Coastal Cutthroat Trout (*Oncorhynchus clarkii clarkii)*
Data: 1999 NOAA Status Review; 2007 PSMFC Review
Partners: AK, BC, CA, OR , WA, FWS, USFS, USGS, NMFS, PSMFC, Tribes.

Species Status review:

Coastal cutthroat trout (*Oncorhynchus clarkii clarkii*) have been considered a vulnerable indicator species in recent years and have been petitioned for listing under the Endangered Species Act (ESA). In 1996, National Marine Fisheries Service (NMFS) listed the Umpqua River coastal cutthroat trout (CCT) as a threatened species under the Endangered Species Act of 1973, as amended (16 U.S.C. 1531 et seq). Following this listing, NMFS conducted a status review of the species throughout their distributional range in the lower 48 state region of North America. During that process NMFS identified six Evolutionary Significant Units (ESU's). The Fish and Wildlife Service (FWS) and NMFS have, in the past, jointly managed CCT under the ESA and on April 5, 1999, the agencies published a joint proposal to list the southwestern Washington-Columbia River cutthroat trout ESU (SWWC-ESU) as a threatened species and to de-list the Umpqua River ESU under the ESA (64 FR 16397). On November 22, 1999, the Directors of NMFS and the FWS signed a joint letter determining that the FWS would assume all ESA regulatory jurisdiction over CCT. In 2002, there was a review and decision by FWS to "withdraw" the SWCW-ESU from listing. Included in the same Federal Register Notice for withdrawing the decision to list CCT, the FWS committed to work with interested States, Native American Tribes, and other interested parties in pursuing a Conservation Initiative which would assist in the restoration of CCT. At the state level, the sub-species is considered to be a "sensitive or at risk" fish, as well as a sportfish in AK, CA, OR, and WA, and British Columbia. There is concern and a fair amount of ambiguity surrounding the status of the anadromous form of this sub-species and there are only a few locations where long-term trend data are available. In some of these locations there is evidence that current smolt counts represent a fragment of historic counts. In addition, we are certain about the disappearance of many populations that were once fished in certain highly developed ecoregions.

CCT are the only sub-species of *O. clarkii* without a multi-agency management plan in place. In 2006, in an effort to remedy this situation and as part of the decision to withdraw the listing of the SWWC-ESU, Pacific States Marine Fisheries Commission (PSMFC) and FSW initiated a voluntary effort among state, tribal, federal and provincial agencies that represent agencies throughout the distributional range of CCT. The goal of this effort is to coordinate agency efforts, share knowledge (meta data approach), and advance our understanding of CCT with the long-term goal of developing a consistent framework for the management, research, restoration, and conservation of the subspecies.

Sportfishing Status of the Coastal Cutthroat:

CCT are not targeted in commercial fisheries although they can be part of a by-catch. Throughout their distributional range there are recreational fisheries, which specifically target CCT or where CCT are part of a salmon-steelhead by-catch both in marine and freshwater habitats. Recreational harvest of naturally produced or "wild" CCT in many areas is generally restricted by angling regulations; direct mortality due to fishing pressure is thought to be relatively low, at least in areas with bait restrictions or in hatchery-augmented systems where anglers can differentiate wild CCT from marked hatchery fish. In Washington, recent fishing regulations require the release of all CCT, except adipose clipped hatchery fish, in Puget Sound, Hood Canal, the mainstem of the Chehalis, Toutle, Coweeman, Cowlitz, and Grays rivers, and in several smaller streams in the Lower Columbia River Basin. Bag and size

limits on recreational harvest of CCT are in effect in the Strait of Juan de Fuca, in coastal streams, and in all Lower Columbia River Basin streams not subject to catch and release regulations. Hatchery CCT fisheries are still fairly active in the Lower Columbia River Basin. In Oregon, catch and release regulations have been imposed in the Rogue, Hood, and Lower Columbia rivers and in portions of the Willamette and Sandy rivers. More restrictive bag and size limits were imposed on other Oregon streams in 1995. Active CCT recreational fisheries still exist in the Smith and Little rivers and in coastal lagoons in northern California with harvest restrictions imposed by California Fish and Game.

In Alaska, the CCT are managed both for sport fishing and as a subsistence fishery for rural Alaskans. Anglers catch an average of 40,000 and harvest approximately 4,000 CCT in Alaska annually. The cornerstone of Alaska's sport fishing regulations is a series of minimum size limits designed to protect 65% (in areas with higher angling pressure) or 100% of trout from harvest until they have spawned at least once. Minimum size limits are only effective if hooking mortality is minimal; so a ban on bait in fresh water is an essential component of the Alaska's sport fishing regulations.

Distribution of Coastal Cutthroat Trout: The distribution of CCT is broader than that of any other cutthroat trout sub-species. It extends along the Pacific coast of North America from the Eel River in northern California, to the Prince William Sound area of Alaska, extending to Gore Point on the Kenai Peninsula. The eastern range of the subspecies rarely extends farther inland than 160 km and usually is less than 100 km. The eastern range is generally bounded by the Cascade Mountain Range in California, Oregon, and Washington, and by the Coast Range in British Columbia and southeastern Alaska. In the Columbia Drainage CCT extend eastward to river km 309, almost to the mouth of the Deschutes River. This range coincides closely with the coastal temperate rain forest belt defined by Waring and Franklin (1979).

As reported by Gerstung (1997), California CCT have been observed in 182 named streams (approximately 71% of the 252 named streams within their range in California) and an additional 45 streams (17% of the named streams) likely support populations. Reproducing populations occur throughout most of the Humboldt Bay tributaries, the Smith and Little River basins, the lower portions of Redwood Creek and the Klamath, Mad, and Eel Rivers, and numerous small named and unnamed coastal tributaries.

Range of the Coastal Cutthroat Trout

In Washington and Oregon, CCT are widespread west of the crest of the Cascade Mountains. At present, freshwater forms (migrants and non-migrants) of CCT are found at least to the

Klickitat River on the Washington side of the Columbia River (WDFW 1998a), and to 15-Mile Creek on the Oregon side. The Willamette basin supports extensive populations of resident and migratory fish. Populations above Willamette Falls are not anadromous. The current distribution of sea-run fish appears to be confined to tributaries downstream from Bonneville Dam (river km 235). The Washington Department of Fish and Wildlife has identified 46 "stock complexes" in Washington.

In British Columbia, CCT are widely distributed in most coastal watersheds however they are restricted to very small streams for spawning and juvenile rearing, and many populations are fragmented. In Alaska, populations of CCT, occur in approximately 5,000 streams and lakes throughout Southeast Alaska and Prince William Sound. In approximately a dozen "trophy" lakes in Southeast Alaska, CCT may grow to be over 25 inches and exceed 15 years of age.

Coastal Cutthroat Trout Habitat Requirements: The life history of CCT is perhaps the most complex of the Pacific salmonids. Non-migratory CCT include fish generally found in small streams, various sized streams above anadromous barriers, and headwater tributaries near spawning and rearing areas. These fish typically undertake only small-scale migrations and maintain relatively small territories compared to forms that make more extensive migrations. Freshwater-migratory CCT include fish that migrate entirely within fresh water. This includes populations that migrate from large tributaries or large rivers to small tributaries to spawn (fluvial-adfluvial); populations that inhabit lakes and migrate upstream to spawn in lake inlets (lacustrine-adfluvial), and populations that live in lakes and migrate downstream to spawn in lake outlets. Saltwater-migratory or "sea-run" CCT include those fish which as juveniles migrate from freshwater natal areas in the spring to feed in marine environments (estuarine or near-shore) for varying periods dependent on stream size and hydrology constraints. They then enter fresh water in the late-summer or fall to feed and seek refuge, and, if sexually mature, prepare for spawning in the late-winter or spring. Sea-run individuals typically return to marine environments the following spring. These various life history forms require a wide diversity of marine, estuarine and freshwater habitats to exploit food and survive. Typical of most cutthroat trout, spawning in freshwater requires suitable substrates in high quality water that have sufficient flows and temperatures to support all life stages. Suitable migratory corridors require sufficient flows and a lack of barriers to movement that allow connectivity between spawning and rearing habitats. Resident populations can occur naturally above waterfall barriers where this feature exists. While the degree of interaction between the above-barrier and below-barrier populations remains unclear, it is believed that the above-barrier populations may accidentally and with low frequency contribute genetically to the below-barrier populations and thus, may serve as weak genetic refugia. In these populations, the expression of anadromous traits maybe incomplete or absent.

Concerns, Issues or Obstacles Relative to the Conservation and Improvement of the Status of Coastal Cutthroat Trout:

Genetic concerns:

Genetic variability among populations of CCT has been examined throughout much of the geographical range of this species with allozyme electrophoresis, and in some regions with mtDNA or microsatellite loci. The general pattern of these data suggest CCT populations are structured at the watershed or tributary scale. For the status review conducted by NMFS, the deliberations on defining population units also considered the effect

hybridization with steelhead or rainbow trout (*O. mykiss)* would have on genetic population structure.

Hybridization: Unlike other west coast species of Pacific salmon, CCT show evidence of natural hybridization with rainbow/steelhead trout. In addition to first-generation hybrids between CCT and steelhead/rainbow trout, it has been noted that CCT with more fully introgressed genes have been detected in natural populations, indicating that some hybrids do survive and interbreed (back cross) with parental species**.** It is not clear what effect hybridization has on CCT populations, and the environmental characteristics with which hybridization is correlated are poorly understood.

Artificial propagation concerns*:*

Although natural fish are the focus of management determinations, possible effects of artificial propagation on natural populations must be taken into account. For example, stock transfers might change the genetic or life-history characteristics of a natural population so that the population seems either less or more distinctive than it was historically. Artificial propagation can also alter life-history characteristics such as smolt age and migration and spawn timing. Second, hatchery releases can lead to increased mortality of wild CCT through misidentification and handling. Third, artificial propagation poses a number of risks to natural populations that may affect their risk of extinction or endangerment. In addition to the stocking of locally derived stocks, CCT have often been transferred within or between watersheds, regions, and states to either initiate or maintain existing hatchery populations. Until recently, the transfer of hatchery stocks of CCT between distant watersheds and facilities was a common management practice in Oregon and Washington watersheds. Growing concern about the genetic and ecological consequences of this practice prompted management agencies to institute policies to reduce the exchange of CCT stocks among watersheds.

The stocking of hatchery-reared salmon may also have an impact on CCT populations. The increased competition from hatchery coho salmon may be an important risk factor for juvenile CCT. The 1999 NMFS review noted that streams in Washington with continuing releases of hatchery coho salmon fry show declining trends in CCT abundance. In Alaska, biologists are concerned with potential impacts to resident CCT populations when aquaculturists release large numbers of sockeye and coho salmon fry into lakes.

Data Shortfalls:

CCT management has been characterized by a pervasive lack of quantitative information of almost all types across the range of the subspecies. In addition, where there is high quality data, there has been little attempt to use this information in a meta-analyses. This is not to say that there is no information about CCT: in fact, as discussed in the preceding sections, there is a considerable amount of information about the biology of this sub-species. However, much of this information is qualitative or descriptive, rather than quantitative. In addition, with a few exceptions, the data tend to be site specific and represent opportunistic sampling approaches. Comprehensive sets of quantitative data, such as distribution, abundance, age structure, survival rates, and run timing, are largely absent for CCT. The fact that CCT do not constitute a commercially important species due to their small size and low abundance, with fewer directed recreational fisheries than for co-occurring Pacific salmon and steelhead, has led to the perception that CCT are a low priority by management agencies. It is likely that this perception has led to the paucity of these data. (However, as mentioned previously, historically CCT represented an important recreational

fishery, and are still the target of many dedicated anglers throughout their native range.)

In 2006, critical information shortfalls for CCT were identified and prioritized by professional biologists in a two-day facilitated CCT Science Workshop (PSMFC 2007). Data shortfalls were identified as impeding progress on the management and conservation of the species (PSMFC 2007) and are listed below:

- Incidence of anadromous vs. other life history forms
- Life History and ecology
- Age-specific survival
- Spawning and fecundity
- Migratory patterns
- Habitat use

Habitat concerns:

Because these fish make extensive use of river basins throughout all or a large portion of their life cycle, they are exposed to a variety of potentially adverse conditions associated with land-use activities. Reduction in freshwater and estuarine habitat quality has most likely contributed to declines in CCT populations. Movement within and between watersheds potentially leading to metapopulation structure may be effected by loss of connectivity through habitat fragmentation. Changes in near-shore habitat characteristics due to alterations in freshwater runoff, ocean circulation patterns, abundance of predator and prey species, and shifts in physical conditions could contribute to declines in CCT summer growth rates or survival. In addition, evidence suggests that logging practices decrease instream habitat quality due to increases in water temperature and siltation, removal of large woody debris that would otherwise provide important habitat structure, changes in river basin hydrology, and insertion of culverts beneath logging roads. The increased incidence of culverts in many CCT streams (due to logging and non-logging-related road construction) is a serious threat because of their effectiveness in blocking instream migration, especially for juveniles, smolts and adults. The loss of coastal wetlands to urban or agricultural development also would directly reduce the productivity of cutthroat populations. The primary losses in estuarine habitat are attributed to the ditching, draining, diking, and filling associated with agricultural and urban development. Indicators of predator-prey encounter rates (observations of predator scars on returning fish) suggest that in some areas or years CCT mortality due to marine mammal predation may be high.

Participants in the 2006 Science Workshop identified urbanization, agricultural practices that adversely effect riparian areas, and timber practices, as the three highest threats to CCT. Alteration in water quality and quantity were also identified as an issue of concern by participants. The cause of water quality issues included all the threats listed above as well as global climate change. In some regions mining and hydropower development were identified as threats as well as issues with fisheries management.

Opportunities and Strategies for Improving Coastal Cutthroat Trout Status:

The conservation, recovery, and enhancement of CCT is a complex problem both biologically and socially. The subspecies occupies a large distributional range and exhibits a breadth of ecological types or life history forms. The full range of life history forms includes large migratory forms that take advantage of a wide range of ecological conditions in freshwater and marine environments. In many regions these fish are capable of supporting recreational anglers while in other regions it appears that these forms are in decline or the current conditions do not support the expression of these forms. Fish that reach maturity at small sizes are widely

distributed, and management agencies report that they are ubiquitous and represent stable populations. Teasing out the complex mechanism of the biology of the sub-species (particularly the expression of life history) in a timely manner that will support management decisions will be a challenge. To meet these challenges State, Federal, and Tribal agencies, along with NGOs will need to identify and increase the priority of CCT.

- ***Monitoring, genetic analyses, and fisheries managment:*** Experts at the 2006 science workshop (PSMFC 2007) identified a number of priority needs for CCT. First, while all life history forms of the species were considered during their discussions it seems apparent that much of the public interest from an angling perspective is focused on the anadromous or "sea-run" form, or typically larger adfluvial, or fluvial forms. However, identifying the various life history forms at early ages to manage these populations is difficult because the mechanisms for anadromy and migration which lead to these larger fish are unknown. Monitoring or assessing the status of CCT is complicated by this issue. In addition much of the monitoring for CCT is conducted ancillary to other salmonid species throughout most of its range. Monitoring programs that can assess the status of CCT need to be developed.

Key Actions:

- Conduct fish population surveys and analysis that identifies the distribution and abundance of populations that can be used to assess the status of the sub-species.
- Establish genetic management units that characterize genetic diversity and identifies the appropriate scale of management actions.
- Support fisheries and habitat management actions which conserve native populations that represent the full range of life history diversity (size limits, bag limits, reducing hatchery impacts; riparian and flow protection)
- Conduct research and monitoring of restoration activities (barrier placement or removal, in-stream structure enhancement, flows, conserving estuarine areas) consistent with an adaptive management approach
- Enforce and support regulatory actions (fishing regulations, water use, riparian and land management) that enhance and conserve native CCT populations

CCT Habitat Manipulations: Restoration of CCT habitat will have to address both habitat quality issues and issues of spatial limitations. Spatial limitations include proper identification of natal streams. Current efforts to manage CCT have been directed toward improving in-stream conditions and restoring limited stream fragments. Future efforts will need to consider recovery at a much larger scale if we are to maintain CCT populations.

Primary Habitat Actions to be addressed:

Identify priority areas for habitat actions
Restore fish passage by standard means
Restore and improve altered channel and riparian zone habitats
Restore and enhance water flow, quality and sediment regimes
Address public and private land management practices to improve habitat
Address loss of estuary habitat
Identify critical CCT streams and reaches used predominantly by CCT and maintain existing habitat

Regulatory Actions to enhance CCT status:

The habitat of CCT must be protected through enforcement of existing and future environmental regulations. Maintaining the sport fish status of the CCT and utilizing regulations to control over-utilization will be an

important component of maintaining the health of CCT populations. In addition, working with a variety of agencies and organizations to develop and enforce appropriate regulations for prevention of disease, water quality impairment, and habitat disturbance are important considerations.

Primary Regulatory Actions to be addressed:

Create, maintain or enhance regulatory actions to prevent further destruction of habitat
Enforce regulatory mechanisms that prevent impacts associated with recreational angling
Enhance and maintain regulatory mechanisms that prevent diseases or illegal introduction of nuisance species

Recommended actions to improve the status of coastal cutthroat trout:

- Develop a monitoring framework for CCT that allows for the assessment of status, i.e., define what constitutes a "healthy" population of CCT including stream health.
- Fund research that aids management agencies in their efforts to identify the important linkages among life history types.
- Identify Genetic Management Units (GMU's) throughout the distributional range of CCT
- Further refine the ESU's identified by NMFS 1999 status review.
- Continue to develop a coordinated effort among tribal, state, federal, provincial agencies that identifies the priority research and management needs for CCT.
- Establish or enhance outreach with angling and NGO groups

Priority Actions within the existing ESU's established by NMFS:

A) Puget Sound
B) Olympic Peninsula
C) SW Washington/lower Columbia River -
D) Willamette River
E) Oregon Coast
F) Southern Oregon /California Coast

1) Distribution and Abundance surveys
   a) Continuation, expansion, and/or establishment of spawner or proxy surveys for CCT escapement/recruitment
   b) Establishment of population assessment programs and benchmarks for CCT in representative watersheds
   c) Determination of genetic affinities of CCT, especially in Columbia River and southwest Washington CCT populations, among/between "resident" and migratory populations, and between CCT and *O. mykiss*

2) Assessment and remediation of fish passage barriers

3) Assessment and restoration of stream water, channel and habitat quality

4) Assessment and restoration of estuarine and near-shore water and habitat quality

Estimated 5-year funding need:

If funding levels and habitat degradation in the next five years remain static, the status of CCT will remain ambiguous and will most likely decline. This results in risk to the future conservation of the subspecies as well as a conundrum for management agencies. Without basic assessment tools, there is not enough information to determine if populations are healthy, or at risk. Experts at the 2006 PSMFC workshop stated that a number of basic tools as well as conceptual frameworks or models need to

be developed before CCT populations can be accurately assessed.

Currently, no additional funding for CCT projects is anticipated through State agencies. Thus, any CCT work will likely come at the cost of existing States fisheries programs-requiring those agencies to shift their priorities. Given the pressing need of other fisheries concerns we feel this shift is unlikely. If any new CCT projects are to be conducted they will most likely have to be projects funded under WNTI.

Funding needs:

1.Establish genetic management units and a conceptual framework for their management
2.Basic research to develop tools for identifying life history forms
3.Establish baseline biological information such as age at maturity and production standards for various life-history stages such as fry, parr, smolts and adults.
4.Basic research to develop a conceptual framework for the importance of various life history forms and their interactions
5.Pilot projects in monitoring populations within an adaptive management framework.
6.Develop a GIS based tool to prioritize needs and assess current status

Estimated 10-year funding need:

1.Implementation of range-wide conservation strategies
2.Monitoring programs that can assess populations in the long-term given the range of natural variation.

Funded Peojects

1. CCT Species status Assessment-2008

Likely Future CCT Joint-Ventures: Bonneville Power Administration

Angling Groups
Army Corps of Engineers
USGS

USFS
PSMFC
Trout Unlimited
Various Tribal Organizations
Various Watershed Councils

References:

1. 1999 NOAA CA, OR and WA Status Report
2. Pacific States Marine Fisheries Commission report, 2007
3. Others from NOAA report

This publication was funded (or partially funded) by Federal Aid to Sportfish Restoration Funds through the Multistate Conservation Grant Program (Grant WY M-8-P), a program supported with funds from the Wildlife and Sport Fish Restoration Program of the U.S. Fish and Wildlife Service and jointly managed with the Association of Fish and Wildlife Agencies, 2006-9.