARWATER	Lower Clearwater River	17060306, 17060304	122			358	25	U	1	5	74	5	0	37	122
		N.Fork Clearwater River	17060307, 17060308	98			813	66	U	18	30	2	15	33	0	98
		S.Fork Clearwater River	17060305	61			561	63	U	2	35	6	1	3	14	61
		Lochsa River	17060303	49			477	48	U	27	10	0	6	5	1	49
		Selway River	17060301, 17060302	80			694	63	U	16	4	10	30	13	6	79
		COMBINED CLEARWATER		410			2903	265								
	SALMON	Lower Salmon River	17060207, 17060209	74			274	16	U	0	1	43	6	13	11	74
		Middle Salmon River	17060203, 17060207	118			680	59	U	5	23	24	11	41	14	118
		Upper Salmon River	17060201, 17060203	115			954	97	U	9	34	9	9	49	5	115
		Little Salmon River	170602010	18			214	19	U	0	2	5	0	7	4	18
		S.Fork Salmon River	17060208	58			470	48	U	3	33	11	5	6	0	58
		Mid. Fork Salmon River	17060205, 17060206	125			1017	98	U	59	16	12	31	3	4	125
		Lemhi River	17060204	46			265	20	U	0	0	0	1	37	8	46
		Pahsimori River	17060202	26			204	13	U	5	0	1	6	14	0	26
		COMBINED SALMON		580			4078	370								
COLUMBIA (Oregon)	JOHN DAY	Upper John Day River	17070201	33			292	43	S	0	20	13				33
		Upper North Fork John Day	17070202	10			23	8	S							no data
		COMBINED JOHN DAY		43			315	51								

Appendix Table 3. Total number of stream miles occupied by westslope cutthroat trout (WCT) that are genetically pure, 90-99.9 % pure, less than 90 % pure, and with unknown genetic characteristics. Also shown are the number of WCT stocks that have been tested genetically and the percentage of those stocks found to be not genetically pure.

BASIN	Major Drainage	Watershed	Number of Occupied Miles				Introgression	
			100% (pure)	90-99%	Hybridized	Unknown	# Tested	% Not Pure
SASKATCHEWAN (Montana)	OLDMAN	Belly						
		Saint Mary						
		COMBINED OLDMAN						
MISSOURI (Montana)	MISSOURI HEADWATERS	Red Rock River	79	138	68	197	43	63
		Beaverhead River	91	27	17	87	15	33
		Ruby River	52	63	49	87	21	62
		Big Hole River	107	71	75	443	29	59
		Jefferson River	22	12	6	19	4	25
		Boulder River	21	0	0	29	4	0
		Madison River	12	19	44	235	6	83
		Gallatin River	0	21	39	149	14	100
		COMBINED HEADWATERS	384	351	298	1246		
	LOWER MISSOURI	Upper Missouri River	64	5	46	157	22	32
		Upper Mis.-Dearborn River	0	0	20	93	?	?
		Smith River	27	12	23	408	15	53
		Sun River	2	14	0	145	5	80
		Belt Creek	40	17	0	127	13	8
		Two Medicine River	28	36	42	110	18	61
		Teton River	30	10	0	70	8	38
		Arrow Creek	0	0	0	13	1	0
		Judith River	12	22	4	154	8	63
		Up. Musselshell River	0	0	0	46	?	?
		Flat Willow Creek	8	0	0	0	1	0
		Box Elder Creek	6	0	0	0	1	0
		COMBINED LOWER MISSOURI	217	116	135	1323		
COLUMBIA (Montana)	KOOTENAI	Upper Kootenai River	43	26	250	355	18	72
		Fisher River	9	2	20	142	3	0
		Yaak River	86	4	39	75	23	43
		Lower Kootenai River	0	0	0	0		
		Moyie River	0	0	0	0	1	0
		COMBINED KOOTENAI	138	32	309	572		
	CLARK FORK	Upper Clark Fork River	224	26	39	290	38	18
		Flint-Rock Creek	144	30	6	449	14	29
		Blackfoot River	255	59	39	666	55	16
		Middle Clark Fork River	105	28	32	702	25	40
		Bitterroot River	353	53	73	886	56	29
		Lower Clark Fork River	249	31	19	408	43	14
		COMBINED CLARK FORK	1330	227	208	3401		
	FLATHEAD	North Fork Flathead River	67	27	6	344	22	27
		Middle Fork Flathead River	19	0	0	452	5	0
		Flathead Lake	66	0	2	69	3	0
		South Fork Flathead River	289	44	32	244	56	39
		Stillwater River	12	9	0	425	5	40
		Swan River	23	7	4	271	5	20
		Lower Flathead River	88	0	10	99	42	14
		COMBINED FLATHEAD	564	87	54	1904		
COLUMBIA (Idaho)	PEND ORIELLE	Pend Orielle Lake/River					0	-
		Priest Lake/River					1	0
		Pend Orielle River, WA					1	100
	SPOKANE	Coeur d'Alene Lake/River					28	54
		St. Joe River					4	25
	KOOTENAI	Lower Kootenai River					8	100
		Moyie River					7	38
	UPPER COLUMBIA	Methow River					7	100
		Lake Chelan					-	-
	CLEARWATER	Lower Clearwater River						
		N.Fork Clearwater River						
		S.Fork Clearwater River						
		Lochsa River						
		Selway River						
	SALMON	Lower Salmon River						
		Middle Salmon River						
		Upper Salmon River						
		Little Salmon River						
		S.Fork Salmon River						
		Mid. Fork Salmon River						
		Lemhi River						
		Pahsimori River						
COLUMBIA (Oregon)	JOHN DAY	Upper John Day River				292	2	L
		Upper North Fork John Day				23	0	U

Appendix Table 4. Land ownership in watersheds occupied by westslope cutthroat trout (WCT), the percentage of the total watershed occupied by WCT, the percentage of occupied habitat administered by federal agencies, and the administrative protections and conservation efforts affecting WCT in these watersheds. Administrative protection consist of ESA Section 7 protection for bull trout (BLT) and steelhead (SH), as well as designated wilderness (W), roadless areas (R), and wild and scenic rivers (WS). Conservation efforts consist of conservation agreements (CA), INFISH (IF), and PACFISH (PF).

BASIN	Major Drainage	Watershed	Land Area (acres)	Land Administration (percent of watershed) Forest Service	Bureau of Land Mgmt	National Parks & Refuges	Tribal	State	Other	Occupied Habitat: Percent of Total Watershed Occupied by WCT	Percent of Occupied Habitat Administered by Federal Agencies	Admin. Protection	Conservation Efforts
SASKATCHEWAN (Montana)	OLDMAN	Belly	116,056	0.0	0.0	97.6	0.0	0.0	2.4	???	100.0		
		Saint Mary	313,105	0.0	0.0	53.5	29.1	0.0	17.4	3.2	96.9		
		COMBINED OLDMAN	429,161	0.0	0.0	39.1	21.2	0.0	13.3	???	97.7		
MISSOURI (Montana)	MISSOURI HEADWATERS	Red Rock River	1,491,200	26.0	29.3	2.4	0.0	12.5	29.9	35.7	48.5		CA
		Beaverhead River	934,400	14.6	23.9	0.0	0.0	14.3	47.2	34.1	32.3		CA
		Ruby River	632,320	35.7	15.0	0.0	0.0	7.1	42.1	33.9	54.0		CA
		Big Hole River	1,785,600	58.3	9.4	0.0	0.0	5.6	26.7	38.6	53.6		CA
		Jefferson River	857,600	27.9	8.5	0.0	0.0	5.6	58.0	10.9	50.5		CA
		Boulder River	482,560	50.8	9.0	0.0	0.0	3.3	36.9	15.4	76.6		CA
		Madison River	1,637,530	48.4	3.4	3.0	0.0	4.7	40.4	28.6	60.5		CA
		Gallatin River	1,160,245	39.3	0.2	4.1	0.0	3.2	53.2	18.3	32.8		CA
		COMBINED HEADWATERS	8,981,455	39.2	12.2	1.5	0.0	7.2	39.9	29.0	52.9		
	LOWER MISSOURI	Upper Missouri River	2,140,246	24.7	7.0	0.0	0.0	5.5	62.8	16.8	25.0		CA
		Upper Mis.-Dearborn River	1,715,200	5.8	1.8	0.4	0.0	6.7	85.3	8.1	24.7		CA
		Smith River	1,292,800	24.9	0.9	0.0	0.0	6.0	68.3	43.7	35.2		CA
		Sun River	1,280,000	34.1	2.0	0.1	0.0	9.0	54.9	19.5	71.8		CA
		Belt Creek	515,840	35.8	0.7	0.0	0.0	2.3	61.2	44.7	64.2		CA
		Two Medicine River	844,800	21.7	0.1	6.2	36.6	2.1	33.2	28.3	59.4		CA
		Teton River	1,254,400	0.0	1.7	0.0	7.8	8.7	81.8	13.9	56.1		CA
		Arrow Creek	780,800	3.5	6.8	0.2	0.0	14.3	75.2	4.5	8.9		CA
		Judith River	1,779,200	16.9	2.5	0.0	0.0	5.0	75.5	16.0	59.4		CA
		Up. Musselshell River	2,592,000	10.6	0.6	0.0	0.0	6.9	81.8	2.8	21.4		CA
		Flat Willow Creek	442,880	4.3	5.9	0.3	0.0	5.8	83.6	3.4	67.6		CA
		Box Elder Creek	748,320	0.0	14.9	0.2	0.0	6.2	78.8	1.1	54.5		CA
		COMBINED LOWER MISSOURI	15,386,486	16.2	2.6	0.4	2.8	6.6	71.4	15.4	19.2		
COLUMBIA (Montana)	KOOTENAI	Upper Kootenai River	1,465,600	78.5	0.0	0.0	0.0	1.7	19.8	45.1	69.4	BT	IF,CA
		Fisher River	522,880	36.5	0.0	0.0	0.0	4.1	59.4	54.9	18.2	BT	IF,CA
		Yaak River	391,040	96.4	0.0	0.0	0.0	0.0	3.6	54.9	81.1	BT	IF,CA
		Lower Kootenai River	568,800	76.7	0.0	0.0	0.0	0.0	23.3	26.6	0.0	BT	IF,CA
		Moyie River	133,120	99.7	0.0	0.0	0.0	0.0	0.3	???	99.7	BT	IF,CA
		COMBINED KOOTENAI	3,081,440	74.2	0.0	0.0	0.0	1.5	24.3	42.6	74.2		
	CLARK FORK	Upper Clark Fork River	1,484,800	29.5	1.2	0.0	0.0	9.0	60.2	68.1	28.8	BT	IF,CA
		Flint-Rock Creek	881,920	57.0	4.1	0.0	0.0	2.5	36.0	78.8	57.9	BT	IF,CA
		Blackfoot River	1,500,800	41.6	5.7	0.1	0.2	7.3	45.0	80.0	41.1	BT	IF,CA
		Middle Clark Fork River	1,260,800	72.4	0.0	0.0	0.0	2.6	25.0	79.6	56.2	BT	IF,CA
		Bitterroot River	1,830,400	68.4	0.0	0.1	0.0	2.6	28.8	82.6	67.7	BT	IF,CA
		Lower Clark Fork River	1,481,600	66.0	0.0	0.0	0.0	3.3	30.6	72.0	56.3	BT	IF,CA
		COMBINED CLARK FORK	8,440,320	55.8	1.7	<0.1	<0.1	4.7	37.8	76.8	57.5		
	FLATHEAD	North Fork Flathead River	609,280	47.1	0.0	44.6	0.0	3.1	5.2	86.7	81.9	BT	IF,CA
		Middle Fork Flathead River	727,680	51.1	0.0	46.0	0.0	0.0	2.8	86.4	94.1	BT	IF,CA
		Flathead Lake	732,160	17.4	0.0	0.4	7.6	3.4	71.2	47.1	7.2	BT	IF,CA
		South Fork Flathead River	1,077,760	97.5	0.0	0.0	0.0	0.0	2.5	70.2	97.4	BT	IF,CA
		Stillwater River	519,040	48.6	0.0	0.0	0.0	20.2	31.2	83.5	42.8	BT	IF,CA
		Swan River	467,200	59.2	0.0	0.3	0.1	9.7	30.7	62.9	47.1	BT	IF,CA
		Lower Flathead River	1,265,920	1.6	0.0	1.7	46.2	3.7	46.9	36.4	42.9	BT	IF,CA
		COMBINED FLATHEAD	5,399,040	44.2	0.0	11.7	11.9	4.4	27.8	63.8	55.9		
COLUMBIA (Idaho)	PEND ORIELLE	Pend Orielle Lake/River											
		Priest Lake/River											
		Pend Orielle River, WA											
	SPOKANE	Coeur d'Alene Lake/River											
		St. Joe River											
	KOOTENAI	Lower Kootenai River											
		Moyie River											
	UPPER COLUMBIA	Methow River											
		Lake Chelan											
	CLEARWATER	Lower Clearwater River	1,578,438	14.2	1.4	0.0	4.6	7.6	72.2			WS, R	PF
		N.Fork Clearwater River	1,508,457	63.4	0.9	0.0	0.0	11.1	24.2			R	IF
		S.Fork Clearwater River	752,474	68.4	2.0	0.0	0.8	0.6	28.1			W, R	PF
		Lochsa River	662,131	93.8	0.0	0.0	0.0	0.0	6.0			WS, W, R	PF
		Selway River	1,266,749	99.8	0.0	0.0	0.0	0.0	0.1			WS, W, R	PF
		COMBINED CLEARWATER	5,768,249	62.1	0.9	<0.1	1.4	5.1	30.5				
	SALMON	Lower Salmon River	1,099,144	57.5	5.9	0.2	0.0	3.7	32.8				PF
		Middle Salmon River	1,629,362	94.7	2.1	0.0	0.0	0.1	2.9			WS, W, R	PF
		Upper Salmon River	1,826,844	67.6	25.5	0.0	0.0	1.6	5.3			WS, W, R	PF
		Little Salmon River	369,316	60.6	4.4	0.0	0.0	4.0	31.0			WS, W, R	PF
		S.Fork Salmon River	240,730	99.3	0.0	0.0	0.0	0.3	0.5				PF
		Mid. Fork Salmon River	1,836,982	99.2	0.0	0.0	0.0	0.3	0.4			WS, W, R	PF
		Lemhi River	807,823	39.4	39.1	0.0	0.0	3.2	18.0				PF
		Pahsimori River	531,870	46.1	42.6	0.0	0.0	2.7	8.7				PF
		COMBINED SALMON	8,342,071	75.0	13.5	0.0	0.0	1.6	9.9				
COLUMBIA (Oregon)	JOHN DAY	Upper John Day River									43.0	BT, SH	PF
		Upper North Fork John Day									98.0	BT,SH	PF

Appendix Table 5. Threats to westslope cutthroat throat trout throughout the historic range of the subspecies. Data are given as the number of water bodies considered water-quality impaired by that particular land-use activity, as low (L), moderate (M), or extensive (E), or as present (X). Harvest is given as catch and release only (C & R), restricted (R), low (L), moderate (M), or extensive (E). Nonnative fish are given as brook trout (BKT), rainbow trout (RBT), Yellowstone cutthroat trout (YCT), kokanee (KOK), brown trout (BRN), largemouth bass (LMB), lake trout (LKT), northern pike (NP) and chinook salmon (CHN).

BASIN	Major Drainage	Watershed	Dams	Forestry	Agriculture	Water Withdrawls	Roads	Channelization	Mining	Natural Sources	Water Quality	Harvest	Nonnative Fish
SASKATCHEWAN	OLDMAN	Belly River											
(Montana)		Saint Mary River	1		1	2		1			1		BKT, RBT, YCT, KOK
MISSOURI	MISSOURI HEADWATERS	Red Rock River	1	2	16	7	2		1	6	17	C & R	BKT, RBT, BRN
(Montana)		Beaverhead River	1	6	18	11	3		6	4	15	C & R	(apply to all MISSOURI
		Ruby River		4	22	11	5		6	8	22	C & R	HEADWATERS watersheds)
		Big Hole River	6	13	49	35	22		17	2	55	C & R	
		Jefferson River	1	1	16	12	8		6	2	14	C & R	
		Boulder River		1	13	4	6		10	1	9	C & R	
		Madison River		5	18	14	3		4	9	15	C & R	
		Gallatin River		5	19	13	11			1	18	C & R	
	LOWER MISSOURI	Upper Missouri River		2	28	17	9		34	3	40	C & R	BKT, RBT, BRN
		Upper Mis.-Dearborn River	1		11	5	2	1	3	3	11	C & R	(apply to all LOWER
		Smith River		8	11	10	4	3	6	1	11	C & R	MISSOURI watersheds)
		Sun River			4	4				2	4	C & R	
		Belt Creek			3	1	3	1	4		6	C & R	
		Two Medicine River			10	11	2		2	2	10	C & R	
		Teton River			9	8		1	1	3	6	C & R	
		Arrow Creek			2	1				2	2	C & R	
		Judith River		4	12	3	2	1	1	6	15	C & R	
		Up. Musselshell River			7	5	2				7	C & R	
		Flat Willow Creek			1							C & R	
		Box Elder Creek			2				3		4	C & R	
COLUMBIA	KOOTENAI	Upper Kootenai River	1	12	7	10	3	1	5	3	17	R	BKT, RBT
(Montana)		Fisher River		3	2			2			3	R	(apply to all KOOTENAI
		Yaak River		8		8	1				7	R	watersheds)
		Lower Kootenai River											
		Moyie River											
	CLARK FORK	Upper Clark Fork River	2	8	33	25	11	8	24	6	37	R	BKT, RBT, BRN
		Flint-Rock Creek		3	15	11	9	1	18	2	30	R	(apply to all CLARK FORK
		Blackfoot River	2	19	33	26	15	1	11	9	43	R	watersheds)
		Middle Clark Fork River	3	13	18	12	17		14	3	23	R	
		Bitterroot River		19	26	13	11	1	3	3	36	R	
		Lower Clark Fork River	1	15	18	12	8		3	2	21	R	
	FLATHEAD	North Fork Flathead River		6				1		2	6	R	BKT, RBT
		Middle Fork Flathead River		4						2	4	R	(apply to all FLATHEAD
		Flathead Lake		1	3			3			5	R	watersheds)
		South Fork Flathead River	1	1		1						R	
		Stillwater River		5	3	2	1			2	7	R	
		Swan River											
		Lower Flathead River	1		10	3	1			3	10	R	
COLUMBIA	PEND ORIELLE	Pend Orielle Lake/River	E	M		M	M	L	L		L	L/M	BKT,LMB,RBT,LKT,KOK,BRN
(Idaho)		Priest Lake/River	L/M	M		L	M/E	L	L		L	L	LKT,RBT,BKT
		Pend Orielle River, WA	M/E	M		M	M	M	L		L	L/M	RBT,BKT,BRN,LMB,KOK
	SPOKANE	Coeur d'Alene Lake/River	L	M/E		L	M/E	L/M	M/E		L	M/E	BKT,CHN,YCT,BRN,RBT,KOK,NP
		St. Joe River	L	M/E		L	M/E	L/M	L		L	M/E	BKT,YCT,RBT,NP
	KOOTENAI	Lower Kootenai River	M/E	M		M	E	M	L			L/M	RBT,YCT,BKT
		Moyie River	L	M		L	M/E	L	L			L	RBT,YCT,BKT
	UPPER COLUMBIA	Methow River	L	L/M		L/M	L	L/M	L		L	L/M	RBT,BKT
		Lake Chelan	M/E	L/M		L	L/M	L	L/M		L	M	RBT,KOK,LKT,CHN
	CLEARWATER	Lower Clearwater River	X	X	X		X				X	L	RBT
		N.Fork Clearwater River	X	X	X		X		X		X	L	~15 nonnative spp.
		S.Fork Clearwater River		X	X		X		X		X	L	RBT,BKT
		Lochsa River		X			X	X			X	L	RBT,BKT
		Selway River		X			X				X	L	RBT,BKT
	SALMON	Lower Salmon River		X	X		X				X	L	
		Middle Salmon River		X	X		X	X	X		X	L	BKT
		Upper Salmon River		X	X		X	X	X			L	RBT, BKT
		Little Salmon River		X	X	X					X	L	BKT, BRN
		S.Fork Salmon River		X	X		X		X			L	RBT,BKT
		Mid. Fork Salmon River	X	X	X		X	X	X			L	RBT,BKT
		Lemhi River	X		X	X					X	L	BKT
		Pahsimori River		X	X	X			X			L	BKT
COLUMBIA	JOHN DAY	Upper John Day River	N	M		M	M	L	L			L	RBT
(Oregon)		Upper North Fork John Day	N	M		N	M	N	M			L	YCT, O, U