

Pacific Coast

Species Summaries

LISTING STATUS: red (ESA listed as Threatened or Endangered), yellow (not ESA listed but federal sensitive species or state species of concern (majority of states), green (not listed in majority of states)

CURRENT RANGE: red (10 percent or less), yellow (11 -25 percent), green (>25 percent)

HISTORICAL RANGE: red (<1,000 miles), yellow (1,000-10,000 miles), green (>10,000 miles)



Coastal Cutthroat Trout

Category	Status	Explanation
Listing status	Yellow	Sensitive species (USFS) Species of Concern (WA) Species of Special Concern (CA)
Current range	Green	Data quality varies but most of historical range is believed to be currently occupied
Historical range	Green	Broadly distributed in coastal streams from Canadian border to Eel River in CA
Climate change	Yellow	Increasing drought and wildfires coupled with reduced snowpack negatively impact habitat
Energy development	Green	Impacts from energy development relatively minor
Non-native species	Green	Impacts from non-native species are minor
Water demand	Yellow	Impacts from diversions are uncertain but may be more substantial in southern part of this region
Data issues	Yellow	Populations are infrequently monitored

Coastal Rainbow Trout

Category	Status	Explanation
Listing status	Green	No special status for primary freshwater forms. Some steelhead ESUs are listed in the Pacific Coast region
Current range	Green	The degree of introgression from hatchery stocked rainbows is uncertain in many areas but most of historical range is believed to be currently occupied
Historical range	Green	Broadly distributed in coastal streams from Canadian border to Baja California
Climate change	Yellow	Increasing drought and wildfires coupled with reduced snowpack negatively impact habitat
Energy development	Green	Impacts from energy development relatively minor
Non-native species	Red	Potential widespread impacts, including hybridization, from hatchery-produced rainbows
Water demand	Yellow	Impacts from diversions are substantial in the southern part of this region
Data issues	Yellow	Better information is needed on degree of hatchery stocking influence on native genomes

Bull Trout

Category	Status	Explanation
Listing status	Red	Listed as Threatened under ESA (Endangered Species Act)
Current range	Green	Rangewide, approximately 60 percent of historical range is currently occupied but less in the Klamath Basin.
Historical range	Green	Ranged broadly throughout Klamath, Upper Snake, Columbia, Coastal and McCloud River systems
Climate change	Red	Very sensitive to rising water temperatures; wildfires a concern with reduced snowpack and forest drying
Energy development	Green	Minimal impacts other than legacy hydroelectric developments
Non-native species	Red	Lake trout, brook trout, brown trout and northern pike are particularly problematic
Water demand	Green	Dams fragment habitat
Data issues	Yellow	Status of many smaller populations is uncertain



Dolly Varden

Category	Status	Explanation
Listing status	Green	Not listed by WDFW or USFWS
Current range	Yellow	Data are uncertain, but current populations appear to be restricted to smaller headwater streams
Historical range	Yellow	Southern extent of range is northwest WA
Climate change	Red	Very sensitive to temperature increases and changes in winter precipitation from snow to rain
Energy development	Green	No known energy development concerns other than legacy hydroelectric power
Non-native species	Yellow	Not believed to be a serious issue although potential competition with hatchery-produced salmonids
Water demand	Green	Water diversions are minor issue
Data issues	Red	Distribution uncertain; population data lacking for many stocks; distinction from bull trout not always certain

Columbia River Redband Trout

Category	Status	Explanation
Listing status	Yellow	Sensitive species (USFS, BLM) Species of Special Concern (ID, MT, NV, OR)
Current range	Green	Rangwide, 44 percent of stream habitat is currently occupied
Historical range	Green	Historically occupied about 32,300 miles of stream habitat
Climate change	Red	Snowpack is reduced; stream temperatures rising, wildfires increasing
Energy development	Green	No known energy development projects
Non-native species	Red	Major threat from hatchery-produced rainbow trout
Water demand	Yellow	Drought-prone landscape and agricultural demands
Data issues	Red	Have only tested genetics on 18 percent of occupied habitat and still a fairly high level of uncertainty on current distribution and abundance

Klamath Redband Trout

Category	Status	Explanation
Listing status	Yellow	Listed as sensitive in OR
Current range	Green	Although populations are reduced in some areas, most of the historical range is currently occupied within the Klamath Basin
Historical range	Green	Broad historical range in the Klamath Basin
Climate change	Red	Drought, stream warming and wildfires are major issues; the basin is currently in a prolonged drought
Energy development	Green	No known energy conflicts other than legacy hydroelectric development
Non-native species	Red	Introduced rainbow trout pose hybridization risk; yellow perch and other non-native fishes have become established in lakes and reservoirs
Water demand	Red	Many streams have diversions; water demand is very high in the basin
Data issues	Yellow	Interagency workgroup maintains good population data; flow data needs improving

Coastal Cutthroat Trout (*Oncorhynchus clarkii clarkii*)

Coastal cutthroat trout are broadly distributed in watersheds draining the Coast Range from the Eel River in California northward into Canada and Alaska. Within the Pacific Coast region, they also occur as far inland as portions of the Willamette River drainage. The life history of these fish is highly variable and includes non-migratory resident freshwater forms, fluvial freshwater forms that migrate within the freshwater system, adfluvial forms that migrate between lakes and their tributary streams and sea-run or anadromous forms that move between freshwater and marine environments. The sea-run or anadromous forms do not have major oceanic migrations, but instead utilize estuaries and other near-shore environments for short periods of time before returning to freshwater; some individuals may take these migrations several times during their life.

Cutthroat trout tend to be more sensitive to warming water and disturbance than are rainbow or redband trout. Migratory fish, including the sea-run life history, are particularly sensitive to dams, poorly-designed culverts and other barriers to their free movement within stream networks. Other sources of degraded habitat for coastal cutthroat include poor forestry practices and poorly-designed or maintained roads that contribute sediment to stream systems, or land uses that degrade estuaries. Populations near or downstream of urban areas also may be impacted by polluted runoff and increasing pesticide loads.

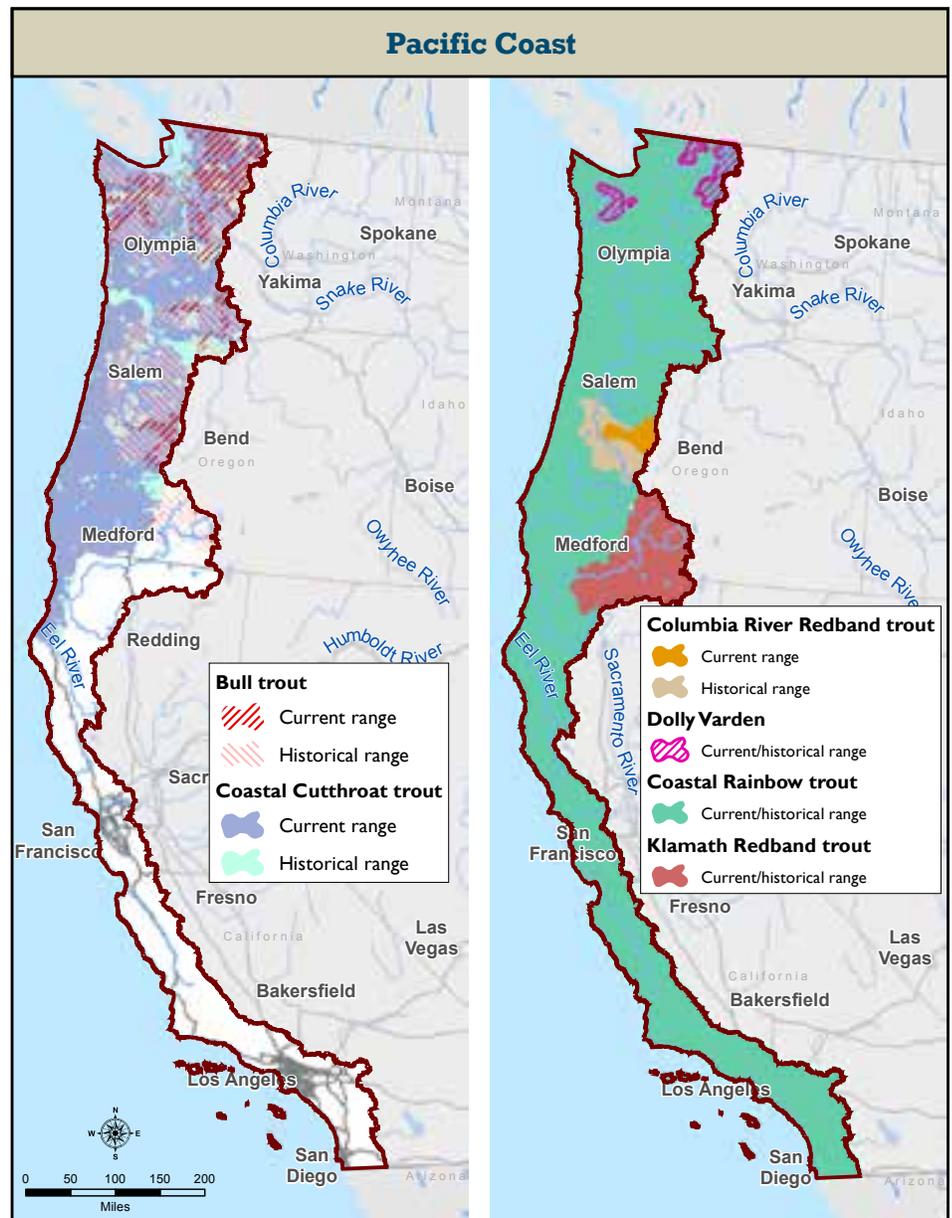
In California, Dr. Peter Moyle from University of California-Davis estimates that the best remaining populations of coastal cutthroat occur in the Smith, Mad and lower Klamath rivers. In Oregon, the Department of Fish and Wildlife believes that virtually the entire historical habitat is currently occupied by coastal cutthroat trout and that all life histories are present. At times, some sea-run populations in Oregon and Washington have appeared to be at a higher risk but this generally reflected only sea-run fish and did not take into account the relative life history plasticity and the ability in single populations to express multiple migratory and resident

forms. Nor did it focus on the extent of resident coastal cutthroat above barriers. Dams and other instream barriers have a greater impact on migratory forms. The larger, migratory fish may also be subjected to greater catch rates in the creel.

Coastal Rainbow Trout (*Oncorhynchus mykiss irideus*)

Coastal rainbow trout is the most abundant and widespread native salmonid in North America. In addition to a broad natural range throughout Pacific coastal areas, they have been widely cultured and introduced throughout much of the continent and beyond. As a result, there are now anadromous rainbow trout in the southern

Pacific Ocean and northeastern Atlantic Ocean. Part of the success of this fish is due to its varied life history and ability to shift from one life style to another. Most anglers are familiar with two major life histories, an anadromous form known as steelhead and a resident form that spends its life in freshwater. But even within these two major groups there is variability such as with run timing of steelhead and separation between summer steelhead and winter steelhead. Environmental conditions, such as food availability, temperature, flows and habitat conditions, greatly influence whether an individual fish stays in freshwater or moves into the ocean to become a steelhead. In southern



Historical and current distributions of native trout and char in the Pacific Coast Region.

California, urbanization and dams now block many coastal drainages, effectively isolating the freshwater resident form. Generally speaking the distinction between these lifestyles is primarily environmental rather than genetic.

The federal government manages geographic distinctions in steelhead by grouping populations into ESUs – Evolutionarily Significant Units. Some steelhead ESUs are listed as Endangered or Threatened pursuant to the ESA. For example, the [Southern California Coast Steelhead](#) is listed as Endangered. The listing includes only anadromous steelhead naturally produced downstream of impassible barriers and not resident rainbow trout. Similarly, [Central California Coast Steelhead](#) are listed as Threatened and include only naturally-produced anadromous steelhead located downstream of dams and other impassible barriers. Other ESUs of steelhead also are listed northward through Puget Sound and to the Interior Columbia and Snake rivers.

Indiscriminate hatchery stockings and movement of populations across drainage boundaries have clouded the taxonomy and historical distinctions among many coastal

rainbow populations. Substantial natural variation likely occurred among and within major drainage areas. Genetic techniques are available that can determine whether rainbow trout in a given stream system are genetically pure or whether they have been contaminated through introgression with stocked hatchery rainbows. A recent study completed by Trout Unlimited and NOAA-Fisheries staff examined rainbow trout from 27 streams in southern California and found only three streams that still contained predominantly pure native trout and many others that were some mix of hatchery and native genes (1). Such studies help focus recovery efforts where there is still a predominance of native fish.

Because threats to anadromous salmonids are more complex than freshwater resident forms and because federal agencies often manage steelhead separately from purely freshwater forms, we are treating steelhead and salmon in future State of the Salmon reports.

Bull Trout (*Salvelinus confluentus*)

In the Pacific Coast region, [bull trout](#) historically occurred in Washington coastal streams, Cascade-drainage streams in the

Willamette River drainage in Oregon and in the upper Klamath River drainage. Bull trout are widely distributed within the Interior Columbia Basin/Northern Rockies region and were historically known to occur in the McCloud River in California, where they are now extinct. The species occupies a variety of large lakes, small headwater streams and larger river systems. In many areas, the species is highly migratory and maintenance of diverse life history expression is a primary recovery strategy. As such, habitat fragmentation caused by dams, poorly designed stream crossings and other factors is a major legacy threat to bull trout. Non-native species are another primary threat. Most large lake systems inhabited by bull trout are also habitat for introduced populations of brook trout, brown trout, lake trout and on occasion, northern pike. These species can prey on bull trout and are likely to compete for scarce resources. Many stream systems inhabited by bull trout also have large populations of brown and brook trout. The presence of brook trout is especially problematic because both brook and bull trout are fall spawners and readily hybridize, thereby reducing the diversity



Bull trout

and fitness of the bull trout population.

Preferred habitats of bull trout are characterized by the 4-Cs: cold, clean, connected and complex (2). Their habitat requirements are more specific than other native salmonids in the region. Bull trout require cold water, substrates that are clean of sediment and other pollutants, complex stream channels including deep pools and an interconnected stream network that facilitates spawning migrations and free movement up and down riverine corridors.

Climate change poses a dramatic risk for bull trout, especially warming of migratory and larger river habitats. The more southern portions of the range, including the Willamette and Klamath basin drainages in the Pacific Coast region may be particularly susceptible. In Idaho, warming stream temperatures are constricting the lower-elevation range of bull trout in many areas. Wildfires are another increasing risk associated with climate change. Like other parts of the bull trout range, changes in winter precipitation from snow to rain, earlier peak flows, forest drying and increased insect pests all favor increasing wildfires and subsequent stream sedimentation within the Pacific Coast region.

Bull trout populations along the Pacific Coast appear to be more robust in Washington streams and less robust in more fragmented habitat that becomes increasingly common as the distribution moves south in the region. In the Willamette River, for example, bull trout were known from the Clackamas, Middle Fork Willamette, McKenzie and Santiam. They were extirpated from all of these rivers except the McKenzie. Bull trout persist in the McKenzie River and the species has recently been reintroduced into the Clackamas River under experimental, non-essential provisions of the ESA. In the upper Klamath River system, bull trout occurred historically in the Wood, Williamson, Sprague, Sycan and some of the smaller streams draining from the Cascades into the Wood and Upper Klamath Lake systems. A reintroduced population persists in Sun Creek in Crater Lake National Park and downstream towards the Wood River. Small remnant populations still persist in the Upper Sycan and Sprague river systems.

Rangewide, the US Fish and Wildlife Service reports that the distribution of bull trout has changed little since the species was listed in 1999 (2). However the latest draft recovery plan of the USFWS also reports that more than 60 percent of known core areas have imminent threats that are rated as moderate or substantial. The status of bull trout in the Klamath Recovery Area is poor compared to other parts of the species range.

Dolly Varden (*Salvelinus malma*)

[Dolly Varden](#) is a close relative to bull trout and it was not until 1978 that the two species were confirmed to be distinct. In the U.S., Dolly Varden naturally occur only in coastal drainages in northwestern Washington from the Canadian border south through Puget Sound and south on the Olympic Peninsula to the Quinault River. Morphologically, Dolly Varden are very similar to bull trout and there has been some confusion in distinguishing the species, especially in northwest Washington where both species coexist in the same or adjacent drainages. Adding to the confusion is the potential for hybridization between the two species, which has been recorded in British Columbia.

The Washington Department of Fish and Wildlife reported in 2000 that the two species occurred together in the Quinault and Nooksack rivers and perhaps the Elwha as well (3). Since that time it appears that Dolly Varden in Washington may be restricted to small headwater tributaries of coastal rivers. Email exchanges between Bill McMillan and colleagues around 2004 reveal a more restricted distribution with smaller, non-anadromous populations occurring in isolated headwater drainages. Bill and John McMillan report Dolly Varden present in the headwaters of the Sol Duc, Dungeness, Nooksack, Quinault, Skagit and Elwha, with few or no Dolly Varden present in larger mainstem river systems (4). Populations in Washington likely were always restricted to the headwater streams.

Dolly Varden exhibit various life histories, including anadromous, fluvial, adfluvial and resident stream forms. In a report that combined bull trout and Dolly Varden, the Washington Department of Fish and Wildlife reported that 5 of 29

stocks are classified as “healthy”, none were classified as either “depressed” or “critical” but 24 were not classified due to incomplete data (3). At that time (2000), it was believed that most Dolly Varden populations were anadromous but more recent information indicates that most populations are restricted to headwater streams and exhibit freshwater resident life histories. Dolly Varden are readily caught and are susceptible to overfishing by anglers. They also appear very sensitive to pollutants and increases in stream temperature.



Oncorhynchus mykiss gairdneri

Columbia River Redband Trout (*Oncorhynchus mykiss gairdneri*)

For the purposes of this report, we follow the genetic relationships of redband trout as described by Ken Currens and co-authors in a 2009 report on the evolutionary ecology of redband trout (5). They report three distinct lines that appear to be worthy of subspecific description: the [Columbia River redband](#) trout, Klamath redband trout and Sacramento redband trout. A fourth line of redbands in isolated basins of southeastern Oregon also appear to be distinct but their taxonomy is not as clear. Many of these redband are known as “interior redband trout.” State and federal agencies, Tribes and Trout Unlimited are all part of a rangewide conservation agreement dedicated to the conservation and restoration of interior redbands, including the Columbia River subspecies.

In the Pacific Coast region, the Columbia River redband trout is known from tributaries of the Willamette River, upstream of and including the Calapooia River, near Albany, Oregon (6). Hatchery rainbow trout have been broadly introduced within the Willamette drainage, which complicates distributional certainty. Currently, the most abundant and robust remaining population in the Willamette River drainage is in the McKenzie River. This fish also is known as the McKenzie redband, redside or

rainbow and is a favorite of local anglers. Within the McKenzie River, stocking of hatchery rainbows is the largest threat posed to native redband trout. Habitat in the McKenzie River remains in relatively high quality with redbands distributed widely in the drainage. Minor areas of stream channelization and riparian habitat degradation exist in the lower sections of the river.

Columbia River redband currently occupy just 45 percent of their historical stream habitat in the Columbia River system. The degradation and fragmentation of aquatic systems from land conversion, roads and the development of natural resources has contributed to local extirpations of redband trout, particularly at the lower elevations where these activities are the most prevalent. Dams, irrigation diversions and road culverts often create passage barriers for redband trout, eliminating their ability to move among lake, river and stream habitats. Although non-native species such as brown trout and smallmouth bass have displaced redband trout through competition for resources and direct predation, the greatest threat is from the widespread introduction of hatchery rainbow trout and non-native cutthroat trout, which commonly hybridize with the native redbands. It is estimated that 55 percent of streams currently occupied by redband trout contain hybridized populations.

Klamath Redband Trout (*Oncorhynchus mykiss newberryi*)

Redband trout from the upper [Klamath River headwaters](#), Agency and Upper Klamath lakes and streams draining the coastal Klamath Mountains comprise the Klamath redband trout. In the upper basin, redband trout occur in the Sprague, Sycan, Williamson, Wood and Lost rivers, Jenny Creek, in addition to lakes and reservoirs. The redband trout population in Upper Klamath Lake is the largest adfluvial trout population in Oregon. Generally, the Klamath redband are highly migratory and move between lake and riverine habitats to feed and spawn as seasons, flows and water conditions dictate. Hatchery rainbow trout have been widely introduced in this basin, including stocking into Upper Klamath Lake as early

as 1928. However, the Klamath redband evolved in the hypereutrophic waters of Upper Klamath and Agency lakes and it is doubtful that hatchery rainbows could survive and reproduce in the system, thus maintaining the natural genetic stocks of redband trout in the upper basin. The extent to which hatchery rainbow stocking has influenced some of the other redband populations in the basin is unknown.

Drought, dams, water diversions and poor water quality are concerns throughout the Klamath Basin, especially in the upper basin in Oregon. Currently the basin is enduring a prolonged drought, which exacerbates problems of overallocation of water in the basin. Upper Klamath and Agency lakes are hypereutrophic with periodic blooms of blue-green algae and related poor water quality conditions. These conditions may extend downstream of the lakes into Copco and Iron Gate reservoirs near the California border. Although constructed with a fish ladder, J.C. Boyle Dam poses a migration barrier for redband as do the remaining dams on the mainstem Klamath that lack fish passage facilities. Drought conditions will cause further water quality declines and likely contribute to increased wildfire risk.

Historically, competition for water has been intense in the basin, often placing farmers and ranchers against Native American Tribes, fishermen and bird enthusiasts. Much of the upper basin is prime agricultural land but salmon, steelhead and trout in the basin also support major commercial and recreational fisheries. Water resources are thin and demand is very high. The continuing battles for water supply caused many disparate parties to come together in recent years to produce a Klamath Basin Restoration Agreement and Klamath Hydroelectric Settlement Agreement. The agreements were signed by 45 parties, including federal agencies, the states of Oregon and California, Tribes, counties, irrigators and conservation groups in 2010. If and when the agreements are funded and fully implemented, they would reallocate water among competing parties and improve water quality and fish passage in the basin by removing four major dams on the Klamath River, restoring the potential for anadromous fish to once again access the upper basin.

The agreements remain contentious and dependent on federal funding.

Regional Trends

The following factors impact native trout in the Pacific Coast region: timber harvest and associated forestry practices, agriculture, urban development, overfishing, stocking of non-native fishes, dams and other instream barriers, estuary degradation and climate change. Impacts may not be consistent across the three-state coastal region. Urban areas containing large swathes of impenetrable surfaces, such as roads and buildings, speed runoff with earlier peak flows following storms and higher levels of polluted stormwater runoff, which can carry warm water, sediment, hydrocarbons and chemical pollutants into stream systems. Many rivers in the region contain dams and impassible culverts that limit movement of the highly migratory bull trout, Dolly Varden, Klamath redband trout and coastal cutthroat trout. Water temperature also may restrict fish migra-

The region also has experienced dam removal projects on the Sandy, Rogue and most recently, the Elwha River, which have restored access between headwater and downstream river networks.

tions and hence their distribution within and across watersheds. The region also has experienced dam removal projects on the Sandy, Rogue and most recently, the Elwha River, which have restored access between headwater and downstream river networks.

Estuary conditions are a concern for native trout that exhibit anadromous life histories. Unlike salmon and steelhead, the ocean migrations of coastal cutthroat trout, bull trout and Dolly Varden are short and may be limited to estuaries; occurring over the period of a few months rather than years for salmon. Although bull trout are also known to enter saltwater and to move between watersheds. In areas with poor estuary conditions or where dams or other



Glins Canyon Dam on the Elwha River:
Removed 2012 – 2013

mainstem river problems are substantial, coastal cutthroat trout and Dolly Varden may be restricted to headwater streams and a freshwater resident life history. Generally, it is highly advantageous for these fishes to be able to move throughout stream networks to find suitable conditions and avoid acute disturbances associated with flood, drought, or wildfire.

The Pacific Coast region is timber country and there has been extensive timber harvest on public and private lands in the past that have left a legacy of problems. Often associated with timber harvest is the construction of a network of primitive roads to facilitate timber removal. Roads intercept hill-slope runoff and channelize flows into streams at a faster rate than would normally occur. At the time the Northwest Forest Plan was prepared, there was an estimated road density on Forest Service and BLM public lands in the region of 4.22 miles of road/sq. mile (7). This high road density coupled with steep lands and normally high rainfall in the Pacific Coast can greatly increase peak stream flows in addition to road failures and associated debris flows into

streams that result in increased stream sedimentation (8).

Streamside riparian buffers were increased and harvest levels were reduced on federal lands in association with the Northwest Forest Plan. Watershed conditions improved in the 10-year period following plan implementation (9) yet a significant legacy of poorly maintained roads and stream crossings persist in the region. Culverts are susceptible to blow out, especially in areas where substantial logging debris may clog culvert entrances and where there are shallow soil mantles and high likelihood of rain-on-snow events.

As the Pacific Coast region warms from climate change, there has been a shift in higher elevation winter precipitation from snow to rain. This can cause earlier season peak flows and lower base flows in the fall (10). Also, winter stream scouring can occur, which adversely impacts fall-spawning bull trout and Dolly Varden. An extreme drought is occurring in the southern portion of the region. California is in the fourth year of one of the most severe droughts on record. Beyond the lack of precipitation for providing stream flow

and recharging groundwater for storage later in the year, 2015's drought has been particularly consequential for all species that depend on water – humans and trout included – due to warmer than normal winter temperatures. Complicating the water supply situation in California has been rapidly expanding cultivation of water-thirsty marijuana plants. Each plant needs about 6 gallons per day. In Outlet Creek, which is a tributary of the Eel River, California Department of Fish and Wildlife estimates that there are 441 marijuana cultivation sites with 32,000 plants requiring 191,000 gallons of water per day. Legal and illegal diversions are drying these drought-stricken streams.

The year 2014 was the [warmest on record for California](#), 4.1oF above the 20th Century average and 1.8oF above the highest previous record set in 1934. Following the warmest calendar year on record in California, December through February of 2015 were the warmest in the state's recorded history. The 2015 snowpack is also very low in Oregon and Washington with the Klamath Basin near 10 percent of its historical average.

SUCCESS STORY:

Restoring Habitat Diversity to an Oregon Coastal Stream: Niagara Creek Large Wood Project

BY ALAN MOORE, TROUT UNLIMITED

PHOTOS COURTESY US FOREST SERVICE – HEBO RANGER DISTRICT



Niagara Creek is a major spawning and rearing tributary to the Nestucca River for winter steelhead, coho and Chinook salmon and coastal cutthroat trout. Most of Niagara Creek and its tributaries run through an inventoried roadless area of the Siuslaw National Forest. Habitat conditions generally are good and it is considered to be a productive stream for salmonid fishes. However, there are sections of Niagara Creek that are devoid of large wood where spawning gravel has been scoured out and refuge areas needed by juvenile salmon and trout to survive are few and far between. “Stream cleaning” and other activities back in the last century removed a lot of the large wood that naturally occurs in streams like this that provides a catalyst for innumerable natural processes needed by rivers, fish and other species. One of the major strategies for restoring habitat function in streams like Niagara is putting some of that large wood back and setting the table for more of it to enter the stream naturally in the future.



What the operation looks like on the ground.



The Chinook preparing to place a large tree in Niagara Creek.



A twin-engine Boeing Chinook CH-47 heavy-lift airship, owned and operated by Columbia Helicopters. The Chinook is the only available helicopter capable of transporting the large size of trees (up to 160') needed for the project. Large trees, especially large complexes made up of multiple trees weighing each other down, will stay in the stream corridor during high water events without any cabling or other artificial anchoring. Using large trees not only keeps the wood relatively in place, it allows the wood to act more naturally with the dynamic forces of the stream, preventing unintended results like unnatural erosion and other problems associated with cabling wood in place. Also, using a large helicopter to place large trees allows for large areas of a stream to be treated in a relatively short time and, importantly, with minimal ground disturbance. For this operation, we were able to place 160 pieces of large wood in complexes over more than 3 miles of Niagara Creek and one of its tributaries, Beulah Creek, in a matter of hours.

The Niagara Creek project is a partnership with major contributions from Trout Unlimited, US Forest Service (Siuslaw NF Hebo Ranger District), Oregon Watershed Enhancement Board, National Fish and Wildlife Foundation, Nestucca-Neskowin Watershed Council, Columbia Helicopters and the Austin Family.