Paiute cutthroat trout
(Oncorhynchus clarkii seleniris)

5-Year Review:
Summary and Evaluation

U.S. Fish and Wildlife Service
Nevada Fish and Wildlife Office
Reno, Nevada
June 2008

5-YEAR REVIEW

Species reviewed: Paiute cutthroat trout (*Oncorhynchus clarkii seleniris*)

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5-YEAR REVIEW
Paiute cutthroat trout/*Oncorhynchus clarkii seleniris*

I. GENERAL INFORMATION

I.A. Methodology used to complete the review

The U.S. Fish and Wildlife Service (Service) reviewed the 2004 revised recovery plan; the August 4, 2005, annual data call; recent genetics information; and information surrounding the implementation of Recovery Criterion 1. The Service requested information on the latest population estimates, habitat surveys, and other recovery actions implemented by California Department of Fish and Game (CDFG), Sierra National Forest, Inyo National Forest, and Humboldt-Toiyabe National Forest.

I.B. Reviewers

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I.C. Background

I.C.1. FR Notice citation announcing initiation of this review:

On March 26, 2006, the Service announced initiation of the five-year review for Paiute cutthroat trout and asked for information from the public regarding the species' status (71 FR 14538). We received one letter from the public during this period. We received information from Forest Service and CDFG personnel which was used in this review.

I.C.2. Listing history:

Original Listing
FR notice: 32 FR 4001
Date listed: March 11, 1967
Entity listed: subspecies
Classification: Endangered

Revised Listing, if applicable
FR notice: 40 FR 29863
Date listed: July 16, 1975
Entity listed: subspecies
Classification: Threatened

I.C.4. Associated rulemakings:

A 4(d) rule was published on July 16, 1975 (40 FR 29863; 50 CFR 17.44(a)). No critical habitat has been designated for this species.

I.C.5. Review History:
The original recovery plan was published on January 25, 1985. A revised recovery plan was published on August 10, 2004. No other reviews have occurred.

I.C.6. Species' Recovery Priority Number at start of review:
The Recovery Priority Number at the start of this review is a 9. This number indicates a subspecies with moderate degree of threat and a high potential for recovery.

I.C.7. Recovery Plan or Outline:
Name of plan: Revised Recovery Plan for the Paiute Cutthroat Trout (*Oncorhynchus clarki seleniris*)
Date issued: August 10, 2004
Dates of previous revisions: January 25, 1985

II. REVIEW ANALYSIS

II.A. Application of the 1996 Distinct Population Segment (DPS) policy

II.A.1. Is the species under review listed as a DPS?

____ ***Yes***
__X_***No***

II.A.2. Is there relevant new information that would lead you to consider listing this species as a DPS in accordance with the 1996 policy?

____ ***Yes***

__X_ ***No***

II.B. Recovery Criteria

II.B.1. Does the species have a final, approved recovery plan containing objective, measurable criteria?

__X_ ***Yes***

____ ***No***

II.B.2. Adequacy of recovery criteria.

II.B.2.a. Do the recovery criteria reflect the best available and most up-to date information on the biology of the species and its habitat?

__X_ ***Yes***
__ __ ***No***

II.B.2.b. Are all of the 5 listing factors that are relevant to the species addressed in the recovery criteria (and is there no new information to consider regarding existing or new threats)?

_ _ _ ***Yes***,
_X__ ***No***

In general, the existing criteria are not strictly threats-based in that they are not specifically framed in terms of the five listing factors. Additionally, difficulties in implementing recovery criterion 1 have emerged, which were not considered in the revised recovery plan (see section II.C.2.e).

II.B.3. List the recovery criteria as they appear in the recovery plan, and discuss how each criterion has or has not been met, citing information. For threats-related recovery criteria, please note which of the 5 listing factors* are addressed by that criterion. If any of the 5-listing factors are not relevant to this species, please note that here.

Recovery Goal: Recovery of Paiute cutthroat trout sufficient to allow delisting of the species.

Recovery Objectives: Improve the status and habitat of Paiute cutthroat trout and eliminate competition from nonnative salmonid species.

Recovery Criteria: Paiute cutthroat trout will be considered for delisting when the following objectives are met:

1) All nonnative salmonids are removed from Silver King Creek and its tributaries downstream of Llewellyn Falls to fish barriers in Silver King Canyon.

This criterion has not been met despite numerous efforts to implement it. See section II.C.2.e.for details.

* Appendix A, attached, from the 2004 revised recovery plan lists the identified recovery criteria in relation to the five listing factors.

2) A viable population occupies all historic habitat in Silver King Creek and its tributaries downstream of Llewellyn Falls to fish barriers in Silver King Canyon.

Criterion 2 cannot be implemented until Criterion 1 is accomplished.

3) Paiute cutthroat trout habitat is maintained in all occupied streams.

Paiute cutthroat trout habitat is being maintained or is improving. See section II.C.1.e. for further details on Paiute cutthroat trout habitat.

4) The refuge populations in Corral and Coyote Creeks, Silver King Creek, and tributaries above Llewellyn Falls as well as out-of-basin populations are maintained as refuges and are secured from the introduction of other salmonid species.

The refuge populations all have effective barriers to keep non-native fish from invading occupied habitat and therefore are considered secured. North Fork Cottonwood Creek may need another barrier to ensure the security of that population which is a task in the 2004 recovery plan.

5) A long-term conservation plan and conservation agreement are developed, which will be the guiding management documents once Paiute cutthroat trout are delisted.

This criterion will be implemented when delisting occurs.

II.C. Updated Information and Current Species Status

II.C.1. Biology and Habitat

Distribution: The Paiute cutthroat trout is known from drainages in the Sierra Nevada range in east-central California. The presumed historic distribution was limited to 14.7 kilometers (km) [9.1 miles (mi)] of habitat in Silver King Creek (Alpine County) from Llewellyn Falls downstream to barriers in Silver King Canyon as well as the accessible reaches of three small named tributaries: Tamarack Creek, Tamarack Lake Creek, and the lower reaches of Coyote Valley Creek downstream of barrier falls (Figure 1) (Service 2004).

Paiute cutthroat trout now occupy approximately 33.2 km (20.6 mi) of habitat in five widely distributed drainages outside of their historic range. They were first established in the upper reaches of the Silver King Creek drainage (above natural barriers) in 1912 when local livestock operators transplanted fish above Llewellyn Falls (Service 2004). The progeny of these early day transplants were then introduced into several other lakes and streams in California. Four self-sustaining populations are now established outside the historic drainage. Currently, no

Paiute cutthroat trout occur within its historic range. The current distribution of the Paiute cutthroat trout consists of the following locations (Service 2004):

Silver King Creek drainage. This drainage is located in the Humboldt-Toiyabe National Forest, Alpine County, California. Paiute cutthroat trout now occupy approximately 9.1 km (5.6 mi) in the upper reaches of Silver King Creek and its tributaries (Four Mile Canyon Creek and Fly Valley Creek) above Llewellyn Falls. Two other occupied tributaries are located below Llewellyn Falls, Corral Valley (3.6 km, 2.2 mi) and Coyote Valley (4.9 km, 3.0 mi) Creeks. The lower part of Silver King Creek proper (from below Llewellyn falls to barriers in Silver King Canyon) and associated tributaries is the historic portion of the Paiute cutthroat trout's range and is not currently occupied (see also above; Figures 1 and 2) (Service 2004).

North Fork Cottonwood Creek and Cabin Creek. Both of these drainages are located in Inyo National Forest, Mono County, California. Paiute cutthroat trout were first established in North Fork Cottonwood Creek in 1946 and currently occupy approximately 5.5 km (3.4 mi). Cabin Creek was established in 1968 and 2.4 km (1.5 mi) are occupied (Figures 2 and 3) (Service 2004).

Sharktooth Creek. This drainage is located in the Sierra National Forest, Fresno County, California. This population was established in 1968 and Paiute cutthroat trout occupy approximately 3.2 km (2 mi) (Figures 2 and 4) (Service 2004).

Stairway Creek. This drainage is located in the Sierra National Forest, Madera County, California. This population was established in 1972 and Paiute cutthroat trout occupy approximately 3.5 km (2 mi) (Figures 2 and 4) (Service 2004).

Abundance: It is difficult to fully characterize the abundance of the Paiute cutthroat trout. Like most animal populations, numbers of Paiute cutthroat trout fluctuate annually due to biotic and abiotic factors. Further, population estimation methods have varied by location, which means only general comparisons among the populations can be made. Overall, the estimates that have been made suggest that Paiute cutthroat trout are stable. Abundance information for each drainage is discussed in further detail below.

Upper Fish Valley: Population estimates in Upper Fish Valley have been periodically conducted since 1964, and annually since it was chemically treated from 1991-1993. Paiute cutthroat trout were reintroduced into Upper Fish Valley from 1994-1998 from populations in Fly Valley and Coyote Valley Creeks. Populations in the Silver King drainage have been estimated by triple-pass depletion electrofishing and snorkeling. The population increased from 0 in 1993 to an estimated 1,500 fish in 2001. The population then declined to an estimated 213 fish in 2003. However, the population then increased to an estimated population size of 627 fish in 2005 (W. Somer, CDFG, unpubl. data, Figure 5).

Fly Valley Creek: Eight population estimate surveys have been conducted on Fly Valley Creek. The first survey was in 1984 and the last was in 2004. In 2004, CDFG surveyed 150 meters (492 feet) of stream and estimated 72 adult fish per kilometer (116 per mile) which is lower than the average of 93 adult fish per kilometer (150 per mile). While juvenile numbers have historically fluctuated, adult numbers have stayed relatively constant (W. Somer, CDFG, unpubl. data, Figure 6).

Four Mile Canyon Creek: Twenty-one population estimate surveys have been conducted on Four Mile Canyon Creek. The first was in 1968 and they have been conducted nearly every year since 1984. In 2004, CDFG surveyed 250 meters (820 feet) of stream and estimated 22 adult fish per kilometer (36 per mile) which is lower than the average of 62 adult fish per kilometer (100 per mile). Adult numbers have stayed relatively constant while juvenile numbers have fluctuated widely (W. Somer, CDFG, unpubl. data, Figure 7).

Coyote Valley Creek: Population estimates on Coyote Valley Creek were sporadically conducted from1964 to 2000. Two separate 150 meter (492 feet) sections, Upper Meadow and Lower Meadow, were surveyed. In 2000, CDFG estimated 110 adult fish per kilometer (178 per mile) for the Upper Meadow section which is near the average of 113 adult fish per kilometer (182 per mile). The Lower Meadow section had an estimated 39 adult fish per kilometer (63 per mile) which is lower than the average of 95 adult fish per kilometer (153 per mile) (W. Somer, CDFG, unpubl. data, Figures 8 and 9).

Corral Valley Creek: Nine population estimate surveys have been conducted on Corral Valley Creek. The first survey was in 1974 and the last was in 2003. In 2003, CDFG surveyed a 150 meter (492 feet) section and estimated 92 adult fish per kilometer (148 per mile) which is higher than the average of 63 adult fish per kilometer (101 per mile) (W. Somer, CDFG, unpubl. data, Figure 10).

Sharktooth and Stairway Creeks: The Sierra National Forest has used a fly rod depletion method (Stephens and Christenson 1980) on a five year rotation for sampling Paiute cutthroat trout on Sharktooth and Stairway Creeks. Sharktooth Creek was sampled in 1999 and 2004 (Figure 11) while Stairway Creek was sampled in 2000 and 2005 (Figure 12). This method of sampling is not intended to be a good estimator of population size and is biased towards larger fish. However, other information can be collected such as size distributions and condition factors (a measure of general well-being). The size distribution indicates that there are relatively more fish in both streams in 2004-2005 versus 1999-2000 (Figures 11 and 12); however, they are smaller in size. The condition factor also reflects population changes with lower conditions factors in 2004-2005 versus 1999-2000 (Figures 11 and 12). A reduction in condition factor is expected as a population increases and has to compete for limited resources (Anderson and Neumann 1996). Condition factors found in Sharktooth and

Stairway Creeks are consistent with other small streams on the west side of the Sierra-Nevada Mountains (P. Strand, Sierra National Forest, pers. comm. 2006).

North Fork Cottonwood Creek: On this drainage a standard section of stream from Granite Meadows downstream to just above the Tres Plumas barrier has been surveyed visually since 1989 by CDFG (D. Becker, CDFG, unpubl. data, Figure 13). Estimates of the population indicate a stable population with multiple age classes being present (Figure 13). Visual encounter surveys underestimate population sizes and may be biased towards smaller size classes because larger fish use cover more frequently than fry (Bozek and Rahel 1991).

Cabin Creek: Visual surveys were conducted on Cabin Creek in 1995 and 2000 (D. Becker, CDFG, unpublished data). In 1995, 139 fish were observed and were broken down into size classes. Thirty-eight fish were between 100-200 millimeters (4 to 8 inches). The remaining 101 fish were between 200-254 millimeters (8 to 10 inches). In 2000, 186 fish were observed. The 2000 survey did not break down individual sizes, although multiple size classes were present.

Taxonomic classification: Paiute cutthroat trout was originally listed as *Salmo clarki seleniris*; however, all western North American trout have been reclassified from the genus *Salmo* to the genus *Oncorhynchus*, as summarized by Smith and Stearly (1989) and adopted by the American Fisheries Society's Committee on Names of Fishes, the accepted authority on North American fish taxonomy (Robins *et al*. 1991). We updated the list of threatened and endangered wildlife (50 CFR 17.11) to conform to this change in the nomenclature. Additionally, we have changed the species name to *clarkii* to reflect the original spelling of the species name (Nelson *et al*. 2004).

Genetics: Hybridization with non-native salmonids is the most imminent threat to Paiute cutthroat trout which currently occupy the entire historic range of Paiute cutthroat trout. In the past, non-native trout have been transported above natural barriers in Corral Creek and above Llewellyn Falls in Silver King Creek. Numerous efforts to eradicate non-native trout in the headwaters of the Silver King drainage have occurred since 1964. The most recent genetic study of Paiute cutthroat trout states that past efforts to eliminate hybridized and non-native salmonids have been successful and that pure populations of Paiute cutthroat trout exist in all occupied streams; however, there is limited genetic variation between the established populations due to the small number of individuals used to found those populations (Cordes *et al*. 2004).

Habitat or ecosystem conditions: Paiute cutthroat trout habitat requirements appear to be similar to those reported for other western stream-dwelling salmonids (Hickman and Raleigh 1982). All life stages require cool, well-oxygenated waters. Adult fish prefer stream pool habitat in low gradient meadows with undercut or overhanging banks and abundant riparian vegetation (Behnke and Zarn 1976). Pools are important rearing habitat for juveniles and

act as refuge areas during winter (Hickman and Raleigh 1982; Swales *et al*. 1986; Berg 1994). During the winter months, trout move into pools to avoid physical damage from ice scouring (Scrimgeour *et al*. 1994) and to conserve energy (Everest and Chapman 1972; Cunjak 1996). As with other salmonids, suitable winter habitat may be more restrictive than summer habitat (Jakober *et al*. 1998). Paiute cutthroat trout survive in lakes, but there is no evidence that they ever occurred naturally in any lakes within the Silver King basin. Paiute cutthroat trout demonstrate fluvial spawning behavior and must have access to flowing waters with clean gravel substrates.

A limited amount of habitat monitoring has been conducted within Silver King Creek since 1991 when the last habitat monitoring effort was conducted (Overton *et al*. 1994). Stream channel morphology measurements at a number of locations were collected in both Upper Fish and Lower Fish Valleys in 1999, 2001, and 2002 (Flint 2004). Flint (2004) concluded that both valleys are recovering from grazing impacts, stream banks are stable, and willows and sedges are rapidly recolonizing the riparian area. The Inyo National Forest initiated habitat monitoring for North Fork Cottonwood Creek and Cabin Creek in 2004 (L. Sims, Inyo National Forest, unpubl. data).

More recent habitat data has been collected on Stairway (2005) and Sharktooth (2004) Creeks. Preliminary analysis indicates that both streams continue to recover from a 1997 rain on snow event, which caused severe flooding. This event simplified the habitat by reducing riparian vegetation, reducing large woody debris, and changing pool habitat to runs and riffles (P. Strand, Sierra National Forest, unpubl. data). Now, riparian vegetation is recolonizing eroded areas, large woody debris is being deposited into the stream channel which is forming more pools and creating more complex and diverse habitat (P. Strand, Sierra National Forest, unpubl. data).

II.C.2. Five-Factor Analysis (threats, conservation measures, and regulatory mechanisms) The Paiute cutthroat trout was listed as endangered on March 11, 1967 (32 FR 4001), and reclassified as threatened on July 16, 1975, to facilitate management and allow regulated angling (40 FR 29863). Threats at the time of reclassification included livestock grazing, recreational development, and hybridization from rainbow trout introduction. Existing threats are as follows:

II.C.2.a. Factor A - Present or threatened destruction, modification or curtailment of its habitat or range:

Factor A was identified as a threat at the time of reclassification in 1975 due to concerns about grazing and recreational use (40 FR 29863). The current status of those threats, as well as habitat loss due to beaver activity, is discussed below:

Valuable cover for stream populations of cutthroat trout is provided by undercut banks, which are dependent on extensive vegetative cover for their stability (Behnke and Zarn 1976). Stream bank sloughing occurs as the result of normal erosive forces (floods, channel realignment, etc.) but can be accelerated by human-caused activities (off-highway vehicle use, grazing, etc.).

Grazing

The listing rule indicated that Paiute cutthroat trout may be threatened by livestock grazing activities, but did not provide detailed specifics of the threat. Below is our analysis of any current threat from grazing.

Impacts of livestock grazing to stream habitat and fish populations can be separated into acute and chronic effects. Acute effects are those which contribute to the immediate loss of individuals, loss of specific habitat features (undercut banks, spawning beds, etc.) or localized reductions in habitat quality (sedimentation, loss of riparian vegetation, etc.). Chronic effects are those which, over a period of time, result in loss or reduction of entire populations of fish, or widespread reduction in habitat quantity and/or quality.

According to Minshall *et al.* (1989), riparian/stream ecosystems are the most threatened ecosystems. Native and domestic grazers, especially cattle, are attracted to these narrow green strips of vegetation due to the presence of water, shade, succulent vegetation, and gentle topography (Platts 1979; Marlow and Pogacnik 1985; Smith *et al*. 1992; Kie and Boroski 1996; Parsons *et al*. 2003). Riparian areas, especially, are most vulnerable to the effects of overgrazing because cattle tend to concentrate in them (Platts 1979). Summer season grazing (July 1 through September 15) focuses livestock use on riparian areas because of the availability of water, green vegetation, trees and shrubs for cover and food, and the cooler microclimate associated with areas near water and shade (Platts 1979).

Livestock grazing can affect riparian areas by changing, reducing, or eliminating vegetation, and by the actual loss of riparian areas through channel widening, channel degradation, or lowering of the water table (Belsky *et al.* 1999). Effects on fish habitat include reduction of shade and cover and resultant increases in water temperature, changes in stream morphology,

and the addition of sediment due to bank degradation and off-site soil erosion (Belsky *et al.* 1999). Maintaining streams and their associated riparian areas in a good to excellent condition is important for natural stream functions to occur, increases the stream's ability to respond to natural disturbances such as fires and flood events, and enables the stream to support Paiute cutthroat trout survival and life history traits.

Cattle last grazed the Silver King Basin during the summer of 1994. On March 31, 1995, all authorized grazing on the Silver King Allotment was placed under administrative rest and the allotment is currently vacant (USFS 1995). It will remain vacant unless appealed and upheld under the administrative appeal process (USFS 1995).

The Cottonwood Creek and Tres Plumas grazing allotments in North Fork Cottonwood Creek also had the potential to affect Paiute cutthroat trout habitat (Kondolf 1994). Grazing was suspended for both theses allotments in 2000, and will be in non-use status for at least 10 years in the Cottonwood Basin (U.S. Forest Service 2000).

Cabin Creek is within an active grazing allotment and some degradation of habitat is occurring in the headwaters due to bank failure and increased sediment input. Grazing does not currently affect occupied habitat in Stairway and Sharktooth Creeks due to the inaccessibility of the area to livestock (P. Strand, U.S. Forest Service, pers. comm. 2003).

Recreational Use

The rule reclassifying Paiute cutthroat trout indicate that the trout may be threatened by recreational developments. We are not aware of any current threat from recreational development. Most of the occupied streams are in designated wilderness areas except for North Fork Cottonwood Creek and Cabin Creek. Stairway and Sharktooth creeks receive very little recreational use because they are very difficult to access. The Silver King drainage receives limited use from hikers, horses, and sportfishing below Llewellyn Falls. Recent trail work has been conducted in the Silver King drainage which moved the existing trail away from the stream which was eroding away. Off-highway vehicles do pose a threat to Paiute cutthroat trout in North Fork Cottonwood Creek by directly degrading habitat when crossing streams, creating new sources of erosion, and providing anglers with easier access to Paiute cutthroat trout streams (Clark and

Gibbons 1991). A decision was signed in 1991 by the Inyo National Forest which closed a portion of the Eva Belle road which was the route which most motorized vehicles used to access the Cottonwood Creek watershed (U.S. Forest Service 1991). However, implementation of this closure and monitoring has been inconsistent.

Beaver Impacts

Beavers were introduced to the Sierra Nevada in 1934 and the first recorded transplant into Alpine County was in 1942 (Hensley 1946). Beavers used to be a threat to Paiute cutthroat trout but beavers are no longer present in any of the occupied drainages. Beavers, when they were present, were a problem because they degraded spawning substrates and water quality (Ryan and Nicola 1976). When beavers colonized upper Silver King Creek they removed the aspen faster than it could be regenerated. Consequently after a short period, the beavers were forced to move on to other areas in search of food. After the beavers moved out, the abandoned dams and lodges wash out, and the fine silt and sand that had accumulated behind the dams was eroded and deposited in the streambed. The collapse of old beaver dams, and in Four Mile Canyon Creek, the associated down-cutting, has caused degradation of that stream habitat (Ryan *in litt.*1982). This series of events led to a ten-fold decline in the Paiute cutthroat trout population (Ryan *in litt.*1982). Beavers have not been present in the drainage since 1990 and the habitat is naturally recovering from these past events (W. Somer, CDFG, pers. comm. 2006).

Factor A Summary

Livestock grazing and recreational development were identified as threats at the time of reclassification from endangered to threatened. Changes in grazing practices on National Forest lands have reduced this threat, and streams are beginning to recover from past damage. Recreation in the form of off-highway use continues to pose a threat to the trout's habitat in North Fork Cottonwood Creek. Non-native beavers have historically degraded Paiute cutthroat trout habitat, but since their removal, the streams have been recovering naturally. Due to all of these changes, the threat of habitat loss or modification is less than at the time of listing, but continues due to off-highway recreation in North Fork Cottonwood Creek.

II.C.2.b. Factor B - Overutilization for commercial, recreational, scientific, or educational purposes:

No threats from overutilization were identified under this factor at the time of reclassification (40 FR 29863). The final reclassification rule states the Paiute cutthroat trout would benefit from regulated taking by sportfishing and finalized regulations that permitted sportfishing of Paiute cutthroat trout in accordance with applicable State law, and that violation of State law will also be a violation of the Endangered Species Act (50 CFR 17.44(a)).

Contrary to the 1975 reclassification rule (40 FR 29863), Paiute cutthroat trout are susceptible to unregulated angling. Both the 1985 original recovery plan (Service 1985) and the revised recovery plan (Service 2004) address the issue of unregulated angling. Connell (letter in Ryan and Nicola 1976) reported that in 1890 he and a companion took 1,500 fish from Silver King Creek in only three days of fishing. He noted that "...they fished only a very small part of the time" and that their angling success was enhanced when his fishing companion "...conceived the idea of putting two hooks on his line and succeeded in bringing out two fish in the majority of his casts." From 1952 to 1965, Silver King Creek was open to angling to reduce the number of hybrid fish and the population above Llewellyn Falls was severely depleted. Angling has been closed in Silver King Creek above Llewellyn Falls since 1965. In the early 1970s, the population above the Llewellyn Falls was again significantly reduced following a brief period of unauthorized angling by military personnel (Ryan and Nicola 1976).

Fishing in Silver King Creek from Llewellyn Falls downstream to the confluence of Tamarack Lake Creek has recently (2006) been closed to reduce the threat of unintentional movement of non-native salmonids above Llewellyn Falls into occupied habitat [Section 7.50(b)(178), Title 14, California Code of Regulations]. Additionally, fishing in North Fork Cottonwood Creek, an out-of-basin population, is closed to fishing. The other occupied streams are open to fishing; however, due to their remote locations, fishing has not been documented to be a threat. Currently, there are no data to indicate that overutilization is occurring.

II.C.2.c. Factor C - Disease or predation:

Disease and reclassification were not identified as threats in the reclassification rule (40 FR 29863).

There are several natural predators water shrews (*Sorex palustris*), dippers (*Cinclus mexicanus)*, and trichopteron larvae on Paiute cutthroat trout eggs and fry, but few on adult fish (Service 2004). Predation does not seem to be a significant threat at this time.

Disease is apparently a significant cause of adult mortality in North Fork Cottonwood Creek, particularly in the post-spawning period. Wong (1975) observed extensive fungal infections on the dorsal and caudal fins of several spawned-out fish in North Fork Cottonwood Creek. Many of these fish were so weakened by spawning they were unable to recover. It is unknown how this infection affects Paiute cutthroat trout at the population level, however, it should be noted the population has remained viable in North Fork Cottonwood Creek since the fungus was first observed in the early 1970's. This disease has not been observed outside of North Fork Cottonwood Creek (Service 2004); therefore, disease does not seem to be a significant threat to the species throughout its range.

II.C.2.d. Factor D - Inadequacy of existing regulatory mechanisms:

No inadequacies of existing regulatory mechanisms were identified at the time of reclassification (40 FR 29863). A number of Federal and State regulations provide protections for this species, as described below:

<u>Federal Laws</u>

National Environmental Policy Act
The National Environmental Policy Act (NEPA) provides some protection for the Paiute cutthroat trout. For activities undertaken, authorized, or funded by federal agencies, NEPA requires the project be analyzed for potential impacts to the human environment prior to implementation (42 U.S.C. 4371 et seq.). Instances where that analysis reveals significant environmental effects, the federal agency must propose mitigations that could offset those effects (40 CFR 1502.16). However, NEPA does not require that adverse impacts be fully mitigated, and so some impacts could still occur. Additionally, NEPA is only required for projects with a federal nexus, and

therefore, actions taken by private landowners are not required to comply with this law.

Clean Water Act
Under section 404 of the Clean Water Act, the U.S. Army Corps of Engineers (Corps) regulates the discharge of fill material into waters of the United States, which include navigable and isolated waters, headwaters, and adjacent wetlands (33 U.S.C. 1344). In general, the term "wetland" refers to areas meeting the Corps criteria of having hydric soils, hydrology (either sufficient flooding or water on the soil surface), and hydrophytic vegetation (plants specifically adapted for growing in wetlands). Any actions within Paiute cutthroat trout habitat that has the potential to impact waters of the United States would be reviewed under the Clean Water Act as well as NEPA and the Endangered Species Act (Act). These reviews would require consideration of impacts to the trout and its habitat, and when significant impacts could occur, mitigations would be recommended.

National Forest Management Act
The Paiute cutthroat trout is considered a rare or at risk species by the USFS because of its Federal listing as endangered. Each National Forest was required to complete a Land and Resource Management Plan (LRMP) by the Forest and Rangeland Renewable Resources Planning Act of 1974, as amended by the National Forest Management Act of 1976 (16 U.S.C. 1600). Those acts require that the LRMPs provide for multiple use and sustained yield of the products and services obtained from the National Forests, including wildlife. Consideration of the subspecies by the USFS under NFMA and through consultations with the Service under the Act has lead to important surveys for the subspecies and its habitat and measures to minimize adverse effects of USFS actions. This has ensured that USFS actions do not jeopardize the continued existence of the trout and has contributed substantially to our knowledge of the subspecies.

Endangered Species Act
The Endangered Species Act is the primary Federal law providing protection for the Paiute cutthroat trout. Since its listing, the Service has analyzed the potential effects of projects under section 7(a)(2) of the Act, which requires Federal agencies to consult with the Service prior to authorizing, funding, or carrying out activities that may affect listed species. A jeopardy determination is made for a project that is reasonably expected, either directly or indirectly, to appreciably reduce the likelihood

of both the survival and recovery of a listed species in the wild or reducing its reproduction, numbers or distribution (50 CFR § 402.02). A non-jeopardy opinion may include reasonable and prudent measures that minimize the amount or extent of incidental take of trout from a project. Incidental take refers to taking that result from, but are not the purpose of, carrying out an otherwise lawful activity conducted by a Federal agency or applicant (50 CFR § 402.02). While projects that are likely to result in adverse effects often include minimization measures, the Service is limited to requesting minor modifications in the project description. In instances where some incidental take is unavoidable, the Service requires that additional measures be performed by the project proponents to compensate for negative impacts.

State Laws

California Environmental Quality Act
The California Environmental Quality Act (CEQA) requires review of any project that is undertaken, funded, or permitted by the State or a local governmental agency. If significant effects are identified, the lead agency has the option of requiring mitigation through changes in the project or to decide that overriding considerations make mitigation infeasible (CEQA Sec. 21002). In the latter case, projects may be approved that cause significant environmental damage, such as destruction of listed endangered species or their habitat. Protection of listed species through CEQA is, therefore, dependent upon the discretion of the lead agency involved.

Factor D Summary

A number of State and Federal Laws exist that provide protections to Paiute cutthroat trout and its habitat. Therefore, the inadequacy of existing regulations is not considered to be a threat to the species at this time.

II.C.2.e. Factor E - Other natural or manmade factors affecting its continued existence:

At the time of reclassification 1975, the introduction of rainbow trout and subsequent hybridization were identified as threats to Paiute cutthroat trout (40 FR 29863). The status of that threat as well as two other threats is discussed below:

Introduced Fish

Paiute cutthroat trout are threatened with the human-induced introduction of non-native salmonids. Non-native salmonids can affect Paiute cutthroat trout either through competition or by diluting their DNA through hybridization or integradation (Rhymer and Simberloff 1996).

Competition

Paiute cutthroat trout evolved in isolation from other fish species and, like other cutthroat subspecies, has developed behavioral traits that render its prospects for coexisting with potential competitors highly unlikely (Griffith 1988). In those situations where other salmonids have invaded Paiute cutthroat trout habitats, the Paiute cutthroat trout have eventually been displaced (Service 2004).

Hybridization

Hybridization from non-native salmonids is a common threat to all native western salmonid species (Gresswell 1988; Young 1995). Non-native rainbow trout (*O. mykiss*) and golden trout (*O. aguabonita*) readily hybridize with native cutthroat trout and produce fertile offspring. Extensive genetic mixing of natives, non-natives, and hybrids contribute to the loss of locally adapted genotypes and can lead to the extinction of a species (Rhymer and Simberloff 1996).

When associated with Lahontan cutthroat trout (*O. c. henshawi*) or rainbow trout, the Paiute cutthroat trout tend to lose their distinctiveness through introgressive hybridization (Cordes *et al*. 2004). In the early part of the twentieth century, pure Paiute cutthroat trout were eliminated from their historic habitat through hybridization with introduced rainbow trout, golden trout, and integradation with Lahontan cutthroat trout. Stocking records from 1930 to 1953 document the plantings of thousands of non-native salmonids within the Silver King Basin. Non-native salmonids continue to occupy the entire historic habitat of the Paiute cutthroat trout below Llewellyn Falls (Figure 1) (Service 2004).

Effective fish barriers prevent other trout from invading Paiute cutthroat trout waters. Even with effective barriers, there is an ever-present risk that other trout will be illegally introduced above the barriers by humans (Rahel 2004). At the present time,

the only pure Paiute cutthroat trout in the Silver King Creek drainage occur in non-historic habitat above Llewellyn Falls. Due to the proximity of non-native fish below Llewellyn Falls, the threat of an unauthorized introduction of fish from below this area will remain until non-native fish are removed and Paiute cutthroat trout are reestablished below the falls into their historic habitat. Paiute cutthroat trout will then be isolated within the Silver King Basin because the Silver King Canyon contains several barriers, which will prevent salmonids from migrating upstream into historic Paiute cutthroat trout habitat. The Silver King Canyon is also difficult to access which should discourage humans from moving other trout above the barriers into historic Paiute cutthroat trout habitat.

Stochastic Events

As discussed in the 2004 Revised Recovery Plan (Service 2004), all existing populations of Paiute cutthroat trout are isolated in headwater drainages. This makes each of them highly susceptible to extinction because of the small amount of habitat (Harig and Fausch 2002), small populations (Hilderbrand and Kershner 2000), lack of habitat connectedness (Dunham *et al*. 1997), no gene flow between populations (Rieman and Allendorf 2001), and the threat of a large disturbance such as floods and fire (Dunham *et al*. 2003; Miller *et al*. 2003). Paiute cutthroat trout, to a degree, will always be susceptible to stochastic events because of its limited range. To achieve recovery, the revised recovery plan (Service 2004) recommends reintroduction of the Paiute cutthroat trout into its former range. Once the species is re-established, we anticipate that it will be less susceptible to stochastic events than the currently established populations. This is due to the size and connectivity of the lower Silver King drainage and the number of Paiute cutthroat trout this area is expected to support (Dunham *et al*. 2003). Further, because this species was originally adapted to this stretch of stream, it is expected to provide the best quality habitat.

Challenges to Recovery Efforts

One of the most important recovery actions for Paiute cutthroat trout is the removal of non-native fish from its historic habitat (Recovery Plan Criterion 1) so that it may be reintroduced (Recovery Plan Criterion 2).

New issues regarding the ability of Federal and State agencies to implement recovery criterion 1 (removal of non-native fish) have

emerged. Opposition to the use of rotenone to implement criterion 1 has resulted in multiple annual delays (2002-2005) regarding water quality permitting and environmental compliance [National Environmental Policy Act (NEPA)]. This opposition culminated when a federal judge granted a preliminary injunction on August 31, 2005, which stopped the project to remove nonnative salmonids until an Environmental Impact Statement (EIS) is prepared.

The Service has taken the lead on the project to facilitate its completion. The Service, in coordination with the Forest Service and CDFG, is planning to implement the project in the summer of 2008 after all NEPA issues are addressed.

Summary of Factor E

Introduced trout pose the greatest threat to Paiute cutthroat trout. Where other species of trout have been introduced, they have successfully displaced Paiute cutthroat trout either through competition or hybridization. As a result, Paiute cutthroat trout no longer occur within their historic range and only occur in drainages where they have been introduced and downstream barriers prevent other trout species from invading. Because the remaining populations are confined to small stretches of headwater streams, they are at risk of extirpation due to stochastic events. Efforts to expand the species current range by restoring historic habitat have been challenged and it is unclear when those efforts will be implemented.

II.D. Synthesis

At the time of reclassification, Paiute cutthroat trout had been extirpated from its historic range by habitat loss and displacement by introduced trout species. Today, small populations occur where they had been introduced to stream reaches where natural barriers prevent the invasions of non-native trout species. The primary threats at the time of reclassification were habitat loss due to livestock grazing practices and recreation development, and the introduction of rainbow trout into streams inhabited by Paiute cutthroat trout. Little has changed since the time of reclassification. Some habitat improvement has occurred due to changes in grazing management. Recreation occurs in and around Paiute cutthroat trout streams and poses a risk to streambank stability and trout habitat. Introduced trout pose the greatest risk to the species. Effective fish barriers occur downstream of remaining populations, but the threat of humans moving other trout species into these protected reaches continues. Challenges to proposals to remove non-native trout species have impaired attempts to reduce this threat. Due to the small restricted populations that continue to face threats from recreation and non-native fish introductions, we believe that Paiute cutthroat trout continues to meet the definition of threatened and no change in status is recommended at this time.

III. RESULTS

III.A. Recommended Classification:

It is recommended that Paiute cutthroat trout remain as Threatened.

____ **Downlist to Threatened**
____ **Uplist to Endangered**
____ **Delist** (*Indicate reasons for delisting per 50 CFR 424.11):*
  ____ *Extinction*
  ____ *Recovery*
  ____ *Original data for classification in error*
__X_**No change is needed**

III.B. New Recovery Priority Number

It is recommended that the priority number does not change from its current number 9.

III.C. If a reclassification is recommended, indicate the Listing and Reclassification Priority Number (FWS only):

No reclassification is necessary at this time.

IV. RECOMMENDATIONS FOR FUTURE ACTIONS

- Continue efforts to implement Recovery Criterion 1 (the removal of all nonnative salmonids from Silver King Creek and its tributaries downstream of Llewellyn Falls to fish barriers in Silver King Canyon) This includes successful completion of all NEPA requirements.

- Initiate a habitat monitoring program for the Silver King drainage as described in the revised recovery plan (Service 2004), and continuing ongoing habitat monitoring in North Fork Cottonwood, Cabin, Sharktooth, and Stairway Creeks.

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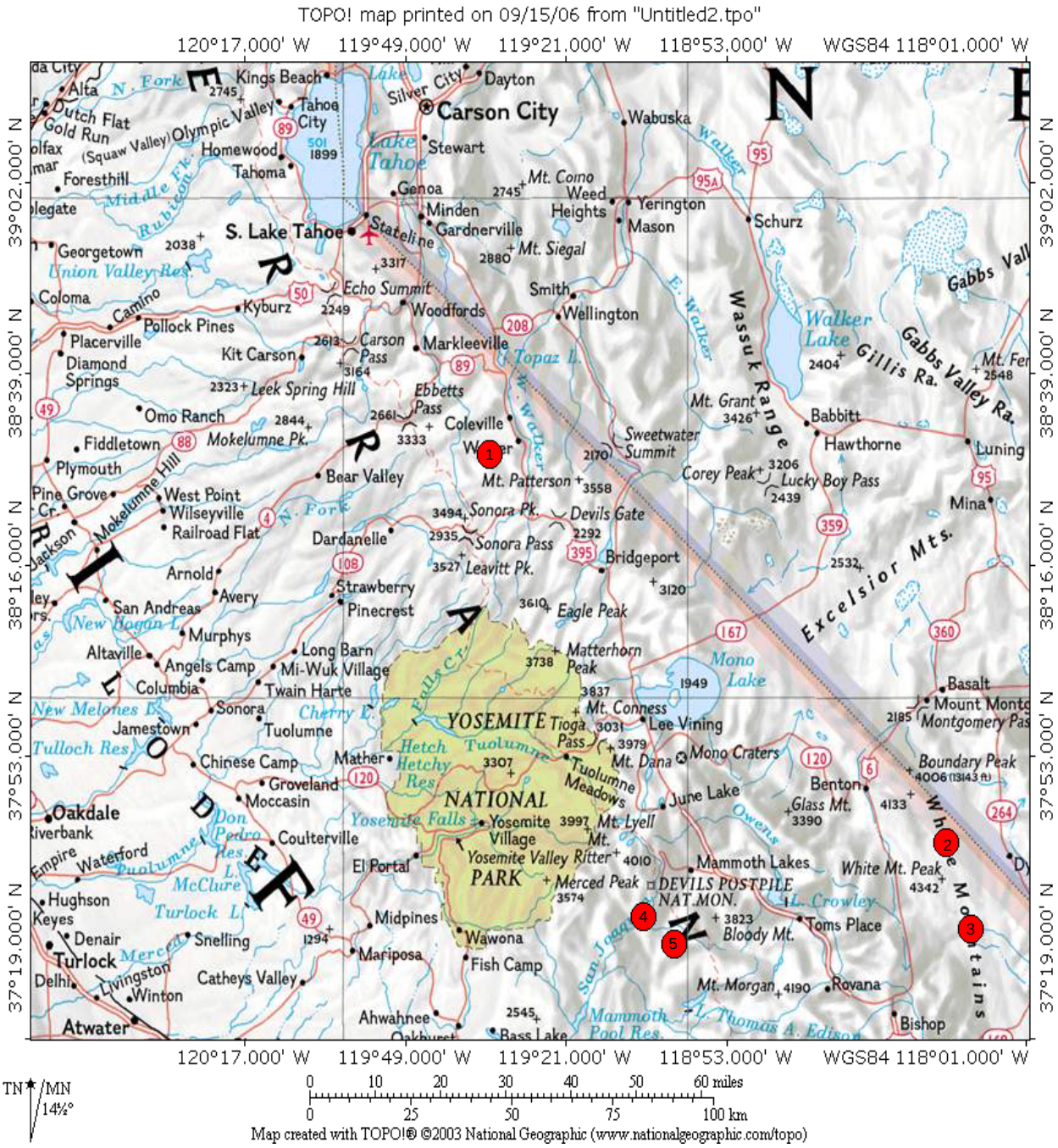

Figure 1. Location of existing Paiute cutthroat populations in the Sierra Nevada Mountain Range: 1) Silver King Creek, Humboldt-Toiyabe National Forest, Alpine County, California; 2) Cabin Creek, Inyo National Forest, Mono County, California; 3) North Fork Cottonwood Creek, Inyo National Forest, Mono County, California; 4) Stairway Creek, Sierra National Forest, Madera County, California; and 5) Sharktooth Creek, Sierra National Forest, Fresno County, California.

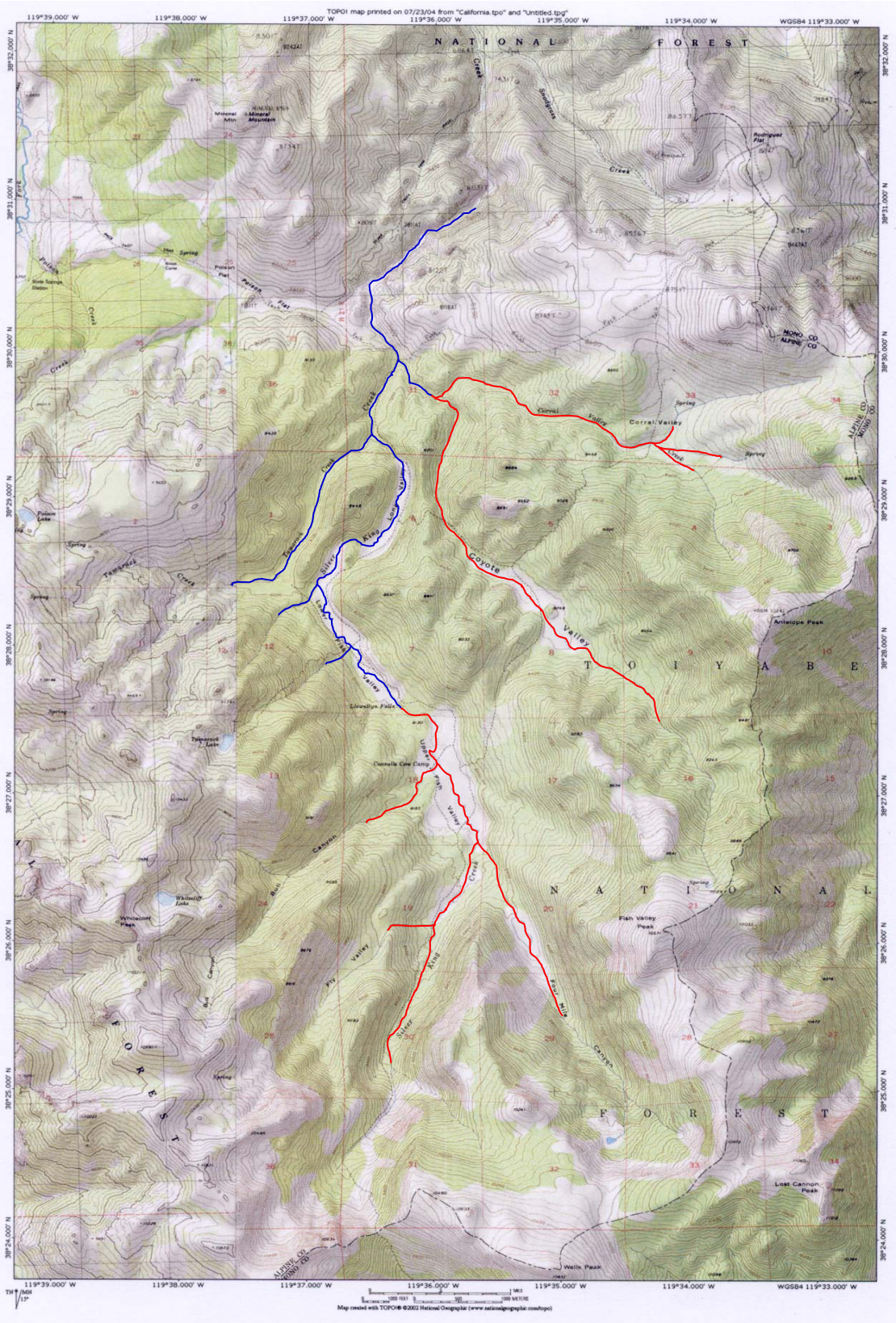

Figure 2. Historic (blue) and currently occupied (red) habitat for Paiute cutthroat trout in Silver King Creek, Humboldt-Toiyabe National Forest, Alpine County, California.

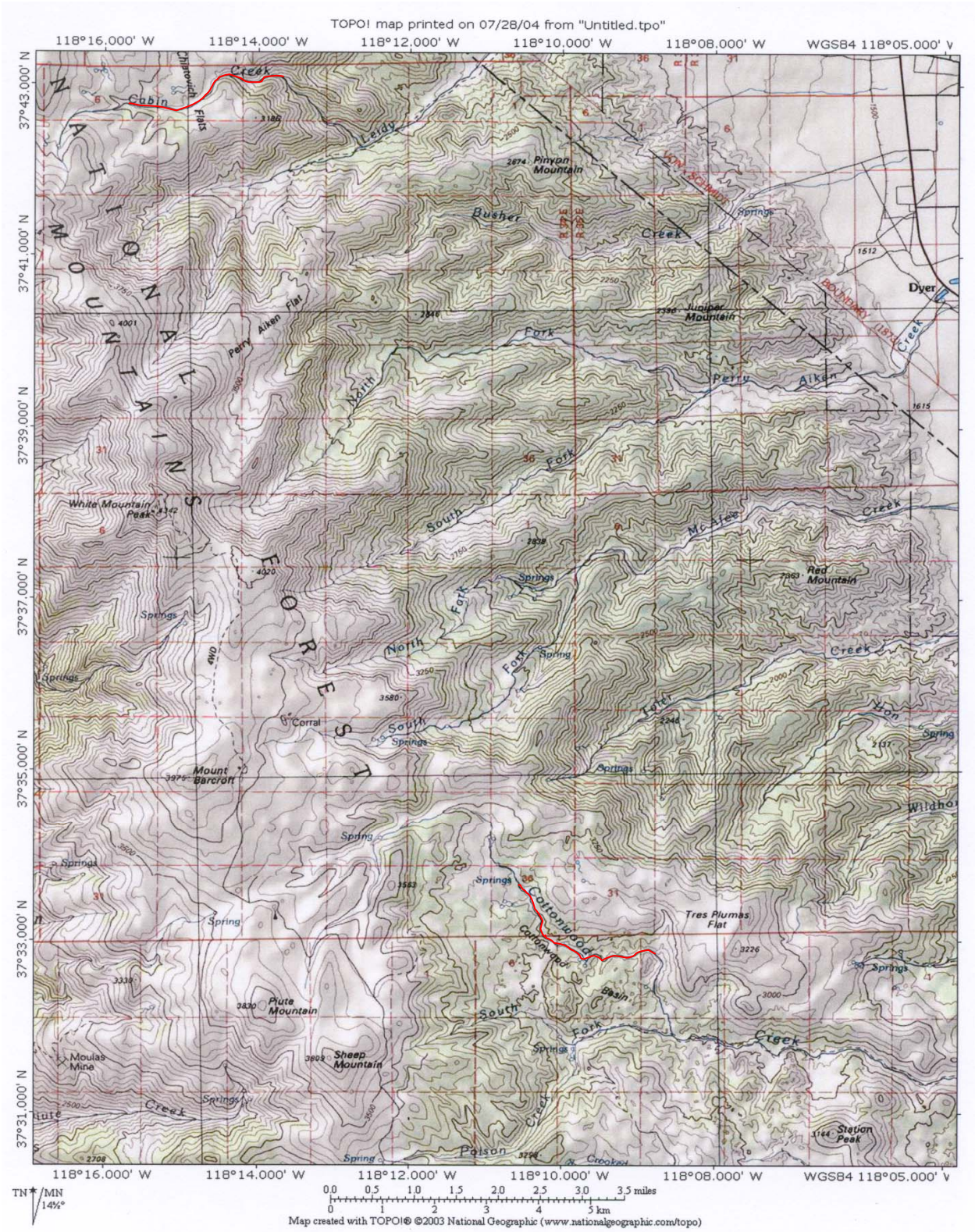

Figure 3. Refugial populations of Paiute cutthroat trout in North Fork Cottonwood Creek and Cabin Creek, Inyo National Forest, Mono County, California.

Figure 4. Refugial populations of Paiute cutthroat trout in the Sierra National Forest, in Stairway Creek, Madera County, and Sharktooth Creek, Fresno County, California.

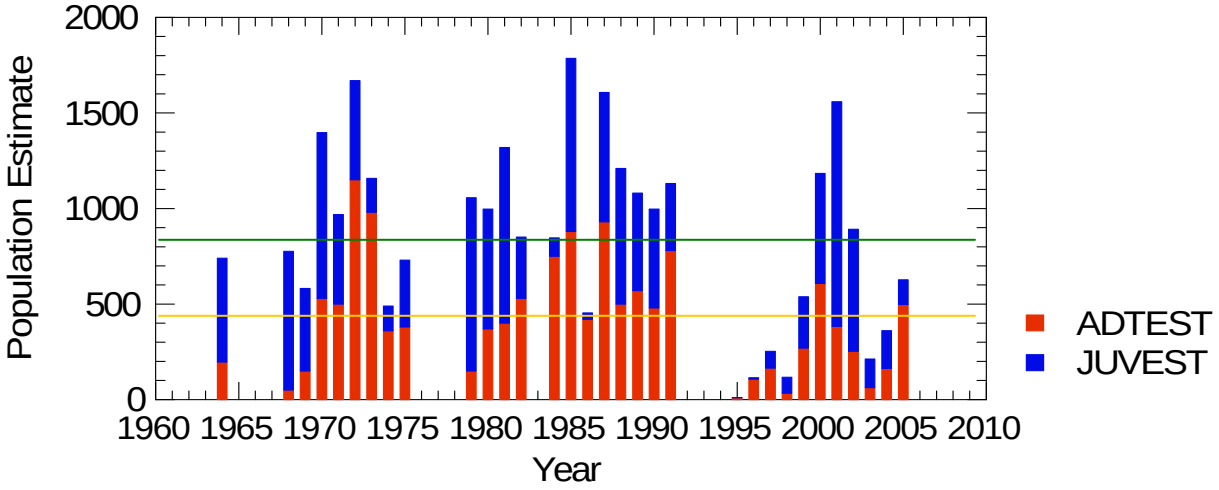

Figure 5. Population estimates for Upper Fish Valley, Silver King Creek from 1964-2005. Red bars represent adults [over 150 millimeters (mm), 6 inches (in)]), while blue bars represent juveniles (less than 150 mm [6 in]). The green line indicates the 41 year mean for the entire population (adults and juveniles) which is 832 individuals. The yellow line indicates the 41 year mean for the adult population which is 425 individuals. The stream section in Upper Fish Valley is approximately 1,900 meters (1.2 miles) long (W. Somer, CDFG, unpubl. data).

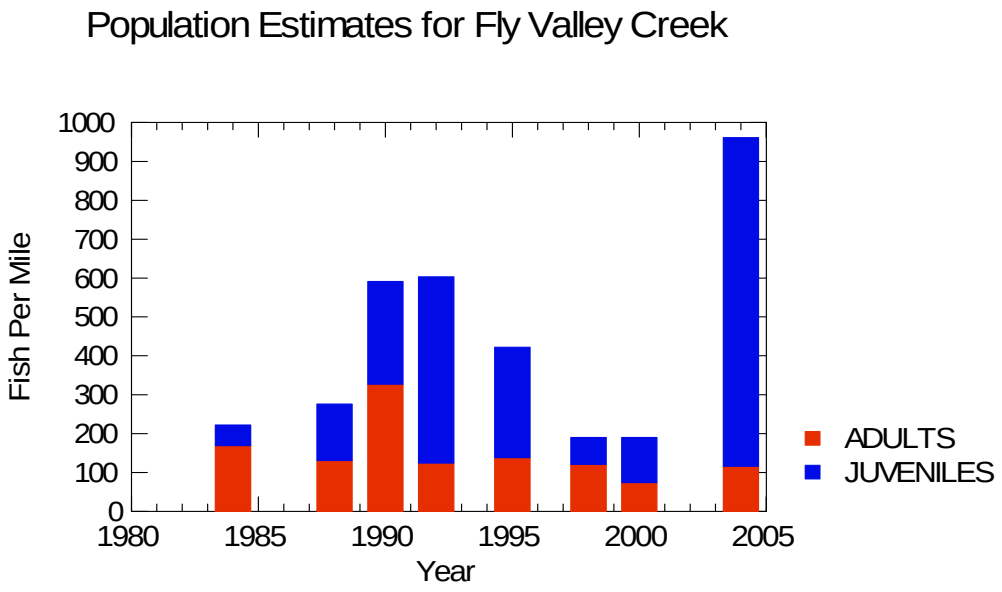

Figure 6. Estimated fish per mile for Fly Valley Creek from 1984-2004. Red bars represent adults (over 150 mm [6 in]), while blue bars represent juveniles (less than 150 mm [6 in]). The stream section sampled in Fly Valley Creek is 150 meters (492 feet) long (W. Somer, CDFG, unpubl. data).

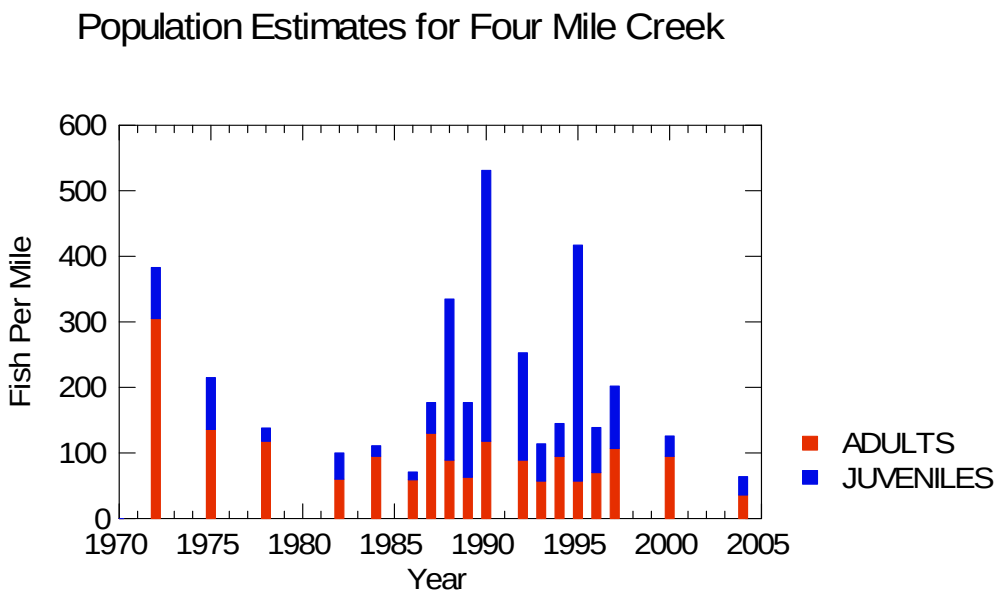

Figure 7. Estimated fish per mile for Four Mile Creek from 1972-2004. Red bars represent adults (over 150 mm [6 in]), while blue bars represent juveniles (less than 150 mm [6 in]). The stream section sampled in Four Mile Creek is 250 meters (820 feet) long (W. Somer, CDFG, unpubl. data).

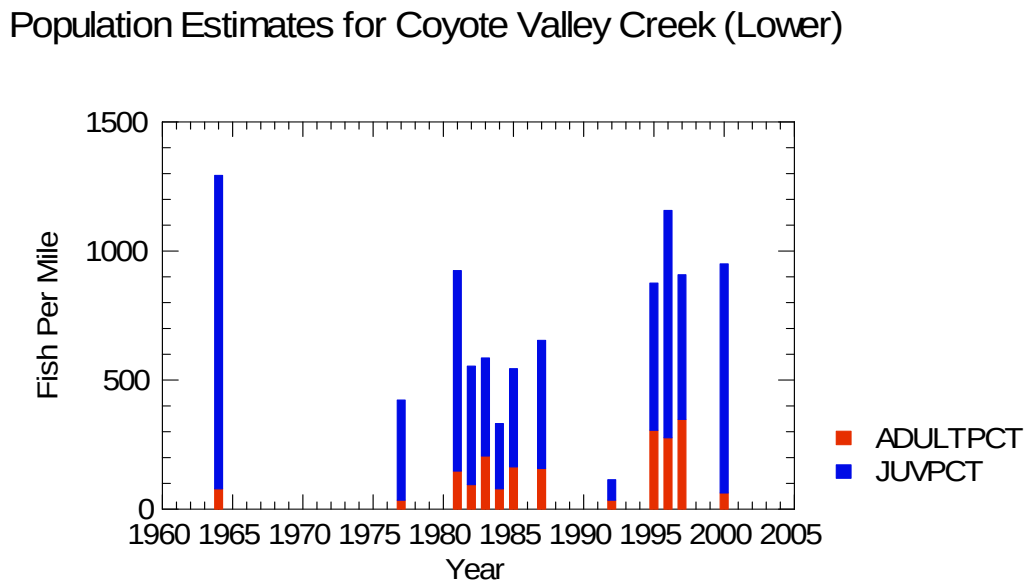

Figure 8. Estimated fish per mile for Coyote Valley Creek (Lower Meadow) from 1964-2000. Red bars represent adults (over 150 mm [6 in]), while blue bars represent juveniles (less than 150 mm [6 in]). The stream section sampled in Coyote Valley Creek is 150 meters (492 feet) long (W. Somer, CDFG, unpubl. data).

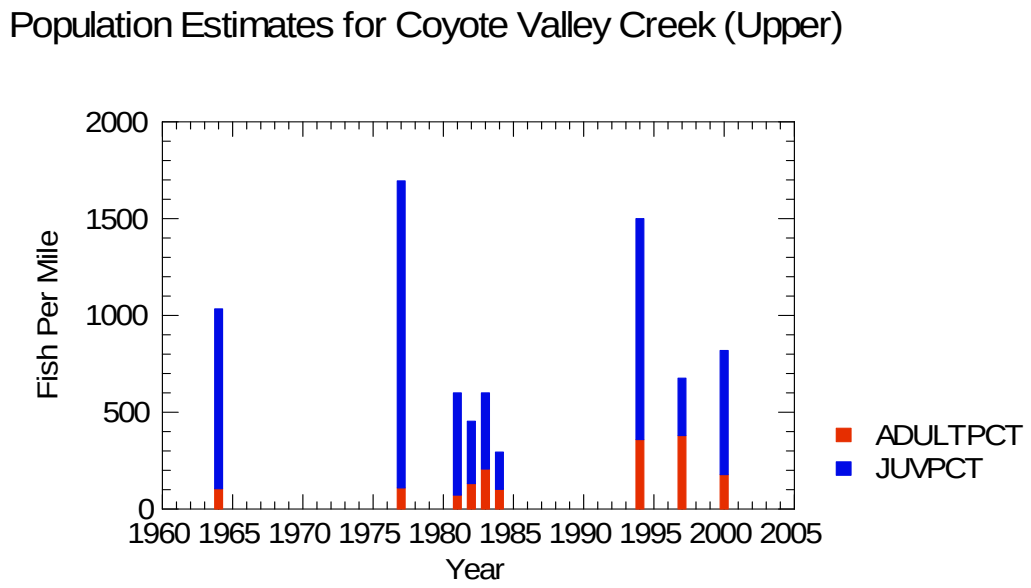

Figure 9. Estimated fish per mile for Coyote Valley Creek (Upper Meadow) from 1964-2000. Red bars represent adults (over 150 mm [6 in]), while blue bars represent juveniles (less than 150 mm [6 in]). The stream section sampled in Coyote Valley Creek is 150 meters (492 feet) long (W. Somer, CDFG, unpubl. data).

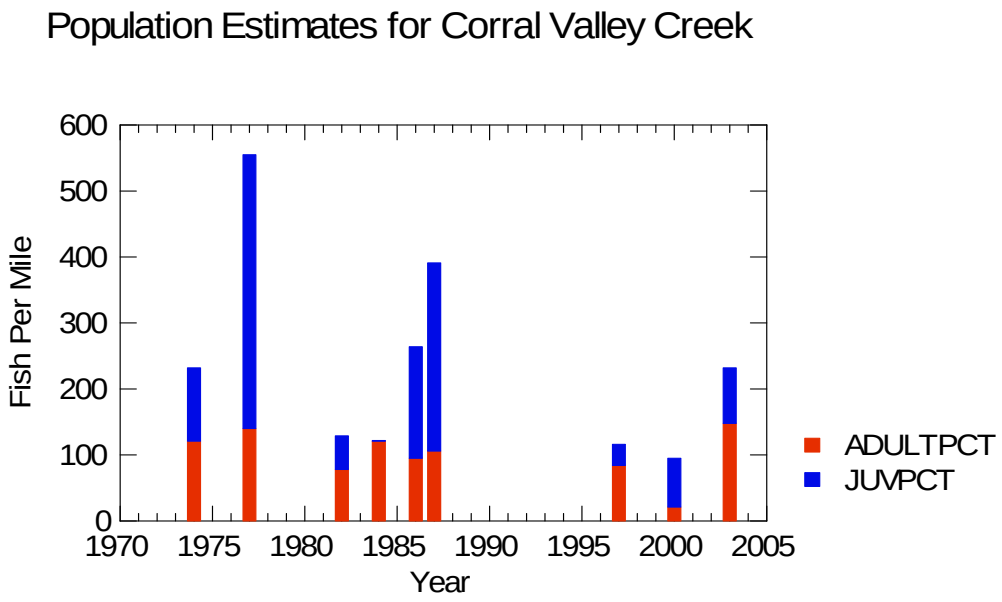

Figure 10. Estimated fish per mile for Corral Valley Creek from 1974-2003. Red bars represent adults (over 150 mm [6 in]), while blue bars represent juveniles (less than 150 mm [6 in]). The stream section sampled in Four Mile Creek is 150 meters (492 feet) long (W. Somer, CDFG, unpubl. data).

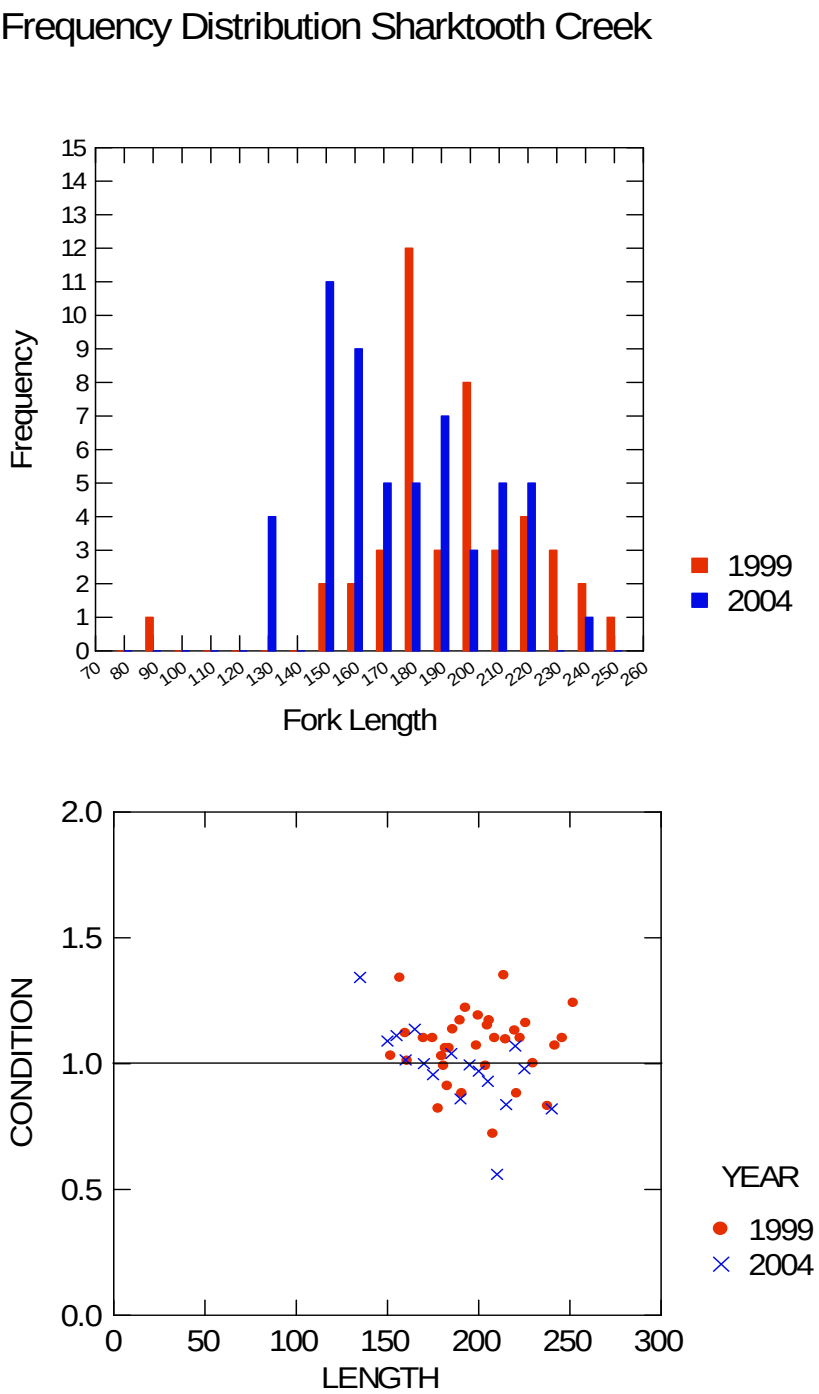

Figure 11. Length frequency distribution and Fulton condition factor from the population of Paiute cutthroat trout in Sharktooth Creek during 1999 and 2004. Condition factors between years were not significant; however, they were approaching significance (p = 0.077) (P. Strand, Sierra National Forest, unpubl. data).

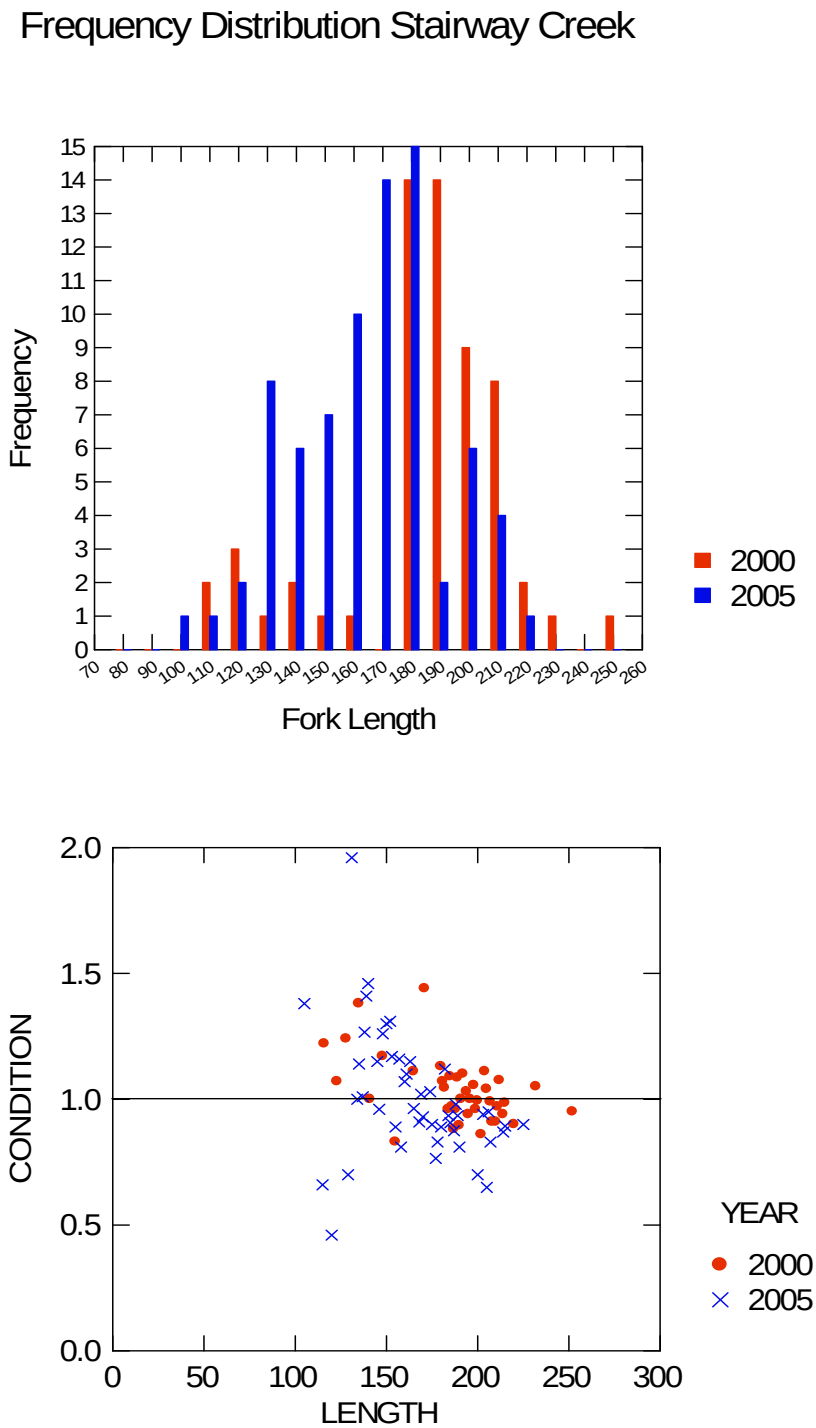

Figure 12. Length frequency distribution and Fulton condition factor from the population of Paiute cutthroat trout in Stairway Creek during 2000 and 2005. Condition factors between years were not significant; however, they were approaching significance (p = 0.084) (P. Strand, Sierra National Forest, unpubl. data).

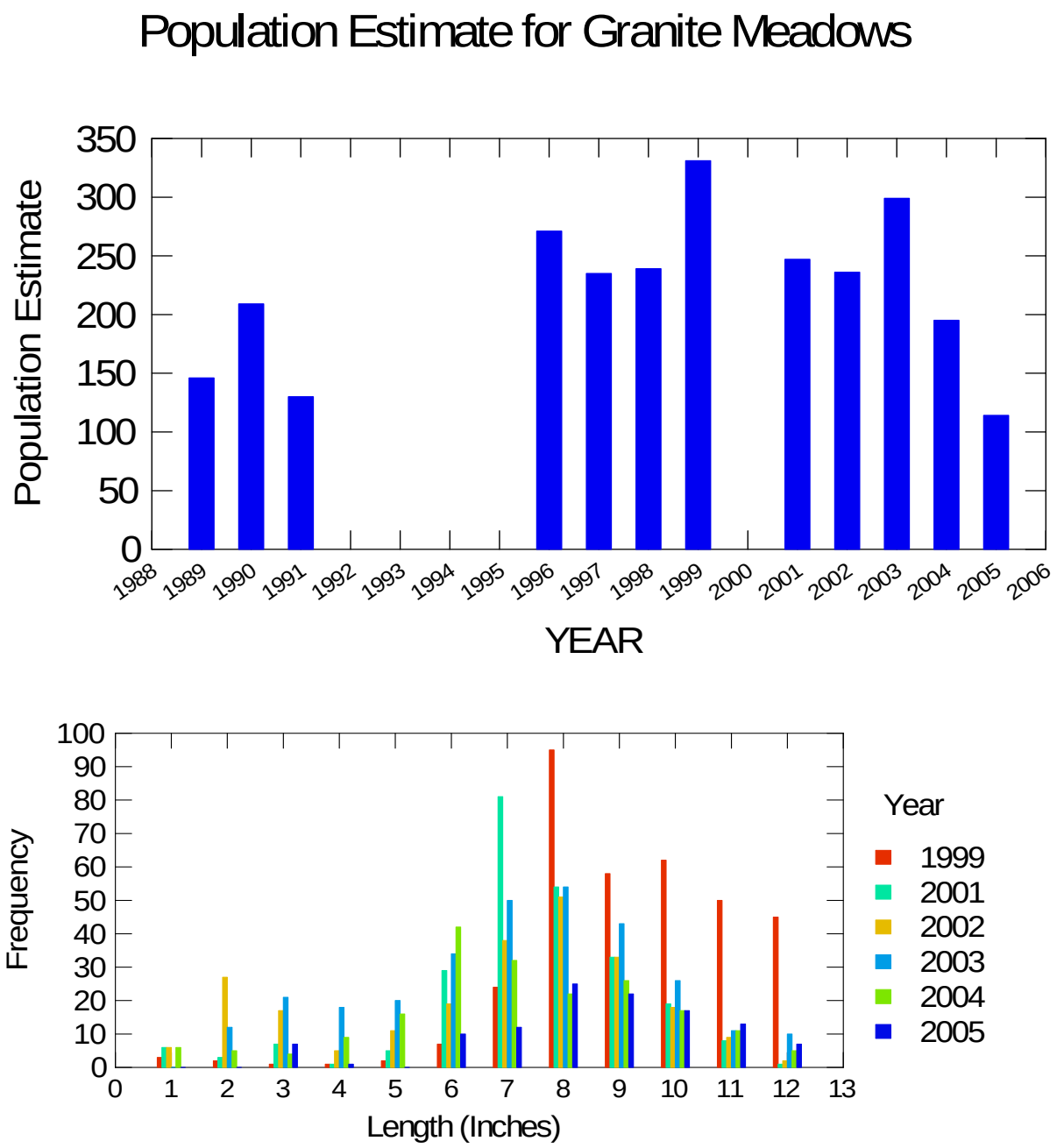

Figure 13. Population trends and length frequency distribution for Granite Meadows, North Fork Cottonwood Creek, Inyo National Forest. This section of stream from Granite Meadows downstream to just above the Tres Plumas barrier has been surveyed visually since 1989 by CDFG (D. Becker, CDFG, unpubl. data).

APPENDIX A. Summary of Threats and Recommended Recovery Actions.

LISTING FACTOR	THREAT	RECOVERY CRITERIA	RECOVERY ACTION NUMBERS
A	Streambank degradation from recreational activities	3	3.1.1, 3.1.2, 3.1.6, 3.2.1, 3.2.2, 3.2.4, 3.3.3
A	Streambank degradation from cattle grazing	3	3.1.1, 3.1.3, 3.1.6, 3.2.1, 3.2.3, 3.2.8, 3.3.1, 3.3.2, 3.3.3
A	Degradation of water quality and spawning substrates by beavers	3	3.1.1, 3.1.4, 3.1.5, 3.1.6, 3.2.1, 3.2.5, 3.2.6, 3.2.8, 3.3.1, 3.3.3
B	Unregulated angling	2, 4	3.1.6, 3.2.4, 3.2.8, 3.3.1, 3.3.3, 4.1.1, 4.2, 6.1, 6.2
C	Natural predators [not currently significant]	NA	
C	Fungal infections	2	4.3.1, 4.4.1, 4.5.1
D	Potential budgetary constraints on agency commitment to recovery actions	1, 2, 3, 4, 5	4.2, 5.1, 5.2
E	Hybridization and competition with introduced trout	1, 2, 4	1, 2, 4.1.1, 4.1.2, 4.3.2, 4.3.5, 4.4.2, 4.4.5, 4.5.2, 4.5.5
E	Need for fish barriers to prevent upstream migration of introduced trout	1, 2, 4	1, 2, 3.2.7, 4.3.3, 4.3.5, 4.4.3, 4.4.5, 4.5.3, 4.5.5
E	Human introduction of trout	1, 2, 4	1, 2, 4.1.1, 4.1.2, 4.2, 4.3.5, 4.4.5, 4.5.5, 6.1, 6.2
E	Vulnerability to catastrophic events due to limited distribution	2, 3, 4	2, 4.3.1, 4.3.4, 4.4.1, 4.4.4, 4.5.1, 4.5.4, 4.6

Listing Factors:
A. The Present or Threatened Destruction, Modification, or Curtailment Of Its Habitat or Range
B. Overutilization for Commercial, Recreational, Scientific, Educational Purposes (not a factor)
C. Disease or Predation
D. The Inadequacy of Existing Regulatory Mechanisms
E. Other Natural or Manmade Factors Affecting Its Continued Existence

U.S. FISH AND WILDLIFE SERVICE
5-YEAR REVIEW of Paiute Cutthroat Trout (*Oncorhynchus clarkii seleniris*)

Current Classification: Threatened
Recommendation resulting from the 5-Year Review

____ **Downlist to Threatened**
____ **Uplist to Endangered**
____ **Delist**
__X__ **No change is needed**

Appropriate Listing/Reclassification Priority Number, if applicable: _n/a__

Review Conducted By: Chad Mellison, Fish and Wildlife Biologist

FIELD OFFICE APPROVAL:

Lead Field Supervisor, Fish and Wildlife Service

Approve_____ Date 7/2/08

REGIONAL OFFICE APPROVAL:

Acting Lead Regional Director, Fish and Wildlife Service

Approve_____ Date 7/10/8