Coastal Cutthroat Trout

(*Oncorhynchus clarkii clarkii*)

Data: 1999 NOAA Status Review; 2007 PSMFC Review, 2018 PSMFC Assessment

Partners: Alaska Department of Fish and Game, Ministry of Environment, British Columbia, California Department of Fish and Wildlife, Oregon Department of Fish and Wildlife, Washington Department of Fish and Wildlife, US Fish and Wildlife Service, US Forest Service, US Geological Survey, National Marine Fisheries Service, Pacific States Marine Fisheries Commission, Northwest Indian Fisheries Commission, US Bureau of Land Management

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Species Status and Distribution

Introduction

Coastal Cutthroat Trout (CCT: *Oncorhynchus clarkii clarkii*) are one of the four major subspecies of Cutthroat Trout (CT) in North America (Behnke 1992, Williams et al. 2018) and occupy coastal streams in California, Oregon, Washington, British Columbia, and Alaska (Figure 1). They have a complex life history in which they depend on freshwater streams and rivers for spawning and rearing. Yet they are the only CT that migrate to marine environments for feeding forays, dispersal, or to seek refuge. They are important ecologically, and are a popular sport fish, however our understanding of this subspecies remains limited, including our understanding of their status. Coastal Cutthroat Trout distribution overlaps with Pacific salmon and Steelhead (*Oncorhynchus mykiss*), however, CCT are not harvested for commercial use. Coastal Cutthroat Trout are rarely monitored, although they are incidentally monitored in programs that target other commercial or sport fish, such as Coho Salmon (*Oncorhynchus kisutch*). Some long-term datasets provide insights into local conditions.

Coastal Cutthroat Trout are managed as a native trout and a sportfish; in some cases, CCT comprise portions of subsistence fisheries. Coastal Cutthroat Trout population sizes are small and

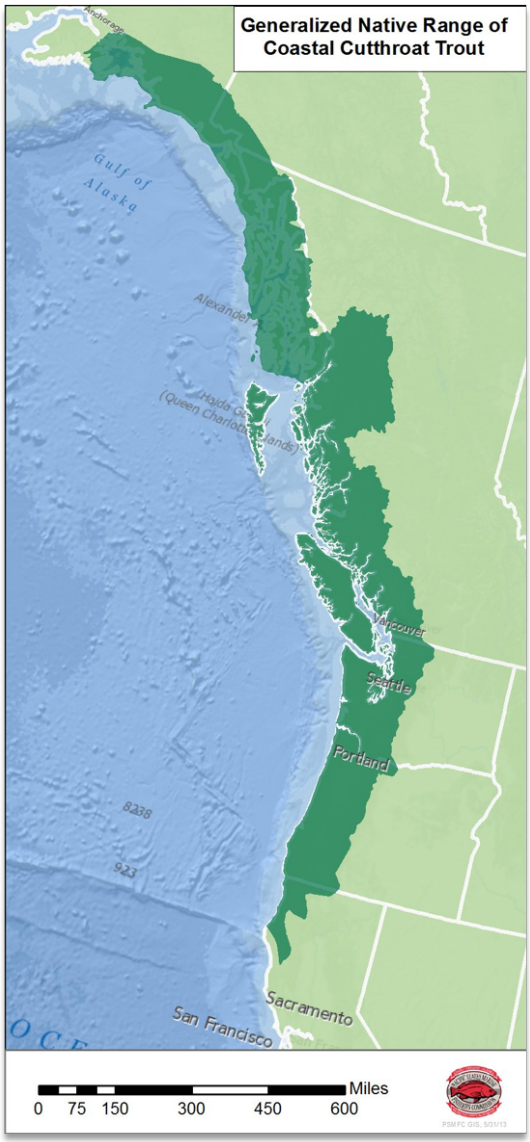

Figure 1. Coastal Cutthroat Trout Distribution in North America – updated May 2020. Source: CCT Assessment (PSMFC).

thought to be structured at the watershed scale. These factors, in combination with their unique and complicated life history, have historically created challenges for managing this subspecies. This document includes a general summary of the status, distribution, and life history of CCT as well as limiting factors and ongoing conservation actions and opportunities that have been developed to better understand and manage CCT. An overview of range-wide conditions, including detailed information by jurisdiction, highlights unique information, concerns, and approaches to managing this species.

Federal listing activities/state status

Before 1999, the National Marine Fisheries Service (NMFS) and US Fish and Wildlife Service (FWS) shared federal authority of CCT. The FWS was responsible for the freshwater portion of their populations, and NMFS was responsible for marine migrants. When ocean adult returns to the Umpqua River, Oregon seemed to decline in the early 1990s, NMFS conducted a status review. In 1996, NMFS listed North Umpqua CCT as a threatened species under the Endangered Species Act of 1973 (ESA), as amended (16 U.S.C.1531 et seq). Following this listing, NMFS conducted an additional status review of the subspecies throughout their geographic range in the lower 48 states of North America, identifying six Evolutionary Significant Units (ESU) (Fig. 2).

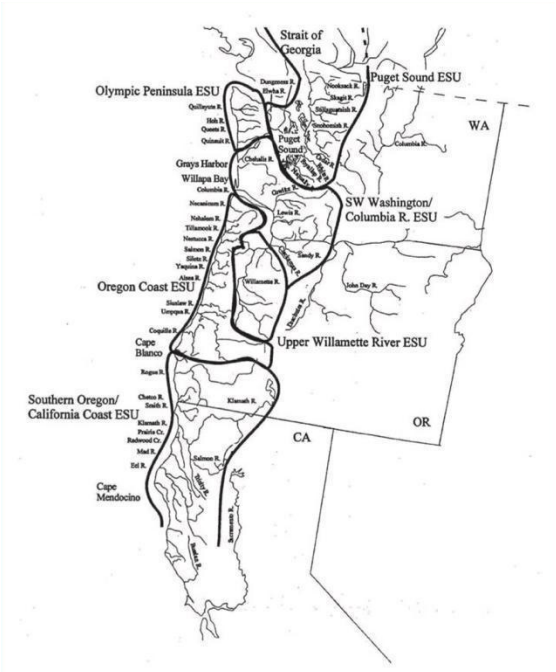

Figure 2. Six Evolutionary Significant Units of CCT in North America. Source: National Marine Fisheries Service 1999).

On April 5, 1999, NMFS and the FWS published a joint proposal to list the southwestern Washington/Columbia River CCT ESU (SWWC-ESU) as a threatened species and to delist the Umpqua River ESU (acknowledging the Umpqua population was part of a larger ESU) (64 FR 16397). On November 22, 1999, the FWS assumed all ESA regulatory jurisdiction for CCT, and the ESU designation was changed to a Distinct Population Segment (DPS).

In 2002, the FWS withdrew the SWCW-ESU (DPS) listing proposal (67 FR 44933) The decision to withdraw was overturned in court, and the FWS was required to revisit its decision. In 2008, the FWS reconsidered the 2002 withdrawal of the listing proposal, especially in reference to whether marine and estuarine areas are a significant portion of the range of the DPS. In 2010, the FWS determined that listing the DPS was not warranted based on a five-factor analysis of threats to CCT in marine and estuarine environments (75 FR 8621).

In 2006, the Pacific States Marine Fisheries Commission (PSMFC) and FSW created an interagency committee consisting of state, tribal, federal, and provincial agencies to coordinate agency efforts, share knowledge, and advance understanding of CCT with the long-term goal of developing a consistent framework for management, research, restoration, and conservation throughout the subspecies geographic range (75 FR 8621, Finn et al. 2008). This effort is ongoing and has resulted in workshops, symposia, an online library, distribution map tool, and a range-wide assessment.

Currently, California designates CCT as a Species of Special Concern. Oregon has defined four management units and designates CCT as Potentially at Risk in the Lower Columbia management unit (ODFW 2005, Lorion 2018). The Washington Department of Fish and Wildlife has identified 40 stock complexes (Blakely et al. 2000) in Washington (Losee and Thiesfeld 2018). Washington designates CCT as a Species of Concern. British Columbia designates CCT as a Species of Special Concern. There is no listing status for CCT in Alaska.

Distribution

Coastal Cutthroat Trout are distributed along the Pacific Coast of North America from the Eel River in California, to the Prince William Sound area of Alaska (DeWitt 1954, Trotter 1987). The eastern range of the subspecies rarely extends farther inland than 160 km, and usually extends 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 SE Alaska. This range coincides closely with the coastal temperate rainforest belt defined by Waring and Franklin (1979). The current geographic distribution of CCT generally reflects the historic distribution since European contact. Although the freshwater form is well-distributed, the migratory forms, and in particular, marine migrants, have been the subject of concern by state and federal agencies, and local population extirpation or declines have been reported (Slaney and Roberts 2005).

California
The range-wide assessment conducted by PSMFC documents CCT distribution in 1,675 km of California rivers and streams (Garwood 2018). 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, estuaries, and lagoons, a unique habitat type in this region. All life history forms are present in California.

Oregon
Coastal Cutthroat Trout are widespread in Oregon coastal streams. All life history forms are present. Willamette Falls presents a complete barrier to anadromous fish, thus all populations above the falls in the Willamette River are freshwater residents or freshwater migrants (ODFW 2005). The distribution of CCT extends east to the crest of the Cascade Mountains (Johnson et al. 1999). Coastal Cutthroat Trout are also found in the Columbia River and its tributaries and have been documented in 15-Mile Creek (Johnson et al. 1999). They are also present in urban streams in the city of Portland (Silver 2018).

Washington
Coastal Cutthroat Trout are distributed throughout Washington State, including the Lower Columbia River and SW Washington, Puget Sound and tributaries, the Olympic Peninsula, and North Cascades (Leider 1997). A small number of populations have been documented in the San Juan Islands (Glasgow et al. 2020).

British Columbia
In British Columbia, CCT inhabit three eco-provinces, including Coastal Mountains, Georgia Depression, and Central Interior. Coastal Cutthroat Trout inhabit low elevation lakes and rivers along much of the coast, including streams in the Fraser River basin, on Vancouver Island, and in parts of the Queen Charlotte Islands (Costello 2008). In the Skeena River, they are found to the divide at Morrison Lake (>400 km inland) and in the Stikine River up to Telegraph Creek (~160 km inland; Carl et al. 1967). Although CCT are currently found throughout much of their historic range in British Columbia, they have become increasingly displaced from their preferred small stream habitat associated with low gradient valley bottoms (areas which often serve as focal points for human development) (Slaney and Roberts 2005, Costello 2008).

Alaska
In Alaska, CCT are found in streams and lakes along the coastal range from lower SE Alaska to Prince William Sound and are the most common trout species in the region (Alaska Department of Fish and Game 2020). The freshwater-resident form lives in a wide variety of habitats,

from small headwater tributaries and bog ponds to large lakes and rivers. Sea-run CCT are usually found in river or stream systems with accessible lakes. In some watersheds, the two forms are found together. In 13 "trophy" lakes in SE Alaska, CCT may exceed 20 inches, weigh three to seven pounds (Harding 2018).

Coastal Cutthroat Trout Habitat Requirements

In general, CCT require cool, clean, and well-oxygenated water. They spawn in riffles, or the tails of pools, in small low velocity and low gradient streams, and use pea-sized gravel for their spawning beds (DeWitt 1954). Although they prefer low velocity and low gradient stream reaches, they can be found throughout a watershed, including high and steep headwater streams. Coastal Cutthroat Trout are often the last salmonid documented in small tributary streams. Juveniles generally rear in smaller streams with dense overhead cover and cool summer temperatures (Rosenfeld et al. 2000, 2001). Presence of large woody debris can provide refuge for juveniles during winter high flow events (Harvey et al. 2011). Optimal stream temperatures are less than 18°C; preferred temperatures being around 9-12°C.

Ample instream cover, including large wood, boulders, undercut banks, deep pools, or turbulence, is a critical limiting resource that provides shelter and feeding stations for juveniles and adult CCT (Gerstung 1998, Rosenfeld and Boss 2001). During seasonal low flows, CCT use cover near deeper water and select larger-sized cover in shallower water with implications for emigration and populations (Penaluna et al. 2020). Other factors may impact where CCT are present in freshwater. In British Columbia, juvenile CCT seem to be confined to smaller streams, headwaters, or sub-basins of larger watersheds (< 13 km^2 in high runoff watersheds) whereas steelhead dominate large streams (Hartman and Gill 1968, Slaney and Roberts 2005, Ptolemy 2013).

Coastal Cutthroat Trout Life History

Migration

The life history, movement, and migration of CCT is perhaps the most complex and flexible of the Pacific salmonids (Northcote 1997). There are migratory and non-migratory forms of CCT ranging from stream residents to ocean or river migrants, lake residents, and lake migrants. Type and duration of migration depends on opportunities and the type of habitat they occupy. Full expression of these migrations and life histories requires migratory access to marine, estuarine, and freshwater habitats. In addition, self-sustaining populations of CCT are found above waterfall barriers throughout their geographic range. A small number of these fish may move

downstream over the falls to contribute to below-barrier populations. Although the degree of interaction between 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 (Guy et al. 2008).

A general description of four complex life history forms present throughout their geographic range was offered by Trotter (1997). These include: headwater stream-resident; stream dwelling fish that migrate within river systems but remain in fresh water; lake dwelling fish that make local migrations between lake inlets and outlets; and marine migrants, commonly referred to as "sea-run" cutthroat trout. Although CCT undergo the transformation that allows them to tolerate salt water, they do not overwinter or undergo long ocean migrations similar to other Pacific salmon. Instead, they remain relatively close to shorelines and make seasonal migrations returning to freshwater in the fall or winter. Coastal Cutthroat Trout that have access to protected estuaries may have more complex and extended marine migrations and durations (Krentz 2007).

Northcote (1997) provided a model that describes the movement and life history of CCT as behavior on a spectrum that is driven by feeding and reproduction. Migratory juvenile fish move to feeding areas, which may include lakes, rivers, or the marine environment. This is followed by a refuge migration for overwintering in freshwater habitat, which could include lakes, rivers, or headwater tributaries. This cycle or variations of it may be repeated yearly until maturation when a spawning migration to headwater tributaries is undertaken in the spring. These cycles influence the growth and fecundity of CCT, which have long-term implications for population growth. In areas accessible to the ocean, all three life-history strategies (resident, freshwater migratory, and sea-runs) are likely to be expressed in the same river system.

Life Cycle

The life cycle of CCT is similar to other CT species, but because of their extensive geographic range, there is great deal of local variation in spawning time, emergence time, and migration times.

Spawning times vary locally, but in general, CCT spawn in the winter or spring. In Northern California, their upstream migration to spawning sites begins after the first substantial rainfall, which usually occurs between August and October. In Oregon, CCT trout typically spawn from December through June, with peak spawning in February. Fry emerge six to seven weeks following spawning, and spend their first year in rearing habitat, such as side channels.

In Puget Sound, fish re-enter their spawning tributaries from February to June (Losee et al. 2016).

Coastal Cutthroat Trout can spawn repeatedly. They can spawn every year, however, post-spawning mortality can be significant. On average, sea-run CCT make their first foray to salt water at age two to three and first spawn at age four. They may repeat their spawning cycle two to five times. Non-migratory fish often reach sexual maturity earlier (between the ages of two and three years) and are mature at a smaller size compared to anadromous fish (Trotter 1989, Johnson et al. 1999). Sexually mature trout can demonstrate precise homing capabilities in their migrations to natal streams (Losee et al. 2016). In general, the life span of CCT is four to seven years, although under some conditions, CCT can be long-lived. The maximum age recorded for CCT is 18 years for a lake-dwelling individual in Alaska (Harding 2018).

Smolts or adults entering the saltwater environment remain close to the shore and do not normally venture more than about 7 km from the edge of the coast (Johnson et al. 1999). Typically, they stay in or close to the plume of the river in which they were reared (Pearcy 1997). Individuals can spend prolonged periods (months) in estuaries, often moving in and out of fresh water, likely taking advantage of different feeding and rearing habitats (Krentz 2007, Zydlewski et al. 2008). They feed on various crustaceans and fishes, including Pacific sand lance (*Ammodytes hexapterus*), salmonids, herring and sculpins. Marine predators include Pacific hake (*Merluccius productus*), spiny dogfish (*Squalus acanthias*), harbor seals (*Phoca vitulina*) and adult salmon (Jacquet 2002).

Sportfish Management

Throughout their range, CCT are specifically targeted as a recreational fishery in both marine and freshwater habitats. Although they are not a commercial species, CCT have been documented in bycatch of salmon-steelhead fisheries (Pearcy 1997). In Alaskan waters, CCT are a subsistence species. Recreational harvest of naturally produced, or "wild", CCT in many areas is managed using angling regulations, including bait restriction, harvest restrictions, and size limits. Historically, hatchery supplementation was used as a tool to support fisheries, but there are few hatcheries for CCT that remain in operation.

California

The CCT fishing season is open from the last Saturday in May through August 31, and includes a two fish/day bag limit and 10-inch minimum size limit, with the exception of Stone Lagoon, which has a 14-inch minimum size limit.

Oregon

In Oregon, a variety of sport fishing regulations are in place that help to manage CCT. Trout fishing in streams is generally open from late May through October, but year-round catch and release opportunities are available in some areas. Limited CCT harvest is allowed in most coastal rivers, but some coastal streams have catch and release regulations, or are closed to trout fishing. In the Rogue and Umpqua basins, nearly all streams are closed or restricted to catch and release fishing. Catch and release regulations are also in place for the Willamette River and several other Columbia River tributaries, although limited harvest is allowed in some areas of these basins. Lakes with CCT are generally open to trout fishing year-round. There is a higher bag limit than streams, but the same minimum length requirement.

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.

British Columbia

Stream closures, mandates for using single, barbless hooks, a province-wide bait ban, and daily bag and length limits are used to manage CCT fisheries in British Columbia.

Alaska

In Alaska, CCT are managed both for sport fishing and as a subsistence fishery for rural Alaskans. Anglers catch an average of more than 20,000 CCT and harvest about 2,100 CCT in Alaska annually. The cornerstone of Alaska's sport fishing regulations are a series of size slot limits with minimum size limits designed to protect the majority of trout from harvest until they have spawned at least once. Minimum size limits are only effective if hooking mortality is minimal; thus a ban on bait in fresh water is often a component of Alaska's sport fishing regulations. Spawning closures help maintain good spawning populations.

Threats

Habitat

Generally, the limiting factors for CCT include habitat loss and habitat fragmentation, or actions that increase population isolation and loss of migration corridors, water quality and quality, including temperature, alterations of hydrology and watershed function, and loss of estuarine habitat for rearing, ocean productivity, climate impacts (loss of coastal fog, increased fire intensity), and introduced species. Lack of resources for monitoring CCT populations and target data for monitoring has also been identified as a limiting factor.

Because CCT make extensive use of river basins throughout all or a large portion of their life cycle, they are exposed to a diversity of potentially adverse conditions associated with land use activities (Johnson et al. 1999). Degradation of both freshwater and estuarine habitats has most likely contributed to declines in CCT populations (Gerstung 1997, Hooton 1997, WDFW 1998). Major anthropogenic land use activities, including agriculture, forestry, grazing, water diversions, urban and industrial development, road construction, and mining, have altered and reduced CCT habitat and has resulted in subsequent loss in production (Johnson et al. 1999). Moyle et al. (2013) identify CCT in California as critically vulnerable to climate change stressors including increasing water temperatures (which will affect growth and survival) and estuary habitat degradation caused by sea level rise.

Genetic concerns

CCT populations are small and genetically distinct. Understanding the amount of genetic exchange and how populations interact provides information to better manage their populations. In addition, CCT hybridize with Rainbow Trout/steelhead trout and produce viable offspring throughout their geographic range. This suggests the need to understand the amount of interaction and overlap with Rainbow Trout/steelhead, including habitat use and spawning times so we can understand important interactions between them, especially as habitat and conditions change through time. Because CCT and Rainbow Trout have evolved together, there is not an inherent conservation risk to natural hybridization. Hatchery releases of Rainbow Trout and subsequent hybridization may be an exception to this. Currently the release of CCT from production hatcheries is limited to a few locations in Washington state and British Columbia.

California (Garwood 2018)

- Degraded habitat/ water quality, climate (sea-level rise, loss of summer fog, temperature, wildfire), invasive species.

Oregon (Oregon Conservation Strategy 2016)

- Habitat fragmentation, or actions that increase population isolation.
- Alterations of hydrology and watershed function.
- Loss of estuarine habitat for rearing.
- Ocean productivity.
- Loss of habitat through urbanization and agriculture.

Washington (Anderson 2010, WDFW 2015)

- Fish passage.
- Shoreline modification and shoreline armouring.
- Loss of estuary habitat from agriculture, logging, mining, dams, grazing, urbanization, industry, invasive species, and aquaculture.
- Loss of habitat in the lower Columbia River and estuary from dredging, filling, diking, and channelization. The original extent of tidal marsh and swamp in the estuary has been reduced by more than 50 percent (LCREP 1999).

British Columbia (Slaney and Roberts 2005)

- Urbanization, which is affecting spawning and rearing habitats in small CCT streams, is the major limiting factor for CCT.
- Legacy effects of timber harvesting, which increase sediment supply and reduce riparian recruitment of large wood.

Alaska (Harding 2018)

- Loss or degradation of habitat (road expansion, hydroelectric development, urban development, and large-scale logging).

Data Shortfalls

In general, data gaps throughout CCT range include information on the incidence of anadromous versus other life history forms, life history and ecology, abundance, distribution, population trends, age-specific survival, spawning and fecundity, migratory patterns, and habitat use, particularly in marine environments.

Critical CCT state- and provincial-specific data information needs include:

California

- Status and distribution through population surveys.

Oregon (Oregon Conservation Strategy 2016)

- Breeding and genetic relationships among different life history types.
- Abundance.
- Distribution.
- Population age composition, estimates, and trends.
- Marine waters distribution and mechanisms affecting marine survival.

Washington

- Spawn timing.
- Movement.
- Life history diversity.
- Abundance.

British Columbia (Slaney and Roberts 2005)

- Confirm the sea-run life history form of CCT in the lower Fraser River and accessible tributary reaches.
- Quantify wild-hatchery stock interactions associated with the anadromous CCT program in the Lower Mainland.
- Confirm age-specific survivals of sea-run CCT under varying conditions and productivities.
- Evaluate the effectiveness of special regulations on piscivorous lake fisheries.

Alaska

- Monitoring of abundance and length composition.
- To better understand distribution of cutthroat in the northern and western extent of their range.
- Outreach for increased angler participation, especially in the Prince William Sound area.

Conservation Opportunities

Conservation strategies for freshwater fish increasingly rely on a multi-pronged approach (Finn 2008). Monitoring population trends, improving or restoring habitat, and data-driven harvest regulations are important tools in the fisheries manager's toolbox. This is especially important for CCT because of lack of baseline data, such as genetic structure, and their complex migratory patterns (Losee et al. 2016). Thus, leveraging data gathering and management actions that target a multispecies approach and partnerships (Finn 2008, ODFW species management plan) is critical to the success of CCT management and conservation. In many jurisdictions habitat restoration for Pacific salmon benefits CCT, but one of the goals of the Interagency Committee is to

ensure CCT are including in planning and restoration efforts.
The following conservation actions and opportunities have been identified through the PSMFC assessment and state partners (either through the assessment or independently):

Create a conservation agreement, identify conservation populations, maintain or restore aquatic, estuarine, and riparian habitat, provide suitable water quality, and habitat complexity. Continue ongoing restoration efforts involving landowners, tribes, and agency partners (NOAA, NMFS, Oregon Department of Fish and Wildlife, Oregon Watershed Enhancement Board). Reduce localized impacts where populations could become increasingly fragmented. Continue to use special designations to raise awareness of CCT, such as California's Heritage and Wild Trout program. Use special designations to protect habitat. For example, CDFW designated 142 stream miles of the South Fork of the Smith River as a Wild Heritage Trout stream, which supports the largest CCT population in California. Continue to use land acquisitions and support sustainable harvest regulations.

WNTI Completed/Ongoing Projects

Eccles Creek Watershed Road Fish Passage and Habitat Restoration, AK (2009) - $50,000

Protecting stream Habitat for Coastal Cutthroat Trout Via Water Reservations in Southeast Alaska (2010) - $38,000

Alaska Coastal Cutthroat assessment (2011) - $48,646

Mabel Creek (Youngs River) resident coastal cutthroat trout passage and habitat restoration, OR (2011) - $27,000

Protecting Lacustrine Habitat for Coastal Cutthroat through Reservation of Water in Southeast Alaska (2012) - $39,500

Umpqua River Watershed Outreach, OR (2012) - $1,250

Upper Wynoochee Bull Trout Population Assessment, WA (2012) - $3,000

Coastal Cutthroat Trout Range-Wide Status Assessment, AK, CA, OR, WA - (2013) $62,900

Yankee Creek Coastal Cutthroat Trout habitat development, OR (2014) - $12,000

Bear Creek Connectivity and Habitat Enhancement Proposal, OR (2015) - $28,710

"Forest & Fins" Education Program, WA (2015) - $3,000

Nooksack Salmon Enhancement Association - Nooksack River Stewards program expansion, WA (2015) - $3,000

Bum Creek Instream Restoration, OR (2016) - $3,000

Deer Creek Floodplain Enhancement Project, OR (2017) - $19,023

Going to Extremes: Exploring the Northern Extent of Alaskan Trout Species, AK (2019) - $4,750

West Hills College Coalinga Citizen & Undergraduate Science Project, CA (2019) - $5,000

Coastal Cutthroat Habitat Restoration Project (CCHRP) , WA (2020) - $32,897

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