# Final Assessment of NOAA Fisheries' Critical Habitat Analytical Review Team (CHART) For the Oregon Coast Coho Salmon Evolutionarily Significant Unit

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## EXECUTIVE SUMMARY

This report summarizes the results of the critical habitat analytical review team (CHART) charged with analyzing the best available data to assess biological information relevant to making a critical habitat designation for the Oregon Coast coho salmon Evolutionarily Significant Unit (ESU). The CHART reviewed information for 80 watersheds within the range of this ESU including the presence and distribution of essential habitat features in each watershed, potential management actions that may affect those features, and the conservation value of each watershed. This information will be used in conjunction with other agency analyses (e.g., economic analyses) to support NOAA Fisheries' final critical habitat designation for Oregon Coast coho salmon.

## ACKNOWLEDGEMENTS

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# 1. BACKGROUND

Over the past several years, NOAA Fisheries has listed 27 distinct population segments, or evolutionarily significant units (ESU), of Pacific salmon and steelhead in Oregon, Washington, Idaho and California as threatened or endangered species under the U.S. Endangered Species Act (ESA). Collectively, these ESUs occupy thousands of miles of streams in watersheds covering more than 250 thousand square miles. In 2000, NOAA Fisheries designated critical habitat for 19 of the listed ESUs (65 FR 7764, February 16, 2000). These designations were challenged in court on a number of grounds. NOAA Fisheries entered into a consent decree resolving these claims and pursuant to court order the designations were vacated. Following remand, NOAA Fisheries received a letter from environmental groups providing 60-day notice of intent to sue for not having designations in place for these 19 ESUs and one additional ESU, Northern California Steelhead. The agency entered into a consent decree with the environmental groups establishing a schedule for completing new designations.

On December 14, 2004 the agency published a *Federal Register* Notice proposing designation of critical habitat for the Oregon Coast coho ESU and 12 other ESUs in Oregon, Washington, and Idaho covered by the consent decree (69 FR 74572). The proposed designation was based in part on analyses provided by the Oregon Coast critical habitat analytical review team (CHART). The CHART was charged with analyzing the best available data to assess biological information relevant to making a critical habitat designation for the Oregon Coast coho salmon ESU.

On January 19, 2006, NOAA Fisheries issued a final determination that listing the Oregon Coast coho ESU under the ESA was “not warranted” (71 FR 3033). In so doing the agency also withdrew the proposed critical habitat designation for this ESU. The decision not to list the Oregon Coast coho ESU was later challenged in *Trout Unlimited III v. Lohn*. On October 9, 2007, the U.S. District Court for the District of Oregon invalidated the January 2006 decision not to list Oregon Coast coho and ordered NOAA Fisheries to issue a new decision on listing consistent with the ESA. In November the court extended the date to February 2008.

As part of the effort to complete this final rulemaking the agency re-convened the Oregon Coast CHART to review information (including public comments on the 2004 proposed designation) for 80 watersheds within the range of the Oregon Coast coho salmon ESU. This review included assessing the presence and distribution of essential habitat features in each watershed, potential management actions that may affect those features, and the conservation value of each watershed. The resultant CHART findings will be used in conjunction with other agency analyses (e.g., economic analyses) to support NOAA Fisheries’ final critical habitat designation for Oregon Coast coho salmon.

## 1.1 CRITICAL HABITAT UNDER THE ESA

The ESA defines critical habitat under section 3(5)(A) as follows:

> (i) the specific areas within the geographical area occupied by the species, at the time it is listed . . ., on which are found those physical or biological features (I) essential to the conservation of the species and (II) which may require special management considerations or protection; and
>
> (ii) specific areas outside the geographical area occupied by the species at the time it is listed . . . upon a determination by the Secretary that such areas are essential for the conservation of the species.

Once critical habitat is designated, ESA Section 7 requires federal agencies to ensure that they do not fund, authorize, or carry out any actions that are likely to destroy or adversely modify that habitat. This requirement is in addition to the Section 7 requirement that federal agencies ensure that their actions do not jeopardize the continued existence of listed species.

A recent amendment to section 4(a) of the ESA precludes military land from designation, where that land is covered by an Integrated Natural Resource Management Plan that the Secretary has found in writing will benefit the listed species.

ESA Section 4(b)(2) requires NOAA Fisheries to designate critical habitat for threatened and endangered species "on the basis of the best scientific data available and after taking into consideration the economic impact, impact on national security, and any other relevant impact, of specifying any particular area as critical habitat." This section grants the Secretary [of Commerce] discretion to exclude any area from critical habitat if he determines "the benefits of such exclusion outweigh the benefits of specifying such area as part of the critical habitat." The Secretary's discretion is limited, as he may not exclude areas if it "will result in the extinction of the species."

## 1.2 SALMONID LIFE HISTORY

Pacific salmon and steelhead are anadromous fish, meaning adults migrate from the ocean to spawn in freshwater lakes and streams where their offspring hatch and rear prior to migrating back to the ocean to forage until maturity. The migration and spawning times vary considerably between and within species and populations (Groot and Margolis, 1991). At spawning, adults pair up to lay and fertilize thousands of eggs in freshwater gravel nests or "redds" excavated by females. Depending on lake/stream temperatures, eggs incubate for several weeks to months before hatching as "alevins" (a larval life stage dependent on food stored in a yolk sac). Following yolk sac absorption, alevins emerge from the gravel as young juveniles called "fry" and begin actively feeding. Depending on the species and location, juveniles may spend from a few hours to a few years in freshwater areas before migrating to the ocean. The physiological and behavioral changes required for the transition to salt water result in a distinct "smolt" stage in most species. On their journey, juveniles must migrate downstream through every riverine and estuarine corridor between their natal lake or stream and the ocean. For example, smolts from Idaho will travel as far as 900 miles from their inland spawning grounds. En route to the ocean, the juveniles may spend from a few days to several weeks in the estuary, depending on the species. The highly productive estuarine environment is an important feeding and acclimation area for juveniles preparing to enter marine waters.

Juveniles and subadults typically spend from 1 to 5 years foraging over thousands of miles in the North Pacific Ocean before returning to spawn. Some species, such as coho and chinook salmon, have precocious life history types (primarily male fish) that mature and spawn after only several months in the ocean. Spawning migrations known as "runs" occur throughout the year, varying by species and location. Most adult fish return or "home" with great fidelity to spawn in their natal stream, although some do stray to non-natal streams. Salmon species die after spawning, while steelhead may return to the ocean and make repeat spawning migrations.

This complex life cycle gives rise to complex habitat needs, particularly during the freshwater phase (Spence et al. 1996). Spawning gravels must be a certain size and free of sediment to allow successful incubation of the eggs. Eggs also require cool, clean, and well-oxygenated waters for proper development. Juveniles need abundant food sources, including insects, crustaceans, and other small fish. They need places to hide from predators (mostly birds and bigger fish), such as under logs, root wads, and boulders in the stream, as well as beneath overhanging vegetation. They also need places to seek refuge from periodic high flows (side channels and off-channel areas) and from warm summer water temperatures (coldwater springs and deep pools). Returning adults generally do not feed in fresh water but instead rely on limited energy stores to migrate, mature, and spawn. Like juveniles, they also require cool water and places to rest and hide from predators. During all life stages, salmon and steelhead require cool water that is free of contaminants. They also need migratory corridors with adequate passage conditions (timing, water quality, and water quantity) to allow access to the various habitats required to complete their life cycle.

The homing fidelity of salmon and steelhead is reflected in the distribution of distinct, locally adapted populations among watersheds with differing environmental conditions and distinct habitat characteristics (Taylor 1991, Policansky and Magnuson 1998, McElhany et al. 2000). Spatially structured populations in which populations or subpopulations occupy habitat patches, connected by some low-to-moderate stray rates, are often generically referred to as "metapopulations" (Levins 1969). Low-to-moderate levels of straying result in regular genetic exchange among populations, creating genetic similarities among populations in adjacent watersheds (Quinn 1993, Utter et al. 1989, Ford 1998).

The overall health and likelihood of persistence of salmon and steelhead metapopulations are affected by the abundance, productivity, connectivity/spatial structure, and diversity of the component populations (see McElhaney et al. 2000). With respect to the habitat requirements of a healthy ESU, an ESU composed of many diverse populations distributed across a variety of well-connected habitats can better respond to environmental perturbations including catastrophic events (Schlosser and Angermeier 1995, Hanski and Gilpin 1997, Tilman and Lehman 1997, Cooper and Manger 1999). Additionally, well-connected habitats of different types are essential to the persistence of diverse, locally adapted salmonid metapopulations capable of exploiting a wide array of environments, as well as capable of responding to and surviving both short- and long-term environmental change (e.g., Groot and Margolis 1991, Wood 1995). Differences in local flow regime, temperature regime, geological, and ecoregion characteristics correlate strongly with ESU population structure (Ruckelshaus et al. 2001).

ESUs with fewer and less diverse habitat types and associated populations are more likely to become extinct due to catastrophic events. They also have a lower likelihood that the necessary phenotypic and genotypic diversity will exist to maintain future viability. ESUs with limited geographic range are similarly at increased extinction risk due to environmental variability and catastrophic events. ESUs with populations that are geographically distant from each other, or that are separated by severely degraded habitat, may lack the connectivity to function as metapopulations and are more likely to become extinct. ESUs with reduced local adaptation and limited life-history diversity are more likely to go extinct as the result of correlated environmental catastrophes or environmental change that occurs too rapidly for an evolutionary response. Assessing the conservation value of specific habitat areas to ESU viability involves evaluating the quantity and quality of habitat features (for example, spawning gravels, wood and water condition, side channels), the relationship of the area to other areas within the ESU, and the significance to the ESU of the population occupying that area.

## 1.3 GEOGRAPHICAL AREA OCCUPIED BY THE SPECIES AND SPECIFIC AREAS WITHIN THE GEOGRAPHICAL AREA

In past critical habitat designations, NOAA Fisheries concluded that the limited availability of species distribution data prevented mapping salmonid critical habitat at a scale finer than occupied river basins. While various efforts were underway to address these data limitations, the agency noted that "most have yet to be completed or fail to depict salmonid habitats in a consistent manner or at a fine geographic scale." (65 FR 7764, February 16, 2000). Therefore, the 2000 designations indicated that the "geographical area occupied by the species" was best characterized by all accessible river reaches within the current range of the listed species.

For specific areas within that geographical area occupied by the species, NOAA Fisheries relied on the U.S. Geological Survey's (USGS) identification of subbasins, which was the finest scale mapped by USGS at that time. The subbasin boundaries are based on an area's topography and hydrography, and USGS has developed a uniform framework for mapping and cataloging drainage basins using a unique hydrologic unit code (HUC) identifier (Seaber et al. 1986). The HUCs contain separate two-digit identifier fields wherein HUC1 refers to a region comprising a relatively large drainage area (e.g., Region 17 for the entire Pacific Northwest), while subsequent fields identify smaller nested drainages. Under this convention, subbasins are commonly referred to as HUC4s. In its 2000 designations, then, NOAA Fisheries identified as critical habitat all areas accessible to listed salmon within an occupied HUC4.

Since the previous designations in 2000, two key efforts have significantly improved NOAA Fisheries' ability to identify freshwater and estuarine areas occupied by salmonids and to group the occupied stream reaches into finer scale "specific areas." The first key effort has allowed NOAA Fisheries to be more precise about the "geographical area occupied by the species." Federal, state, and tribal fishery biologists have made progress mapping species distribution at the level of stream reaches. The mapping includes areas where the species has been observed or where it is presumed to occur based on the professional judgment of biologists familiar with the watershed. Much of these data can now be accessed and analyzed using geographic information systems (GIS) to produce consistent and fine-scale maps. As a result, nearly all salmonid freshwater and estuarine habitats in Washington, Oregon, and Idaho are now mapped and available in GIS at a scale of 1:24,000. Previous distribution data were often compiled at a much coarser scale of 1:100,000 or greater. NOAA Fisheries made use of these finer-scale data for the current critical habitat designations and now believes that they enable a more accurate delineation of "geographical area occupied by the species" referred to in the ESA definition of critical habitat.

The second key effort has allowed NOAA Fisheries to identify "specific areas" (section 3(5)(a)) and "particular areas" (section 4(b)(2)) at a much finer scale. Since 2000, various federal agencies have identified HUC5 watersheds throughout the Pacific Northwest using the USGS mapping conventions referred to above. This information is now generally available from these agencies and via the internet (California Spatial Information Library 2004, Interior Columbia Basin Ecosystem Management Project 2003, Regional Ecosystem Office 2004). NOAA Fisheries used this information to organize critical habitat information systematically and at a scale that was relevant to the spatial distribution of salmon and steelhead. Organizing information at this scale is especially relevant to salmonids, since their innate homing ability allows them to return to particular reaches in the specific watersheds where they were born. Such site fidelity results in spatial aggregations of salmonid populations (and their constituent spawning stocks) that generally correspond to the area encompassed by HUC4s or HUC5s (Washington Department of Fisheries et al. 1992, Kostow 1995, McElhany et al. 2000).

In addition, HUC5 watersheds are consistent with the scale of recovery efforts for West Coast salmon and steelhead. In its review of the long-term sustainability of Pacific Northwest salmonids, the National Research Council's (NRC) Committee on Protection and Management of Pacific Northwest Anadromous Salmonids concluded that "habitat protection must be coordinated at landscape scales appropriate to salmon life histories" and that social structures and institutions "must be able to operate at the scale of watersheds" (NRC 1996).

Watershed-level analyses are now common throughout the West Coast (Forest Ecosystem Management Assessment Team 1993, Montgomery et al. 1995, Spence et al. 1996). There are presently more than 400 watershed councils or groups in Washington, Oregon, and California alone (For the Sake of the Salmon 2004). Many of these groups operate at a geographic scale of one to several HUC5 watersheds and are integral parts of larger-scale salmon recovery strategies (Northwest Power Planning Council 1999, Oregon Plan for Salmon and Watersheds 2001, Puget Sound Shared Strategy 2002, CALFED Bay-Delta Program 2003). Concurrent with these efforts, NOAA Fisheries has developed various ESA guidance documents that underscore the link between salmon conservation and the recovery of watershed processes (NMFS 1996 and 1999). Aggregating stream reaches into HUC5 watersheds allowed the agency to delineate "specific areas" within or outside the geographical area occupied by the species at a scale that corresponds well to salmonid population structure and ecological processes.

Occupied estuarine and marine areas were also considered. In previous designations of salmonid critical habitat we did not designate marine areas outside of estuaries and Puget Sound. In the Pacific Ocean, we concluded that there may be essential habitat features, but they did not require special management considerations or protection. Since that time we have considered the statutory and regulatory direction, the best available scientific information, and related agency actions, such as the designation of Essential Fish Habitat under the Magnuson-Stevens Fishery Conservation and Management Act.

We now conclude that it is possible to delineate specific estuarine areas in Puget Sound and the Columbia River, as well as specific nearshore areas of Puget Sound that are occupied and contain essential habitat features that may require special management considerations or protection. Estuarine areas are crucial for juvenile salmonids given their multiple functions as areas for rearing/feeding, freshwater-saltwater acclimation, and migration (Simenstad et al. 1982, Marriott et al. 2002). In many areas, especially the Columbia River estuary, these habitats are occupied by multiple populations and ESUs. We are delineating occupied estuarine areas in similar terms to our past designations, as being defined by a line connecting the furthest land points at the estuary mouth.

Nearshore areas also provide important habitat for rearing/feeding and migrating salmonids, and in Puget Sound support multiple populations of Puget Sound Chinook and Hood Canal summer-run chum salmon (Bakkala 1970, Healey 1982, Simenstad et al. 1982, Bax 1983, Salo 1991 as cited in Johnson et al. 1997, Beamish et al. 1998, Pacific Fishery Management Council, 1999, WDFW and Point No Point Treaty Tribes (PNPTT), 2000; Battelle Marine Sciences Laboratory et al. 2001, Nightingale and Simenstad 2001, Ruckelshaus et al. 2001 and 2002, Williams and Thom 2001, Puget Sound Nearshore Ecosystem Restoration Program 2003; Williams et al. 2003, Brennan et al. 2004, Fresh et al. 2004, Washington State Conservation Commission 1999-1003). As noted in the previous rulemaking (65 FR 7764, February 16, 2000), the unique ecological setting of Puget Sound allowed us to focus on defining specific occupied marine areas. As with the freshwater areas described above, we identified 19 nearshore marine zones in Puget Sound based on water resource inventory areas defined by the state of Washington (Washington Department of Ecology 2004). In delineating these nearshore areas in Puget Sound, we focused on the area contiguous with the shoreline out to a depth no greater than 30 meters relative to mean lower low water. This nearshore area generally coincides with the maximum depth of the photic zone in Puget Sound and contains physical or biological features essential to the conservation of salmonids (Puget Sound Nearshore Ecosystem Restoration Program 2003, Williams et al. 2003).

We did not identify offshore marine areas of Puget Sound and the Pacific Ocean. For salmonids in offshore marine areas beyond the nearshore extent of the photic zone, it becomes more difficult to identify specific areas where essential habitat features that may require special management considerations can be found. We did identify certain prey species that are harvested commercially (e.g., Pacific herring) as physical or biological features essential to conservation that may require special management considerations or protection. However, because salmonids are opportunistic feeders we could not identify "specific areas" beyond the nearshore marine zone where these or other essential features are found within this vast geographic area occupied by Pacific salmon. Prey species move or drift great distances throughout the ocean and would be difficult to link to any "specific" areas (NMFS 2004).

### 1.4 UNOCCUPIED AREAS

ESA Section 3(5)(A)(ii) defines critical habitat to include "specific areas outside the geographical area occupied" if the areas are "essential for the conservation of the species." NOAA Fisheries regulations at 50 CFR 424.12(e) emphasize that the agency "shall designate as critical habitat areas outside the geographical area presently occupied by a species only when a designation limited to its present range would be inadequate to ensure the conservation of the species." The agency focused its attention on the species' historical range when considering unoccupied areas since these logically would have been adequate to support the evolution and long-term maintenance of evolutionarily significant units. As with occupied areas, the agency considered the stream segments within a HUC5 to best describe specific areas. While it is possible to identify which HUC5s represent geographical areas that were historically occupied with a high degree of certainty, this is not the case with specific stream segments. This is due, in part, to the emphasis on mapping currently occupied habitats and to the paucity of site-specific or systematic historical stream surveys.

## 1.5 "PHYSICAL OR BIOLOGICAL FEATURES ESSENTIAL TO THE CONSERVATION OF THE SPECIES" (PRIMARY CONSTITUENT ELEMENTS)

Agency regulations at 50 C.F.R. 424.12(b) interpret the statutory phrase "physical or biological features essential to the conservation of the species." The regulations state that these features include, but are not limited to, space for individual and population growth and for normal behavior; food, water, air, light, minerals, or other nutritional or physiological requirements; cover or shelter; sites for breeding, reproduction, and rearing of offspring; and habitats that are protected from disturbance or are representative of the historical geographical and ecological distribution of a species. The regulations further direct us to "focus on the principal biological or physical constituent elements . . . that are essential to the conservation of the species, and specify that these elements shall be the "known primary constituent elements." The regulations identify primary constituent elements (PCE) as including, but not being limited to: "roost sites, nesting grounds, spawning sites, feeding sites, seasonal wetland or dryland, water quality or quantity, host species or plant pollinator, geological formation, vegetation type, tide, and specific soil types."

NOAA Fisheries biologists developed a list of PCEs specific to salmon steelhead and relevant to determining whether occupied stream reaches within a watershed meet the ESA section (3)(5)(A) definition of "critical habitat," consistent with the implementing regulation at 50 CFR 424.12(b). Relying on the biology and life history of each species, we determined the physical or biological habitat features essential to their conservation. We identified these features in the ANPR (68 FR 55926, September 29, 2003) and subsequently, as a result of the initial CHART assessments, developed a revised set of PCEs described in the proposed rule (69 FR 74572, December 14, 2005). We received very few comments specifically addressing PCEs described in the proposed rule but have included clarifications (see below) regarding why each PCE is essential to the conservation of these ESUs.

The ESUs addressed in this rulemaking share many of the same rivers and estuaries and have similar life history characteristics and, therefore, many of the same physical and biological features are essential to their conservation. These features include sites essential to support one or more life stages of the ESU (sites for spawning, rearing, migration and foraging). These sites in turn contain physical or biological features essential to the conservation of the ESU (for example, spawning gravels, water quality and quantity, side channels, forage species). Specific types of sites and the features associated with them (both of which are referred to as PCEs) include the following:

1. Freshwater spawning sites with water quantity and quality conditions and substrate supporting spawning, incubation and larval development. These features are essential to conservation because without them the species cannot successfully spawn and produce offspring.

2. Freshwater rearing sites with water quantity and floodplain connectivity to form and maintain physical habitat conditions and support juvenile growth and mobility; water quality and forage supporting juvenile development; and natural cover such as shade, submerged and overhanging large wood, log jams and beaver dams, aquatic vegetation, large rocks and boulders, side channels, and undercut banks. These features are essential to conservation because without them juveniles cannot access and use the areas needed to forage, grow, and develop behaviors (e.g., predator avoidance, competition) that help ensure their survival.

3. Freshwater migration corridors free of obstruction with water quantity and quality conditions and natural cover such as submerged and overhanging large wood, aquatic vegetation, large rocks and boulders, side channels, and undercut banks supporting juvenile and adult mobility and survival. These features are essential to conservation because without them juveniles cannot use the variety of habitats that allow them to avoid high flows, avoid predators, successfully compete, begin the behavioral and physiological changes needed for life in the ocean, and reach the ocean in a timely manner. Similarly, these features are essential for adults because they allow fish in a non-feeding condition to successfully swim upstream, avoid predators, and reach spawning areas on limited energy stores.

4. Estuarine areas free of obstruction with water quality, water quantity, and salinity conditions supporting juvenile and adult physiological transitions between fresh- and saltwater; natural cover such as submerged and overhanging large wood, aquatic vegetation, large rocks and boulders, and side channels; and juvenile and adult forage, including aquatic invertebrates and fishes, supporting growth and maturation. These features are essential to conservation because without them juveniles cannot reach the ocean in a timely manner and use the variety of habitats that allow them to avoid predators, compete successfully, and complete the behavioral and physiological changes needed for life in the ocean. Similarly, these features are essential to the conservation of adults because they provide a final source of abundant forage that will provide the energy stores needed to make the physiological transition to fresh water, migrate upstream, avoid predators, and develop to maturity upon reaching spawning areas.

5. Nearshore marine areas free of obstruction with water quality and quantity conditions and forage, including aquatic invertebrates and fishes, supporting growth and maturation; and natural cover such as submerged and overhanging large wood, aquatic vegetation, large rocks and boulders, and side channels. As in the case with freshwater migration corridors and estuarine areas, nearshore marine features are essential to conservation because without them juveniles cannot successfully transition from natal streams to offshore marine areas. We have focused our designation on nearshore areas in Puget Sound because of its unique and relatively sheltered fjord-like setting (as opposed to the more open coastlines of Washington and Oregon).

6. Offshore marine areas with water quality conditions and forage, including aquatic invertebrates and fishes, supporting growth and maturation. These features are essential for conservation because without them juveniles cannot forage and grow to adulthood.

## 1.6 SPECIAL MANAGEMENT CONSIDERATIONS OR PROTECTION

NOAA Fisheries' ESA regulations at 424.10(j) define "special management considerations or protection" to mean "any methods or procedures useful in protecting physical and biological features of the environment for the conservation of listed species." Based on discussions with NOAA Fisheries biologists in the Habitat Conservation Division (HCD) and the report by Spence et al. (1996), NOAA Fisheries identified a number of activities that may threaten the features, such that there would be any methods or procedures useful in protecting the features. The Spence et al. (1996) report contains a comprehensive review of factors limiting salmonid growth and production and relates them to specific human activities and useful management practices/actions. Major categories of habitat-related activities, identified in this report and through discussions with HCD biologists, include (1) forestry (2) grazing, (3) agriculture, (4) road building/maintenance, (5) channel modifications/diking, (6) urbanization, (7) sand and gravel mining, (8) mineral mining, (9) dams, (10) irrigation impoundments and withdrawals, (11) river, estuary, and ocean traffic, (12) wetland loss/removal, (13) beaver removal, and (14) exotic/invasive species introductions. In addition to these, the harvest of salmonid prey species (e.g., herring, anchovy, and sardines) may present another potential habitat-related activity (PFMC 1999). All of these activities have PCE-related impacts via their alteration of one or more of the following: stream hydrology, flow and water-level modifications, fish passage, geomorphology and sediment transport, temperature, dissolved oxygen, vegetation, soils, nutrients and chemicals, physical habitat structure, and stream/estuarine/marine biota and forage (Spence et al. 1996; PFMC 1999). The CHART identified and documented such activities for each area in tables contained in this report.

# 2. CRITICAL HABITAT ANALYTICAL REVIEW TEAM (CHART) ASSESSMENT FOR THE OREGON COAST COHO SALMON ESU

## 2.1 ESU DESCRIPTION & POPULATION STRUCTURE

The Oregon Coast coho salmon ESU was most recently defined as including "all naturally spawned populations of coho salmon in Oregon coastal streams south of the Columbia River and north of Cape Blanco, as well as five artificial propagation programs: the North Umpqua River (ODFW stock #18), Cow Creek (ODFW stock #37), Coos Basin (ODFW stock #37), Coquille River (ODFW stock #44), and North Fork Nehalem River (ODFW stock #32) coho hatchery programs."[1] The geographical area inhabited by the ESU is described in the 1995 species status review as:

> *. . . an area with considerable physical diversity ranging from extensive sand dunes to rocky outcrops. With the exception of the Umpqua River, which extends through the Coast Range to drain the Cascade Mountains, rivers in this ESU have their headwaters in the Coast Range. These rivers have a single peak of flow in December or January and relatively low flow in late summer. Upwelling north of Cape Blanco is much less consistent and weaker than in areas south of Cape Blanco. Sitka spruce is the dominant coastal vegetation and extends to Alaska. Precipitation in coastal Oregon is higher than in southern Oregon/northern California but lower than on the Olympic Peninsula. (Weitkamp et al. 1995)*

Geographical isolation is an important factor in the evolution of separate populations within or between basins. The Oregon Coast coho ESU is, in general, composed of relatively small basins (the Umpqua basin, an exception to this general rule, is a relatively large basin characterized by diverse vegetation and geology). The distance between saltwater entry points of each basin may significantly affect the level of migration or connectivity among populations. Some populations may be significantly affected by migrants from larger or more productive

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[1] At the time of the 2004 proposed rule to list Oregon Coast coho as threatened, five artificial propagation programs were proposed to be listed as part of the ESU: the Cow Creek (ODFW stock #37), North Fork Nehalem River (ODFW stock #32), North Umpqua River (ODFW stock #18), Coos Basin (ODFW stock #37), and Coquille River (ODFW stock #44) coho hatchery programs. Informed by comments on the proposed rule received from ODFW, it was determined that the North Fork Nehalem River hatchery stock has diverged substantially from the ESU and is not part of the ESU. The North Umpqua River, Coos Basin, and Coquille River coho hatchery programs have been discontinued and the last year of returns for these programs was 2007. Given that these latter 3 programs no longer exist, they are not considered part of the Oregon Coast ESU. The final ESU determination for Oregon Coast coho includes only one hatchery stock: the Cow Creek coho hatchery stock. Fish distribution data was not expected to change as a result of changes in the listing status of these artificial propagation programs because the affected watersheds support both hatchery- and natural-origin coho salmon (StreamNet 2005, NMFS 2007c).

systems. When the CHART completed its initial assessment for this ESU the Oregon Workgroup of the Oregon-Northern California Coast Technical Recovery Team (TRT) had preliminarily identified 19 functionally and potentially independent populations, and 48 additional dependent populations (Lawson et al. 2004). Since that time this Workgroup of the TRT has revised its assessment and now identifies 21 independent populations and 35 dependent populations of Oregon Coast coho salmon (Lawson et al. 2007; see Figure 1). The independent populations include: the Necanicum River, Nehalem River, Tillamook Bay, Nestucca River, Salmon River, Siletz River, Yaquina River, Beaver Creek, Alsea River, Siuslaw River, Siltcoos River (lake), Tahkenitch Creek (lake), Lower Umpqua River, Middle Umpqua River, North Umpqua River, South Umpqua River, Tenmile Creek (lake), Coos Bay, Coquille River, Floras Creek, and Sixes River populations.

## 2.2 COHO SALMON LIFE HISTORY

Adult coho salmon begin migrating into coastal streams and rivers with the first freshets in the fall. Spawning begins in November, peaking in December or January, and many continue into March. Eggs hatch in the spring and fry grow rapidly to the parr stage by early summer or early fall. Parr then seek out areas protected from high flows and spend a second winter in freshwater before migrating to the ocean as smolts in March through June. Smolt outmigration timing and smolt size appear to respond to small-scale habitat variability, and have been shown to be affected by anthropogenic activities including: habitat degradation (Moring and Lantz 1975) and habitat restoration (Johnson et al. 1993, Rodgers et al. 1993). About twenty percent of males mature at age 2 and return to freshwater as “jacks” in the same year they entered the ocean as adults. Although the production of jacks is a heritable trait in coho salmon (Iwamoto et al. 1984), the proportion of jacks in a given coho salmon populations is strongly influenced by environmental factors (Silverstein and Hershberger 1992). The remainder of juveniles rear in the ocean for 18 months and return as 3-year-old adults in the fallowing fall. Habitat capacity for coho salmon on the Oregon Coast has significantly decreased from historical levels. During periods of poor ocean survival, high quality habitat is necessary to sustain coho populations (Nickelson and Lawson 1998). The following habitat features have been identified as important to the recovery of Oregon Coast coho salmon (IMST 2002): structure and function of lowland areas, wetland, floodplains, and riparian forests; the presence of large wood on beaches and stream banks, and in streams, channels, estuaries, and floodplains; water quality, including temperature; hydrologic function and flow regimes; connectivity of rivers with floodplain and off-channel habitats; and the presence of diverse native plant communities subject to natural disturbance regimes.

## 2.3 RECOVERY PLANNING STATUS

The CHART recognized that recovery planning will likely emphasize the need for a geographical distribution of viable populations across the range of the ESU (Ruckelshaus et al. 2002, McElhany et al. 2003). The TRT divided the ESU into five biogeographic strata because these units represent both biological diversity (genetic and ecological) and geographic variation. The TRT noted that, given the dominant influence of the ocean on the Oregon Coast climate, ecological conditions are relatively uniform throughout the ESU. The Umpqua River basin is an exception, with inland areas being drier and experiencing more extreme temperatures than the coastal areas. Ecological differences within the ESU relate to the effects of local topography on rainfall, and of local geology on vegetation composition and slope stability. The State of Oregon's Fish and Wildlife Commission adopted the Oregon Department of Fish and Wildlife's Oregon Coast Coho Conservation Plan in March 2007. The CHART considered the TRT products in rating each watershed. We anticipate that, as ESA recovery planning proceeds, we will have better information and may revise our recommendations regarding critical habitat designation.

## 2.4 CHART PROCESS OVERVIEW

In keeping with the process used in recent critical habitat designations (70 FR 52630, September 2, 2005), NOAA Fisheries convened an Oregon Coast coho salmon CHART to assist in the designation of critical habitat under the ESA. The CHART consisted of federal salmonid biologists and habitat specialists tasked with assessing biological information pertaining to areas under consideration for designation. The CHART explored a variety of data sources and used their best professional judgment, a geographic information system, and a computerized decision support system (DSS) to (1) verify the presence of PCEs within each occupied area, (2) verify the existence of activities that may affect the PCEs, and (3) rate the conservation value of watersheds and riverine corridors and determine if any unoccupied areas may be essential to conservation. The CHART has completed four phases of work associated with the critical habitat designation for Oregon Coast coho salmon.

### 2.4.1 CHART Phase 1

In the first phase, the CHART met to discuss the assignment and to identify the best scientific information available regarding Oregon Coast coho and the habitats supporting the ESU. This phase also involved developing a fuzzy logic-based DSS to analyze habitat, spawning, and other related data. Using the DSS allowed the CHART to apply a consistent, transparent, and repeatable ranking methodology across all watersheds evaluated. Appendix A provides an explanation of the data considered, their incorporation into the DSS, and outputs used by the CHART in later phases.

### 2.4.2 CHART Phase 2

After collecting and synthesizing the best available data, the CHART met during Phase 2 to review and discuss the information. In this phase the CHART verified the presence of the PCEs in each occupied watershed/area, identified management activities that may affect those PCEs, and reviewed outputs from the DSS. For each watershed, the CHART members assessed the best available fish distribution data and noted any discrepancies with their own knowledge of the area (which included documented sources of information). If discrepancies were found, they were flagged for follow-up and resolution with the appropriate state or federal fishery agency. The CHART then confirmed whether the occupied reaches/areas were likely to contain one or more of the specified PCEs. To aid in these assessments, the teams were provided with GIS data and maps displaying a variety of data layers including fish and PCE distributions, ESU population boundaries, stream hydrography and gradient, land use, land cover, and land ownership.

The CHART was also asked to determine whether, consistent with the regulatory definition of "special management considerations or protection" (50 C.F.R. 402.02 (j)), there were "any methods or procedures useful in protecting physical and biological features." The CHART was asked to determine whether there were actions occurring in occupied areas that may threaten the PCEs, such that there would be any methods or procedures useful in protecting the PCEs. CHART members drew upon their first-hand knowledge of the areas and the physical or biological features as well as their experience in section 7 consultations. The CHART identified and documented such activities for each area (see Table 1).

### 2.4.3 CHART Phase 3

In Phase 3, the CHART met to discuss the information generated in Phase 2, along with additional considerations and related assessments, to assign a high, medium, or low conservation value[2] to each watershed/area (the conservation value of a given HUC5 is the relative importance of the HUC5 to conservation of the ESU). Coho salmon in this ESU exhibit high genetic variability and form multiple, distinct population complexes (Weitkamp et al. 1995; Nickelson 2001, Lawson et al. 2007). Early in the CHART process, the team members resolved that the process should rate watersheds in the context of their surrounding landscape. The team felt that achieving conservation would require identifying critical habitat throughout the range of coho habitat use and worked to ensure the process did not focus exclusively on the most productive areas of the ESU to the detriment of potentially important habitat elsewhere. In addition, estuaries, lakes, and other off-

[2] In the Advance Notice of Proposed Rulemaking (68 FR 55926, September 29, 2003) we describe the conservation value of a site as depending on "(1) the importance of the populations associated with a site to the ESU conservation, and (2) the contribution of that site to the conservation of the population either through demonstrated or potential productivity of the area."

channel habitats received special attention from team members, as these areas have special value as habitat for coho salmon (Swain and Holtby 1989; Independent Multidisciplinary Science Team 2002). Throughout the rating process, team members identified these areas for special consideration and agreed to consider these areas as highly valuable to the ESU, where appropriate.

The additional considerations weighed by the CHART included the relationship of each HUC5 to other HUC5s in the ESU and the significance to the ESU of the population occupying each HUC5. As an example of the first additional consideration, a HUC5 with lower DSS outputs might receive a medium rating if it is in close proximity to several other HUC5s with higher DSS outputs, while another HUC5 with similarly low DSS outputs might receive a high rating if it is one of only a few HUC5s supporting a population. The second consideration involves population characteristics and is relevant because some populations have a higher conservation value to the ESU than others. Thus a HUC5 that received a modest DSS output might nevertheless be rated high if it supports a unique or significant population within the ESU. As an example of applying both the first and second considerations, connectivity of habitats is an important consideration for anadromous salmonids, which require access to the ocean as well as to a network of connected spawning habitats. In such cases a HUC5 might have medium-value tributary habitat but contain a high-value rearing and migration corridor because it is a rearing and migration corridor for fish from a high-valued spawning area. To accommodate this situation, we assigned separate conservation ratings where a HUC5 contains both tributary habitat and a migration corridor. We gave the migration corridor the same rating as the highest-rated HUC5 for which it serves as a migration corridor (see Figure 1).[3]

Essentially, the DSS scores provided important information about the value of each HUC5 in isolation, while the additional considerations allowed the CHART to evaluate the relative contribution of each HUC5 and come up with an overall rating. Other relevant assessments that, along with the DSS outputs, factored into the CHART's final watershed ratings included: (1) Tier 1 key watersheds identified in the Northwest Forest Plan (FEMAT, 1993); (2) coho core spawning reaches identified by the ODFW (ODFW, 2007) as part of the Coastal Salmon Restoration Initiative (now called "The Oregon Plan for Salmon and Watersheds"); (3) Aquatic Diversity Area designations of the American Fisheries Society (ORAFS, 1995.).

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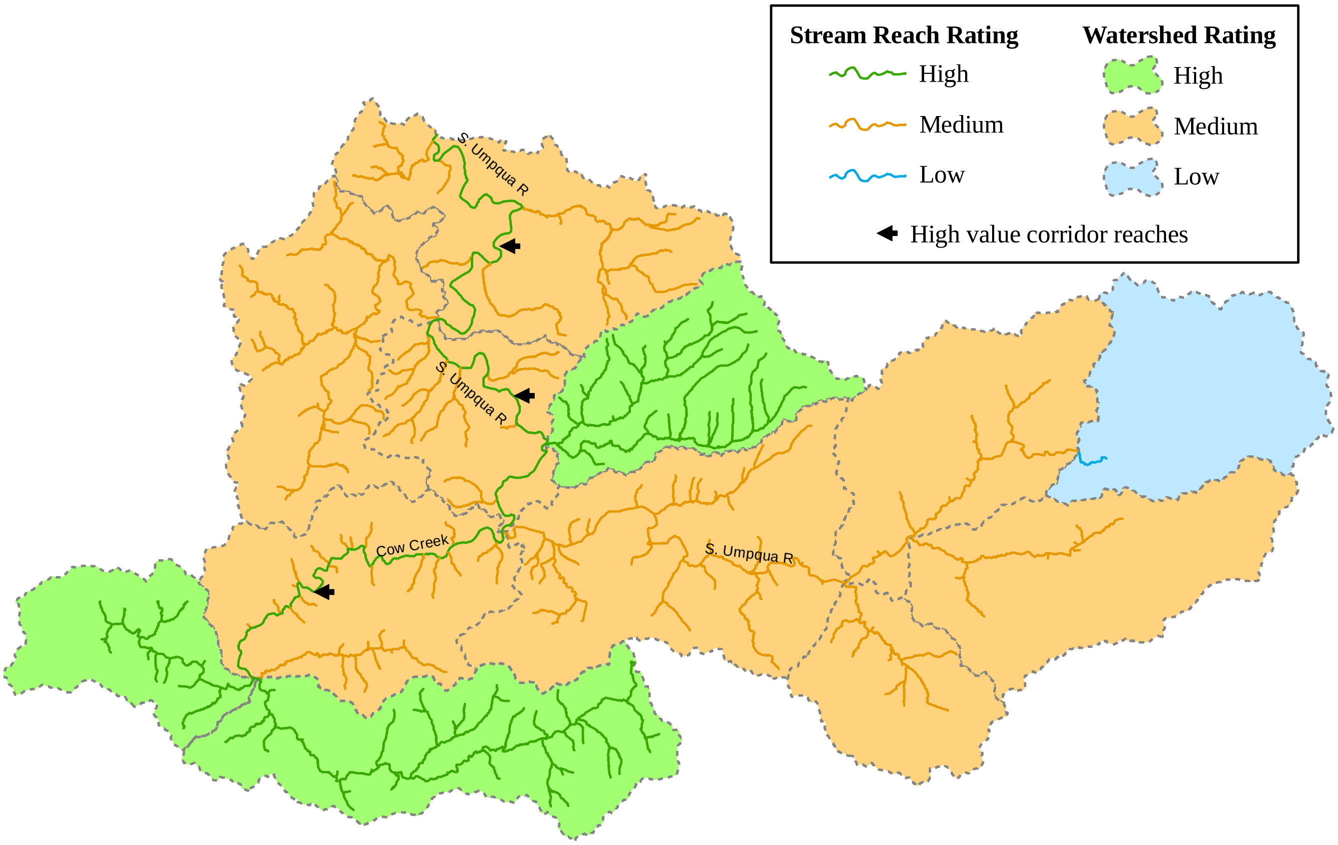
[3] The various west coast salmon and steelhead CHARTs discussed this concept at length and were unanimous in concluding that it was a logical conclusion for anadromous salmon and steelhead to assign a conservation value to a migration corridor based on the conservation value of the spawning areas to which it connects and the fish it serves. Moreover, it helped resolve a recurring issue for this and other ESUs with HUC5s having relatively low or limited value tributary spawning habitats but which had primary importance as a rearing/migration corridor for fish/habitats upstream. In this case, the HUC5 could be assigned a lower overall conservation value, but still contain a rearing/migration corridor with a higher conservation value.

**Figure 1. Rating connectivity corridors**. This example from the South Umpqua subbasin shows how rearing/migration corridors accrue the rating of the highest value watershed situated upstream.




Based on the CHART's overall assessment, high-value watersheds/areas were those deemed to have a high likelihood of promoting ESU conservation, while low-value watersheds/areas were expected to contribute relatively less to conservation. The DSS proved to be a useful tool for informing the rating of conservation value; in general, those watersheds and areas that received the highest DSS outputs also were deemed to have a high conservation value for the ESU, while the opposite was true for watersheds with the lowest DSS outputs.

The final step in Phase 3 involved asking the CHART to consider whether excluding from critical habitat designation particular areas with certain economic impacts (NMFS, 2007a) would significantly impede conservation. The CHART considered these areas both alone or in combination with other eligible areas. In making this determination, the CHART considered such factors as the role the particular area plays in the conservation of the population(s), the uniqueness or importance to the population(s), any recovery planning emphasis on the area, and similar considerations.

### 2.4.4 CHART Phase 4

In the fourth and final phase, the CHART re-convened in the Fall of 2007 to review comments received on the agency's proposed rule (69 FR 74572, December 14, 2004) as well as any new information they had identified that would assist in making final conclusions about areas under consideration as critical habitat. Comments reviewed included those submitted by the public as well as those solicited from peer reviewers with expertise regarding West Coast salmon and their habitats. The CHART evaluated this new information and then made necessary adjustments in their final conclusions for each ESU (see Table 4). The general types of changes made include: (1) adding or removing specific areas due to new information regarding species and PCE distribution; (2) revising the types of actions occurring in occupied areas that may threaten the PCEs; and (3) revising the conservation values of several watersheds.

During this phase the CHART was also asked to determine how well their conservation value ratings corresponded to the benefit of designation (i.e., as it pertains to the ESA's balancing of designation/exclusion benefits in section 4(b)(2)). We recognized that the "benefit of designation" needed to take into account not only the CHART's conservation ratings but also the likelihood of a section 7 consultation occurring in that area and the degree to which a consultation would yield conservation benefits for the species. To address this concern, we developed a profile for a watershed that would have "low leverage" in the context of section 7. The "low leverage" profile included watersheds with: less than 25 percent of the land area in federal ownership, no hydropower dams, and no consultations likely to occur on instream work (see Table 3). We chose these attributes because federal lands, dams and instream work all have a high likelihood of consultation and activities undergoing consultation have a potential to significantly affect the physical and biological features of salmon and steelhead habitat.

We then asked the CHART members to confirm whether they would conclude that the watersheds matching this profile did in fact have low leverage. To make this determination the CHART relied on the agency's recent consultation history (e.g., using data from the NOAA Fisheries Public Consultation Tracking System), detailed topographic maps and GIS data for each watershed, as well as their own knowledge of actions taking place in the watershed that may warrant ESA section 7 consultation. If the CHART affirmed that a watershed was likely to be "low leverage" we would have diminished the watershed's benefit of designation[4] for the purposes of conducting the ESA 4(b)(2) analysis.

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[4] The benefit of designation was diminished somewhat but not completely, since the educational benefits of designation would still be more important the higher the conservation value of an area, and since we cannot predict with complete accuracy all of the section 7 consultations that are likely to occur in a particular area.

As a final step, we also asked the CHART to determine if any low value watersheds not previously considered for exclusion might warrant exclusion due to low leverage.  In such “low-value/low-leverage” cases we further reduced the economic threshold in the agency’s ESA 4(b)(2) process to better address the few cases where the benefits of designation were clearly minimal (NMFS, 2005b).

As described in Table 3, none of the candidate watersheds for low leverage were determined to actually be low leverage, in particular due to the substantial number type of past (and potential) consultations in each watershed

**Figure 2. Proposed historical populations in the Oregon Coast coho salmon ESU** (from Lawson et al. 2007)

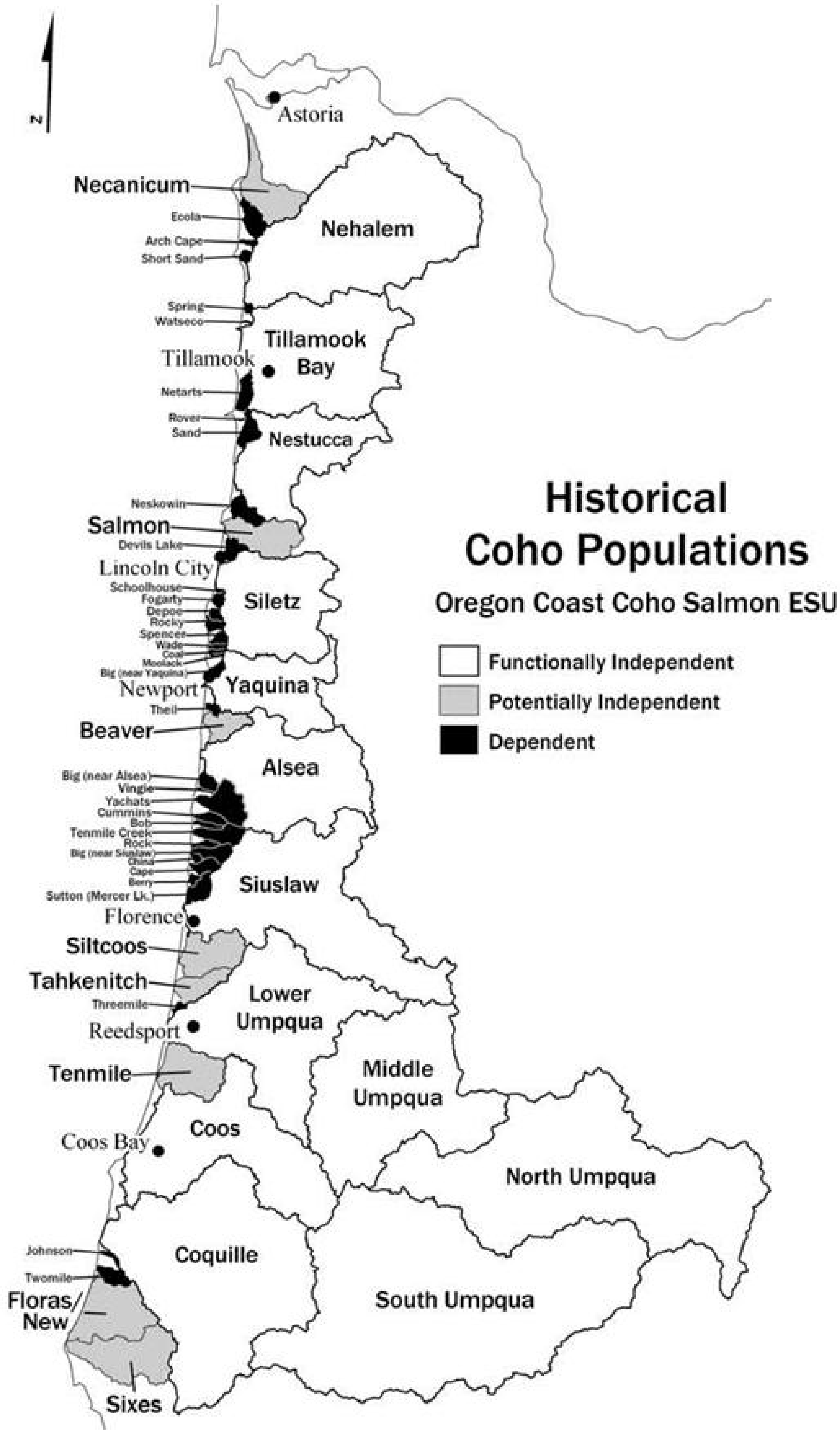


**Table 1. Summary of Occupied Areas, PCEs and Management Activities Affecting Them, and CHART Ratings of Conservation Value for Watersheds Occupied by Oregon Coast Coho Salmon**

| Subbasin | Watershed | HUC5 Code | Spawning/ Rearing PCEs (mi) | Rearing/ Migration PCEs (mi) | Presence/ Migration Only PCEs (mi)* | Key Management Activities** and Issues | CHART Rating of HUC5 Conservation Value | CHART Rating of Corridor Conservation Value* |
|---|---|---|---|---|---|---|---|---|
| NECANICUM | Necanicum River | 1710020101 | 60.6 | 26.3 | | F, G, U - Loss of large woody debris (LWD) and forested land cover, impaired riparian vegetation, loss of habitat access (due to inadequate culverts), diking and floodplain removal, draining and filling of estuarine wetlands, low instream flows associated with municipal water withdrawals, sedimentation (mostly due to landslides associated with roadbuilding and forestry), and urban-related pollution. (Snyder *et al.* 2002) | Medium | |
| NEHALEM | Upper Nehalem River | 1710020201 | 155.0 | 41.7 | | F, U - Loss of LWD and forest land cover, sedimentation (mostly related to forestry), impaired riparian vegetation, and elevated stream temperatures. (Johnson and Maser 1999) | High | |
| NEHALEM | Middle Nehalem River | 1710020202 | 124.0 | 38.0 | | F, G - Loss of LWD and forest land cover, sedimentation (mostly related to forestry and roadbuilding), impaired riparian vegetation, and elevated stream temperatures. (Johnson and Maser 1999) | High | High |
| NEHALEM | Lower Nehalem River | 1710020203 | 103.7 | 38.1 | 0.4 | A, F - Loss of LWD and forest land cover, sedimentation (related to forestry and roadbuilding), stream channel modification (mostly for erosion control), and elevated stream temperatures. (Johnson and Maser 1999) | High | High |
| NEHALEM | Salmonberry River | 1710020204 | 4.8 | 11.0 | | F - Sedimentation (related to forestry and roadbuilding) and loss of LWD and forest land cover. (Johnson and Maser 1999) | Low | |
| NEHALEM | North Fork Of Nehalem River | 1710020205 | 53.7 | 25.9 | | A, F - Loss of LWD and forest land cover, impaired riparian vegetation, stream channel modification (mostly related to erosion control), ongoing water withdrawals (for municipal water supplies), and elevated stream temperatures (Johnson and Maser 1999) | High | |
| NEHALEM | Lower Nehalem River/Cook Creek | 1710020206 | 45.0 | 31.5 | 4.2 | A, F, U - Loss of LWD and forest land cover, impaired riparian vegetation (related to urbanization and agriculture), and sedimentation (related to forestry and roadbuilding) (Johnson and Maser 1999) | High | High |

| Subbasin | Watershed | HUC5 Code | Spawning/ Rearing PCEs (mi) | Rearing/ Migration PCEs (mi) | Presence/ Migration Only PCEs (mi)* | Key Management Activities** and Issues | CHART Rating of HUC5 Conservation Value | CHART Rating of Corridor Conservation Value* |
|---|---|---|---|---|---|---|---|---|
| WILSON/ TRASK/ NESTUCCA | Little Nestucca River | 1710020301 | 28.7 | 9.5 | | A, F, U - Loss of LWD and forested land cover, sedimentation (mostly due to landslides associated with roadbuilding), and altered nutrient cycling related to changes to riparian areas (USDA Forest Service 1998a) | Medium | |
| WILSON/ TRASK/ NESTUCCA | Nestucca River | 1710020302 | 130.5 | 42.1 | 3.2 | A, F - Loss of LWD and forested land cover, sedimentation (mostly due to landslides associated with roadbuilding and forestry), lowland channel entrenchment mostly associated with agriculture), and elevated stream temperatures (due to riparian vegetation removal for forestry, roadbuilding, and agriculture) (USDA Forest Service 1994a; Barczak 1998) | High | |
| WILSON/ TRASK/ NESTUCCA | Tillamook River | 1710020303 | 34.6 | 21.6 | | F, G - Loss of LWD and forest land cover, elevated stream temperatures, sedimentation (related to forestry, roadbuilding, and grazing), agriculture-related pollution, floodplain diking and removal, wetland draining and filling, and modification or removal of estuarine habitat (Strittholt and Frost 1995; Tillamook Bay National Estuary Project 1998; Tillamook Bay National Estuary Project 1999) | High | |
| WILSON/ TRASK/ NESTUCCA | Trask River | 1710020304 | 75.1 | 42.0 | | A, F, G, U - Loss of LWD and riparian vegetation, sedimentation (mostly due to erosion related to roadbuilding), stream flow modification (mostly due to forestry), agriculture- and urban-related pollution, diking and removal of floodplains, and low instream flows associated with municipal and agricultural water withdrawals (Follansbee *et al.* 1998a; Tillamook Bay National Estuary Project 1998; Hawksworth *et al.* 2003) | High | |
| WILSON/ TRASK/ NESTUCCA | Wilson River | 1710020305 | 70.3 | 36.5 | | F, G, U - Wetland draining, diking, and filling (related to grazing and urban development), loss of LWD and forest land cover, elevated stream temperatures, and fish passage barriers (mainly inadequate culverts and tidegates) (Tillamook Bay National Estuary Project 1998; Tillamook Bay National Estuary Project 1999; Sullivan *et al.* 2001) | High | |

| Subbasin | Watershed | HUC5 Code | Spawning/ Rearing PCEs (mi) | Rearing/ Migration PCEs (mi) | Presence/ Migration Only PCEs (mi)* | Key Management Activities** and Issues | CHART Rating of HUC5 Conservation Value | CHART Rating of Corridor Conservation Value* |
|---|---|---|---|---|---|---|---|---|
| WILSON/ TRASK/ NESTUCCA | Kilchis River | 1710020306 | 29.5 | 13.5 | | F, G - Loss of LWD and forest land cover, impaired riparian vegetation (due to forestry and grazing), sedimentation (mostly due to landslides related to forestry and roadbuilding), wetland diking, draining, and filling, stream channelization and entrenchment, and altered steam substrate composition (Follansbee *et al.* 1998b; Tillamook Bay National Estuary Project 1998; Tillamook Bay National Estuary Project 1999) | High | |
| WILSON/ TRASK/ NESTUCCA | Miami River | 1710020307 | 19.6 | 6.3 | | A, F, G, U - Loss of LWD and forest land cover, impaired riparian vegetation (due to grazing, agriculture, and development), filling, diking, and draining of wetlands, fish passage barriers (mostly due to inadequate culverts), and stream channelization and entrenchment (Tillamook Bay National Estuary Project 1998; Tillamook Bay National Estuary Project 1999; Snyder *et al.* 2001) | High | |
| WILSON/ TRASK/ NESTUCCA | Tillamook Bay | 1710020308 | 4.4 | 21.8 | | A, F, G, R, U - Wetland diking, filling, and draining (related to grazing and agriculture), sedimentation (related to forestry, grazing, agriculture, and urbanization), estuary dredging (to support ocean traffic), loss of LWD and forest land cover, and stream channelization (Tillamook Bay National Estuary Project 1998; Tillamook Bay National Estuary Project 1999) | High | High |
| WILSON/ TRASK/ NESTUCCA | Spring Creek/Sand Lake/Neskowin Creek Frontal | 1710020309 | 32.2 | 12.2 | | A, F - Loss of LWD and forested land cover, clearing of riparian areas for agricultural and residential use, and sedimentation (mostly due to landslides associated with roadbuilding) (Barczak 1998; SRI/SHAPIRO/AGCO 1998; Boateng & Associates *et al.* 1999; Follansbee *et al.* 1999) | Medium | |
| SILETZ/ YAQUINA | Upper Yaquina River | 1710020401 | 60.5 | 24.5 | | A, F, G, U - Loss of LWD and forested land cover, diking and draining of wetlands (mostly for urban development, agriculture, and grazing), loss of riparian structure, floodplain removal, and sedimentation (Jones and Moore 2000) | High | |
| SILETZ/ YAQUINA | Big Elk Creek | 1710020402 | 59.6 | 24.7 | | F, G - Loss of LWD and forest land cover, impaired riparian vegetation (related to grazing and forestry), elevated stream temperatures, floodplain removal, and sedimentation (mostly due to landslides related to forestry and erosion related to forestry and grazing) (USDA Forest Service 1995a; Jones and Moore 2000) | Medium | |

| Subbasin | Watershed | HUC5 Code | Spawning/ Rearing PCEs (mi) | Rearing/ Migration PCEs (mi) | Presence/ Migration Only PCEs (mi)* | Key Management Activities** and Issues | CHART Rating of HUC5 Conservation Value | CHART Rating of Corridor Conservation Value* |
|---|---|---|---|---|---|---|---|---|
| SILETZ/ YAQUINA | Lower Yaquina River | 1710020403 | 34.6 | 57.6 | | A, F, G, R, U - Loss of LWD and forested land cover, dredging and urbanization of lower estuary, and diking and draining of wetlands (mostly for urban development, agriculture, and grazing) (Brophy 1999; Jones and Moore 2000; Garono and Brophy 2001) | High | High |
| SILETZ/ YAQUINA | Middle Siletz River | 1710020405 | 31.9 | 15.9 | | F, G - Sedimentation (mostly due to landslides related to forestry and roadbuilding), modified hydrology (increased peak flows related to forestry and roadbuilding), loss of LWD and forest land cover, and impaired riparian areas (Garono and Brophy 2001) | Medium | |
| SILETZ/ YAQUINA | Rock Creek/Siletz River | 1710020406 | 26.0 | 5.3 | | F, G, S - Loss of LWD and forest land cover, sedimentation (from landslides related to quarries as well as roadbuilding- and grazing-related erosion), and channel entrenchment (possibly related to changes in hydrology related to forestry) (Garono and Brophy 1999) | Medium | |
| SILETZ/ YAQUINA | Lower Siletz River | 1710020407 | 107.5 | 69.1 | | F, G, U - Sedimentation (mostly due to landslides related to forestry and roadbuilding), modified hydrology (increased peak flows related to forestry and roadbuilding), loss of LWD and forest land cover, and impaired riparian areas (USDA Forest Service and USDI 1996; Garono and Brophy 2001) | High | High |
| SILETZ/ YAQUINA | Salmon River/Siletz/ Yaquina Bay | 1710020408 | 47.6 | 8.7 | | A, F - Loss of LWD and forest land cover, impaired riparian function, and sedimentation (mostly due to runoff from roads and landslides associated with forestry and roadbuilding) (Boateng & Associates *et al.* 1999) | Medium | |
| SILETZ/ YAQUINA | Devils Lake/Moolack Frontal | 1710020409 | 28.5 | 10.4 | | F, G, U - Sedimentation (mostly due to landslides related to forestry and roadbuilding), modified hydrology (increased peak flows related to forestry and roadbuilding), loss of LWD and forest land cover, impaired riparian areas, urbanization- and forestry related pollution, loss of habitat access due to inadequate culverts and dams, and channel entrenchment (DEQ 2003d; DEQ 2003c; DEQ 2003b; DEQ 2003a; Trask and Higley 2003) | Medium | |
| ALSEA | Upper Alsea River | 1710020501 | 45.7 | 12.7 | | F, S - Loss of LWD and forest cover, degraded riparian vegetation, sedimentation (mostly related to roadbuilding, also related to quarries), and altered hydrology (changes to peak flows related to roadbuilding and forestry) (USDI 1995d; USDI 1995f) | Medium | |

| Subbasin | Watershed | HUC5 Code | Spawning/ Rearing PCEs (mi) | Rearing/ Migration PCEs (mi) | Presence/ Migration Only PCEs (mi)* | Key Management Activities** and Issues | CHART Rating of HUC5 Conservation Value | CHART Rating of Corridor Conservation Value* |
|---|---|---|---|---|---|---|---|---|
| ALSEA | Five Rivers/Lobster Creek | 1710020502 | 101.3 | 22.3 | | F, S - Sedimentation (mostly due to landslides related to forestry and roadbuilding), loss of LWD and forest cover, impaired fish passage (due to inadequate road crossings), and elevated stream temperatures (related to loss of riparian vegetation) (USDI and USDA Forest Service 1997) | High | |
| ALSEA | Drift Creek | 1710020503 | 47.2 | 16.9 | | F, S - Sedimentation (mostly due to landslides related to forestry and roadbuilding), loss of LWD and forest cover, and disturbance of riparian areas (USDA Forest Service and USDI 1997a) | High | |
| ALSEA | Lower Alsea River | 1710020504 | 85.1 | 51.9 | | A, F, G, U - Loss of LWD and forest land cover, over-allocation of surface water (for irrigation and municipal uses), diking and filling of estuarine wetlands, loss of appropriate channel substrates (associated with modified hydrology related to roadbuilding and forestry), and impaired riparian vegetation (mostly due to modification associated with roadbuilding, forestry, agriculture/grazing, and residential development) (USDA Forest Service *et\ al.* 1999) | High | High |
| ALSEA | Beaver Creek/Waldport Bay | 1710020505 | 25.4 | 16.9 | | A, F, U - Loss of LWD and forest land cover, stream channelization and entrenchment (generally due to agricultural use), impaired riparian vegetation, draining and degradation of wetlands, and modified estuary function (related to urbanization) (USDA Forest Service 2001a) | High | |
| ALSEA | Yachats River | 1710020506 | 43.5 | 3.7 | | F, G, U - Loss of LWD, degraded riparian vegetation (related to forestry, roadbuilding, grazing, and residential development), over-allocated water use rights, and stream channelization and entrenchment (related to grazing and development) (USDA Forest Service 1997c) | Medium | |
| ALSEA | Cummins Creek/ Tenmile Creek/Mercer Lake Frontal | 1710020507 | 64.4 | 12.3 | | F - Loss of LWD, sedimentation (related to forestry and roadbuilding), loss of habitat access due to inadequate culverts, and degraded riparian areas (USDA Forest Service 1995b; Andrus *et al.* 1996) | Medium | |
| ALSEA | Big Creek/Vingie Creek | 1710020508 | 7.7 | 1.5 | | F - Loss of LWD, degraded riparian vegetation (related to forestry and roadbuilding), and loss of habitat access due to inadequate culverts (USDA Forest Service 1997c) | Low | |

| Subbasin | Watershed | HUC5 Code | Spawning/ Rearing PCEs (mi) | Rearing/ Migration PCEs (mi) | Presence/ Migration Only PCEs (mi)* | Key Management Activities** and Issues | CHART Rating of HUC5 Conservation Value | CHART Rating of Corridor Conservation Value* |
|---|---|---|---|---|---|---|---|---|
| SIUSLAW | Upper Siuslaw River | 1710020601 | 123.8 | 78.4 | 1.6 | A, F - Loss of LWD and forest cover, elevated stream temperature, impaired riparian vegetation, and sedimentation (mostly due to landslides related to forestry and roadbuilding, also due to agriculture) (USDI 1995e; Ecotrust and Siuslaw Watershed Council 2002) | High | High |
| SIUSLAW | Wolf Creek | 1710020602 | 40.1 | 17.0 | 0.5 | F - Loss of LWD and forest cover and sedimentation (mostly due to landslides related to forestry and roadbuilding) (USDI 1995e; Ecotrust and Siuslaw Watershed Council 2002) | Medium | |
| SIUSLAW | Wildcat Creek | 1710020603 | 47.6 | 4.8 | | F - Loss of LWD and forest cover and sedimentation (mostly due to landslides related to forestry and roadbuilding) (USDI 1995e; Ecotrust and Siuslaw Watershed Council 2002) | Medium | |
| SIUSLAW | Lake Creek | 1710020604 | 67.4 | 30.3 | 2.1 | A, F, G - Loss of LWD and forest cove, impaired riparian vegetation (due to forestry, grazing and agriculture), fish passage barriers (due to inadequate road crossings), and sedimentation (mostly due to landslides related to forestry) (USDI 1995e; USDI 1995b; Ecotrust and Siuslaw Watershed Council 2002) | High | High |
| SIUSLAW | Deadwood Creek | 1710020605 | 65.4 | | | F, G - Loss of LWD and forest cover, impaired riparian vegetation (due to forestry and grazing), elevated stream temperatures, and sedimentation (mostly due to landslides related to forestry and roadbuilding) (USDI 1995e; USDA Forest Service 1996; Ecotrust and Siuslaw Watershed Council 2002) | High | |
| SIUSLAW | Indian Creek/Lake Creek | 1710020606 | 59.5 | | | A, F - Loss of LWD and forest cover, impaired riparian vegetation (due to forestry and agriculture), elevated stream temperatures, and sedimentation (mostly due to landslides related to forestry and roadbuilding) (USDI 1995e; USDA Forest Service 1996; Ecotrust and Siuslaw Watershed Council 2002) | High | |
| SIUSLAW | North Fork Siuslaw River | 1710020607 | 61.8 | 26.4 | | F, G, U - Loss of LWD and forest cover (related to forestry and land clearing for grazing and homebuilding), loss of spawning substrate (related to modified hydrology, possibly related to forestry), channel entrenchment (related to grazing activities), altered riparian vegetation, and sedimentation (mostly due to landslides related to forestry and roadbuilding) (USDA Forest Service 1994b; USDI 1995e; Ecotrust and Siuslaw Watershed Council 2002) | High | |
| SIUSLAW | Lower Siuslaw River | 1710020608 | 78.2 | 69.2 | | F, G, U - Diking and levee construction on estuarine wetlands, restricted estuarine water and fish movement (due to tide gates), sedimentation (mostly due to landslides related to forestry and roadbuilding), impaired riparian vegetation (related to forestry and grazing), and loss of LWD and forest land cover (USDI 1995e; USDA Forest Service 1998b; Ecotrust and Siuslaw Watershed Council 2002) | High | High |

| Subbasin | Watershed | HUC5 Code | Spawning/ Rearing PCEs (mi) | Rearing/ Migration PCEs (mi) | Presence/ Migration Only PCEs (mi)* | Key Management Activities** and Issues | CHART Rating of HUC5 Conservation Value | CHART Rating of Corridor Conservation Value* |
|---|---|---|---|---|---|---|---|---|
| SILTCOOS | Waohink River/ Siltcoos River/ Tahkenitch Lake Frontal | 1710020701 | 50.6 | 87.0 | | F, G, U - Channelization, diking, and entrenchment of stream channels (mostly related to grazing), impaired riparian vegetation (due to grazing, forestry, and urbanization), sedimentation (due to forestry- and roadbuilding-related landslides and grazing-related erosion), modification of lake water levels and stream flows (related to urbanization and industrial water use), and impaired water quality (mostly due to algal blooms and pollution related to urbanization) (USDA Forest Service 1999a) | High | |
| NORTH UMPQUA | Boulder Creek | 1710030106 | 0.9 | | | F - Loss of LWD and forested land cover, sedimentation (mostly related to roadbuilding and landslides), increased peak flows associated with forestry, and loss of habitat access due to inadequate culverts (Stillwater Sciences Inc. 1998; USDA Forest Service 2001b; USDI 2001a) | Low | |
| NORTH UMPQUA | Middle North Umpqua | 1710030107 | 39.7 | | | F, H - Loss of LWD and forested land cover, removal of riparian vegetation, sedimentation (mostly due to landslides related to roadbuilding and forestry), and increased peak stream flows and stream temperatures (Stillwater Sciences Inc. 1998; USDA Forest Service 1999b; USDA Forest Service 2000) | Medium | Medium |
| NORTH UMPQUA | Steamboat Creek | 1710030108 | 0.7 | | | F - Loss of LWD and forested land cover, removal of riparian vegetation, sedimentation (mostly due to landslides related to roadbuilding and forestry), and increased peak stream flows and stream temperatures (Stillwater Sciences Inc. 1998; USDA Forest Service 1999b; USDA Forest Service 2000) | Low | |
| NORTH UMPQUA | Canton Creek | 1710030109 | 1.3 | | | F - Loss of LWD and forested land cover, removal of riparian vegetation, sedimentation (mostly due to landslides related to roadbuilding and forestry), and increased peak stream flows and stream temperatures (Stillwater Sciences Inc. 1998; USDA Forest Service 1999b; USDA Forest Service 2000) | Low | |
| NORTH UMPQUA | Rock Creek/North Umpqua River | 1710030110 | 21.8 | 1.5 | | F - Loss of LWD and forested land cover, sedimentation (associated with roadbuilding and forestry-related landslides), loss of habitat access due to inadequate culverts, and stream flow modification related to roadbuilding (USDI 1996e; Stillwater Sciences Inc. 1998) | Medium | |

| Subbasin | Watershed | HUC5 Code | Spawning/ Rearing PCEs (mi) | Rearing/ Migration PCEs (mi) | Presence/ Migration Only PCEs (mi)* | Key Management Activities** and Issues | CHART Rating of HUC5 Conservation Value | CHART Rating of Corridor Conservation Value* |
|---|---|---|---|---|---|---|---|---|
| NORTH UMPQUA | Little River | 1710030111 | 35.0 | 7.1 | | F - Loss of LWD and forested land cover, sedimentation (due to accelerated erosion due to forestry and roadbuilding), impaired riparian vegetation, elevated stream temperatures, and elevated peak flows (USDA Forest Service and USDI 1995) | Medium | |
| NORTH UMPQUA | Lower North Umpqua River | 1710030112 | 33.9 | 35.1 | | A, F, G, U - Loss of LWD and forested land cover, impaired riparian vegetation, loss of habitat access due to dams and inadequate culverts, stream channelization and riprapping, wetland draining and filling (for agriculture, grazing, and urbanization), sedimentation, and pollution associated with agriculture/grazing and urbanization (Geyer 2003b) | High | High |
| SOUTH UMPQUA | Upper South Umpqua River | 1710030201 | 2.3 | 0.0 | | F - Loss of LWD, sedimentation, and changes to stream channel morphology and hydrology (Dose and Roper 1994; USDA Forest Service 1995c) | Low | |
| SOUTH UMPQUA | Jackson Creek | 1710030202 | 9.6 | 11.4 | | F, G - Loss of LWD and forested land cover, sedimentation, floodplain removal (due to roadbuilding), stream channelization and riprapping, elevated peak flows and stream temperatures, impaired riparian vegetation (related to grazing and forestry), and loss of habitat access due to inadequate culverts (USDA Forest Service 1995c; Geyer 2003g) | Medium | |
| SOUTH UMPQUA | Middle South Umpqua River | 1710030203 | 13.0 | 19.7 | | F - Sedimentation (related to erosion due to forestry), forestry-related pollution (associated with fertilizer or pesticide use), loss of habitat access (due to inadequate culverts), impaired riparian vegetation, and elevated stream temperature, and loss of LWD (DEQ 2003f; Geyer 2003g) | Medium | Medium |
| SOUTH UMPQUA | Elk Creek/South Umpqua | 1710030204 | 24.1 | | | F, G - Loss of habitat access (due to inadequate culverts), impaired riparian vegetation, and elevated stream temperature (DEQ 2003e; Geyer 2003g) | Medium | |
| SOUTH UMPQUA | South Umpqua River | 1710030205 | 64.7 | 28.2 | | A, F, G, I, M - Loss of LWD and forest land cover, sedimentation (related to forestry, roadbuilding, and mining), impaired riparian vegetation (related to forestry, roadbuilding, agriculture, and grazing), wetland diking and damming, loss of habitat access due to inadequate culverts, Walker Dam, and Oshea Creek Dam, mining-related pollution, and low instream flows associated with irrigation withdrawals (USDI 1995a; USDI 1996c; USDI 1998a; Geyer 2003f) | Medium | Medium |

| Subbasin | Watershed | HUC5 Code | Spawning/ Rearing PCEs (mi) | Rearing/ Migration PCEs (mi) | Presence/ Migration Only PCEs (mi)* | Key Management Activities** and Issues | CHART Rating of HUC5 Conservation Value | CHART Rating of Corridor Conservation Value* |
|---|---|---|---|---|---|---|---|---|
| SOUTH UMPQUA | Middle Cow Creek | 1710030207 | 66.1 | 24.7 | 2.6 | A, F, U - Loss of LWD and forest land cover, elevated stream temperatures related to removal of riparian vegetation (due to forestry and agriculture), sedimentation (mostly due to roadbuilding and forestry), wetland diking, draining, and filling (to support agriculture and urbanization), and fish passage barriers (mostly due to improper culverts) (USDI 1997b; USDI 1999b; Kincaid and Umpqua Basin Watershed Council 2002) | High | |
| SOUTH UMPQUA | West Fork Cow Creek | 1710030208 | 31.3 | | | F - Loss of LWD and forest land cover, increased stream temperature related to impaired riparian vegetation, and sedimentation (related to forestry and roadbuilding) (USDI 1997f; Geyer 2003h) | High | |
| SOUTH UMPQUA | Lower Cow Creek | 1710030209 | 46.1 | 0.3 | 26.6 | F, G - Loss of LWD and forested land cover, sedimentation (related to roadbuilding and forestry), elevated stream temperatures, loss of habitat access due to inadequate culverts, and increased peak flows (USDI 1997b) | Medium | High |
| SOUTH UMPQUA | Middle South Umpqua River | 1710030210 | 42.4 | 0.0 | 21.8 | A, F, G, S - Loss of LWD and forested land cover, impaired riparian vegetation (associated with forestry, agriculture, and grazing), loss of habitat access due to inadequate culverts, stream channel modification and sedimentation related to gravel mining and agriculture, stream channel downcutting due to grazing, and wetland diking, draining, and filling (USDI 1997b; USDI 1999c; Geyer 2003d) | Medium | High |
| SOUTH UMPQUA | Myrtle Creek | 1710030211 | 87.5 | 1.8 | | A, F, G, I, U - Loss of LWD and forested land cover, wetland filling, diking, and draining, loss of habitat access due to inadequate culverts and irrigation dams, channelization and riprapping, sedimentation (related to roadbuilding and forestry), urban-related pollution, and low instream flows associated with irrigation and municipal use withdrawals (USDI 1997d; Geyer 2003e) | High | |
| SOUTH UMPQUA | Ollala Creek/Lookin gglass | 1710030212 | 55.2 | 21.6 | | F, G, I - Loss of LWD and forested land cover, sedimentation associated with forestry and roadbuilding, low instream flows associated with irrigation withdrawals, channel substrate erosion (due to increased peak flows associated with forestry and roadbuilding), stream channel entrenchment (mostly associated with grazing), loss of habitat access due to Berry Creek Dam, inadequate culverts, and irrigation dams, and impaired riparian vegetation (USDI 1998b; DeVore *et al.* 2003) | Medium | |

| Subbasin | Watershed | HUC5 Code | Spawning/ Rearing PCEs (mi) | Rearing/ Migration PCEs (mi) | Presence/ Migration Only PCEs (mi)* | Key Management Activities** and Issues | CHART Rating of HUC5 Conservation Value | CHART Rating of Corridor Conservation Value* |
|---|---|---|---|---|---|---|---|---|
| SOUTH UMPQUA | Lower South Umpqua River | 1710030213 | 60.5 | 1.7 | 24.9 | A, F, G, U - Loss of LWD and forested land cover, sedimentation associated with forestry and roadbuilding, low instream flows associated with irrigation withdrawals, channel substrate erosion (due to increased peak flows associated with forestry, urbanization, and roadbuilding), stream channel entrenchment (mostly associated with grazing), loss of habitat access due to inadequate culverts and irrigation dams, impaired riparian vegetation, riprapping and channelization, agriculture- and urban-related pollution, diking and floodplain removal, and wetland filling and draining (USDI 2000b; Geyer 2003c) | Medium | High |
| UMPQUA | Upper Umpqua River | 1710030301 | 108.2 | 0.0 | 57.4 | A, F, G - Loss of LWD and forest land cover, sedimentation (related to forestry and erosion from grazing and agriculture), stream channelization and entrenchment (due to grazing and agriculture), fish passage barriers (mostly due to improper culverts), and impaired riparian vegetation (USDI 1997e) | Medium | High |
| UMPQUA | Calapooya Creek | 1710030302 | 114.3 | 14.0 | 20.1 | F, G, I, M, U - Loss of LWD and forested land cover, sedimentation (related to landslides associated with pasture lands, forestry, and roadbuilding), low stream flows associated with irrigation and domestic withdrawals, loss of habitat access due to irrigation dams and inadequate culverts, wetland drain and filling, diking and removal of floodplains, and mining- and urbanization-related pollution (USDI 1999a; Geyer 2003a) | High | |
| UMPQUA | Elk Creek | 1710030303 | 170.5 | 4.3 | 26.0 | A, F, G, I - Loss of LWD and forested land cover, sedimentation (related to forestry and roadbuilding), low stream flows associated with water withdrawals, elevated stream temperatures associated with loss of riparian vegetation, increased peak flows associated with forestry, and loss of habitat access due to dams and inadequate culverts (USDI 1996a; USDI 1996d) | High | |
| UMPQUA | Middle Umpqua River | 1710030304 | 50.1 | 5.7 | 18.2 | F, G - Loss of LWD, elevated stream temperatures, stream channelization, degradation of riparian habitat, and sedimentation (potentially related to forestry, roadbuilding, and grazing) (USDI 1997e; NMFS 1998) | High | High |

| Subbasin | Watershed | HUC5 Code | Spawning/ Rearing PCEs (mi) | Rearing/ Migration PCEs (mi) | Presence/ Migration Only PCEs (mi)* | Key Management Activities** and Issues | CHART Rating of HUC5 Conservation Value | CHART Rating of Corridor Conservation Value* |
|---|---|---|---|---|---|---|---|---|
| UMPQUA | Lake Creek | 1710030305 | 17.1 | 6.9 | 1.8 | F - Sedimentation (due to landslides related to forestry and roadbuilding), impaired riparian vegetation, and loss of LWD and forested land cover (BioSystems *et al.* 2003) | Low | |
| UMPQUA | Upper Smith River | 1710030306 | 175.0 | 1.5 | | F - Loss of LWD and forested land cover, sedimentation (related to landslides due to roadbuilding and forestry), high stream temperatures (related to impaired riparian vegetation), and loss of habitat access due to inadequate culverts (USDI 1995c) | High | |
| UMPQUA | Lower Smith River | 1710030307 | 140.4 | 45.4 | 11.8 | A, F, R - Loss of LWD and forest land cover, sedimentation (mostly due to landslides related to forestry and roadbuilding), modified stream flow patterns, diking and filling of wetlands, and river/estuary channel dredging (USDA Forest Service and USDI 1997b) | High | High |
| UMPQUA | Lower Umpqua River | 1710030308 | 35.4 | 49.2 | | F, G, U - Loss of LWD and forest land cover, stream channelization and entrenchment (mostly associated with grazing), diking and filling of estuarine wetlands (related to grazing and urbanization), and sedimentation (related to landslides related to forestry and roadbuilding) (USDA Forest Service 1997a; BioSystems *et al.*2003) | High | High |
| COOS | South Fork Coos | 1710030401 | 83.5 | 33.7 | | A, F, G - Sedimentation (due to agricultural/grazing-related erosion and landslides related to forestry and roadbuilding), diking and draining of wetlands for agriculture/grazing, loss of LWD and forest land cover, and stream channelization and entrenchment (USDI 2001b) | High | |
| COOS | Millicoma River | 1710030402 | 78.3 | 20.3 | | F - Loss of LWD and forested land cover, sedimentation (related to roadbuilding), and elevated stream temperatures (BioSystems *et al.* 2003) | High | |
| COOS | Lakeside Frontal | 1710030403 | 38.1 | 41.7 | | F, G, U - Loss of LWD and forested land cover, Sedimentation (related to forestry, roadbuilding, and grazing), stream channelization (for grazing and homebuilding), wetland draining and filling, floodplain removal, pollution associated with urbanization, and loss of habitat access due to inadequate culverts and dams (BioSystems *et al.* 2003; Tenmile Lakes Basin Partnership 2003) | High | |
| COOS | Coos Bay | 1710030404 | 94.0 | 149.9 | 1.4 | F, U - Loss of LWD and forested land cover, sedimentation (related to roadbuilding), loss of habitat access due to inadequate culverts, pollution and increased peak flows due to urbanization, stream channelization, and wetland filling and draining (Satre Associates PC *et al.* 2001; BioSystems *et al.* 2003) | High | High |

| Subbasin | Watershed | HUC5 Code | Spawning/ Rearing PCEs (mi) | Rearing/ Migration PCEs (mi) | Presence/ Migration Only PCEs (mi)* | Key Management Activities** and Issues | CHART Rating of HUC5 Conservation Value | CHART Rating of Corridor Conservation Value* |
|---|---|---|---|---|---|---|---|---|
| COQUILLE | Lower South Fork Coquille | 1710030501 | 45.2 | 8.5 | | A, F, I, M - Loss of LWD and forest land cover, sedimentation (mostly due to landslides related to forestry and roadbuilding, but also to erosion and streambed disturbance from mining activities), and elevated stream temperatures (related to reduced riparian vegetation and water withdrawals related to agriculture) (USDA Forest Service 1995d; USDI 1996b) | Low | |
| COQUILLE | Middle Fork Coquille | 1710030502 | 65.6 | 16.1 | | A, F - Sedimentation (related to roadbuilding and forestry), loss of LWD and forest land cover, elevated stream temperatures, and impaired riparian vegetation (due to agriculture and forestry) (USDI 1997a; USDI 1999d) | Medium | |
| COQUILLE | Middle Main Coquille | 1710030503 | 40.6 | 36.3 | | A, F, G - Sedimentation (mostly related to forestry and roadbuilding), impaired riparian vegetation, draining of wetlands (for grazing and agriculture), loss of LWD and forest land cover, stream channelization and entrenchment, and fish passage barriers (mostly due to improper culverts) (USDI 1997c) | High | High |
| COQUILLE | East Fork Coquille | 1710030504 | 32.7 | 11.2 | | A, F, G, I - Sedimentation (mostly due to landslides related to forestry and roadbuilding), impaired riparian vegetation (related to forestry, agriculture, and grazing), loss of LWD and forest land cover, lowered summer stream flows (due to irrigation withdrawals), and channel downcutting (related to removal of riparian vegetation) (USDI 2000a) | High | |
| COQUILLE | North Fork Coquille | 1710030505 | 99.3 | 37.7 | | A, F, U - Sedimentation (mostly due to landslides related to forestry, also to roadbuilding), loss of LWD and forest land cover, modifications to stream flow volume and timing, water withdrawals (for the city of Myrtle Point), and elevated stream temperatures (USDI 2002) | High | High |
| COQUILLE | Lower Coquille | 1710030506 | 61.0 | 90.4 | | A, F - Loss of LWD and forested land cover, elevated stream temperatures, sedimentation (due to forestry and roadbuilding), loss of habitat access (due to inadequate culverts, tide gates, and dams), diking and draining wetlands, floodplain and riparian area removal, and destruction of estuarine habitat (Hampel 1999) | High | High |
| SIXES | Sixes River | 1710030603 | 32.9 | 25.5 | | A, F, G - Loss of LWD and forested land cover, sedimentation (related to landslides due to forestry and roadbuilding), loss of habitat access due to inadequate culverts, wetland filling and draining (mostly for agriculture and grazing), stream channelization, and high stream temperatures (USDA Forest Service 1997b; Maguire *et al.* 2001b) | Medium | |

| Subbasin | Watershed | HUC5 Code | Spawning/ Rearing PCEs (mi) | Rearing/ Migration PCEs (mi) | Presence/ Migration Only PCEs (mi)* | Key Management Activities** and Issues | CHART Rating of HUC5 Conservation Value | CHART Rating of Corridor Conservation Value* |
|---|---|---|---|---|---|---|---|---|
| SIXES | New River Frontal | 1710030604 | 60.5 | 30.0 | | A, F, G, I, S - Loss of LWD and forest land cover, sedimentation (related to forestry, roadbuilding, and rock mining), impaired riparian vegetation (due to forestry, grazing, and agriculture), stream channelization and entrenchment (due to grazing and agriculture), water withdrawals (mostly related to agriculture and irrigation), and wetland diking and draining (Maguire *et al.* 2001a) | High | |

* Some streams classified as "Presence/Migration Only PCEs" may also include rearing or spawning PCEs, but the GIS data are still undergoing review to confirm species use type.

** This list is not exhaustive. It is intended to highlight key management activities affecting PCEs in each watershed. Activities identified are based on the general categories described by Spence et al. (1996) and summarized previously in the "Special Management Considerations or Protection" section of this report. Coding is as follows: F= forestry, G = grazing, A = agriculture, C = channel modifications/diking, R = road building/maintenance, U = urbanization, S = sand and gravel mining, M = mineral mining, D = hydroelectric dams, I = irrigation impoundments and withdrawals, T = river, estuary, and ocean traffic, W = wetland loss/removal, B = beaver removal, X = exotic/invasive species introductions, H = forage fish/species harvest. Primary sources for this information were the CHART and reports cited in the References and Sources of Information.

**Table 2. CHART Conclusions Regarding ESA Section 7 Leverage**

The following table identifies those watersheds that met the following possible "low leverage" profile identified by NOAA Fisheries habitat biologists:

- less than 25 percent of the land area in federal ownership
- no hydropower dams, and
- no consultations likely to occur regarding instream work.

We chose these attributes because federal lands, dams and instream work all have a high likelihood of consultation, and activities undergoing consultation have a potential to significantly affect the physical and biological features of salmon and steelhead habitat. Where federal lands are involved any activity occurring there must undergo a section 7 consultation if it may affect the species or the designated critical habitat. Salmon and steelhead habitat can be significantly affected by many activities occurring on federal lands, including grazing, timber harvest, roadbuilding, and mining. Dams generally are either federally operated or federally permitted by the U.S. Army Corps of Engineers or by the Federal Energy Regulatory Commission, triggering section 7 consultation. Dam operation can significantly affect salmon and steelhead in many ways, including by impeding passage, inundating habitat and changing flow and temperature regimes. Instream work generally requires a permit from the Corps. Instream work can significantly affect salmon and steelhead habitat in a number of ways, including by reducing channel complexity, increasing flows, diminishing connectivity between the stream channel and floodplain, and increasing sediment. Other types of activities also impact salmon and steelhead habitat, but their potential leverage was not deemed as predictable as those used in the above low leverage profile.

In addition to watersheds matching this profile, the CHART also reviewed all watersheds identified as low conservation value, but not exceeding a $91,556 economic threshold, to determine if they were low leverage and should be considered for exclusion. The basis for the threshold used is described in the agency's 4(b)(2) report (NMFS, 2007a), and the data used to query these parameters were the same as those reported in NOAA Fisheries' final economic analysis (NMFS, 2007b). The table below also includes the CHART's assessment as to whether the watershed was in fact likely to be "low leverage," and if so, the CHART's conclusion as to whether excluding a "low leverage" watershed would significantly impede the conservation of the ESU.

Five HUC5 watersheds within the range of the Oregon Coast coho salmon ESU met the criteria for possible low leverage. However, after discussions with the CHART during its final meeting in the Fall of 2007 and a subsequent discussion with the NOAA Fisheries' consultation biologists, it was concluded that none of the watersheds would be considered low leverage, especially in light of the substantial number type of past (and potential) consultations related to transportation systems and maintenance in each watershed.

| Watershed Name | Watershed Code | Conservation Value Rating | | Likely to be Low Leverage ? | Would Exclusion Significantly Impede Conservation? | Comments |
|---|---|---|---|---|---|---|
| | | Benefit of designating watershed | Benefit of designating connectivity corridor | | | |
| Necanicum River | 1710020101 | Medium | | No | na | CHART concluded that consultations were likely to yield significant leverage in this HUC5, noting that the Public Consultation Tracking System (PCTS)* contains numerous ESA consultations or conferences here since 1997 associated with the following activities: Fill; Road Construction/Maintenance; Pipeline Construction/Repair; Pollutant Discharge; Rip-rap; Waste Management; Culvert; Fish Passage/Trapping; Right-of-Way; Bridge Repair/Construction; Pilings; Stormwater Drainage; Erosion Control; Bank Stabilization; & Excavation/Mining. The CHART underscored this by noting that leverage associated with road construction and maintenance is evidenced by the fact that the Necanicum River flows through the cities of Seaside and Gearhart, Highway 26 parallels and crosses nearly the entire length of the Necanicum River, and Highway 101 crosses over Necanicum tributaries as well as several occupied independent streams in this HUC5. |
| Salmonberry River** | 1710020204 | Low | | No | na | CHART concluded that consultations were likely to yield significant leverage in this HUC5, noting that the Lower Nehalem highway bridge is located at the mouth of the Salmonberry and the recent December 2007 floods caused extensive damage to it and the Port of Tillamook railroad line which runs the entire length of the Salmonberry River. Very recent discussions with the U.S. Army Corps of Engineers and NMFS biologists confirmed that there would be potentially significant leverage in this HUC5 as NMFS and the COE prepare to engage in consultation to address the flood damage and possible railroad bed/track re-alignment. Likely consultation-related activities include: Fill; Road Construction/Maintenance; Pipeline Construction/Repair; Rip-rap; Culvert; |

| Watershed Name | Watershed Code | Conservation Value Rating: Benefit of designating watershed | Conservation Value Rating: Benefit of designating connectivity corridor | Likely to be Low Leverage ? | Would Exclusion Significantly Impede Conservation? | Comments |
|---|---|---|---|---|---|---|
| | | | | | | Bridge Repair/Construction; Erosion Control; & Bank Stabilization. |
| Middle South Umpqua River | 1710030210 | Medium | High | No | na | CHART concluded that consultations were likely to yield significant leverage in this HUC5, noting that the PCTS contains numerous ESA consultations or conferences here since 1997 associated with the following activities: Timber Sale - Thinning; Timber Harvest/Sales; Habitat Restoration/Improvement; Road Construction/Maintenance; Bridge Repair/Construction; Rip-rap; Bank Stabilization; Erosion Control; Culvert; Fill. Some were associated with tributaries. The CHART underscored this by noting that leverage associated with road construction and maintenance is evidenced by the fact that Interstate 5 and Highway 99 parallel and cross over the South Umpqua River as well as occupied reaches of smaller tributaries. |
| Lower South Umpqua River | 1710030213 | Medium | High | No | na | CHART concluded that consultations were likely to yield significant leverage in this HUC5, noting that the PCTS contains numerous ESA consultations or conferences here since 1999 associated with the following activities: Stormwater Drainage; Wetland Modification; Road Construction/Maintenance; Prescribed Burn; Rip-rap; Culvert; Pipeline Construction/Repair; and Cable installation/maintenance. The CHART underscored this by noting that leverage associated with road construction and maintenance is evidenced by the fact that the South Umpqua River flows through the city of Roseburg and Interstate 5 and Highway 99 parallel and cross over the South Umpqua River as well as occupied reaches of smaller tributaries. |
| Elk Creek | 1710030303 | High | | No | na | CHART concluded that consultations were likely to yield significant leverage in this HUC5, noting that the PCTS contains numerous ESA consultations or conferences here since 1995 associated with the following activities: Timber Harvest/Sales; Timber Sale - Thinning; Timber Sale - Green; Road Use Permit; Road Construction/Maintenance; Trail and Campground Maintenance; Grazing; Culvert; Rip-rap; Erosion Control; Excavation/Mining; Fill; Bridge Repair/Construction; Bank Stabilization; and Fish Passage/Trapping. The CHART underscored this by noting that leverage associated with road construction and maintenance is evidenced by the fact that Elk Creek flows |

| Watershed Name | Watershed Code | Conservation Value Rating | | Likely to be Low Leverage ? | Would Exclusion Significantly Impede Conservation? | Comments |
|---|---|---|---|---|---|---|
| | | Benefit of designating watershed | Benefit of designating connectivity corridor | | | |
| | | | | | | through the city of Drain and it as well as numerous occupied tributaries are paralleled or crossed by Interstate 5 and Highways 38 and 99. |

* PCTS queries were made in December 2007 at: http://seahorse.nmfs.noaa.gov/pcts/

** This watershed was subjected to a lower $1,000 threshold (described in the 4(b)(2) report, NMFS 2007a) because it was under consideration as a potentially “very low” conservation value HUC5.  However, for the reasons given above, it was determined to actually have significant potential for leverage.

**Table 3. Final CHART Conclusions Regarding Areas Under Consideration for Exclusion from Critical Habitat**

The CHART considered whether excluding from critical habitat designation particular areas with certain economic impacts would significantly impede conservation. The CHART considered these areas both alone or in combination with other eligible areas. In making this determination, the CHART considered such factors as the role the particular area plays in the conservation of the population(s), the uniqueness or importance to the population(s), any recovery planning emphasis on the area, and similar considerations. The CHART's final conclusions, summarized below for those watersheds considered eligible for exclusion due to economic impacts, were obtained via discussions with each CHART during meetings conducted in the Fall of 2007.

| | | Conservation Value Rating | | | |
|---|---|---|---|---|---|
| **Watershed Name** | **Watershed Code** | **Benefit of designating watershed** | **Benefit of designating connectivity corridor*** | **Would Exclusion Significantly Impede Conservation?** | **Comments** |
| Upper Alsea River | 1710020501 | M | | Yes | CHART concluded that excluding this watershed would significantly impede conservation, noting that the NW Forest Plan identified a Tier 1 key watershed in this HUC5, ODFW has identified core areas for coho in this HUC5, and the presence of large and contiguous reaches of high intrinsic potential that comprise 50% of the occupied areas in this HUC5. |
| Cummins Creek/Tenmile Creek/Mercer Lake Frontal | 1710020507 | M | | Yes | CHART concluded that excluding this watershed would significantly impede conservation, noting that the NW Forest Plan identified approximately half of this HUC5 as a Tier 1 key watershed and most of this HUC5 has been classified as an Aquatic Diversity Area by the Oregon Chapter of the American Fisheries Society. This area is also the focus of important habitat restoration work. |

| | | Conservation Value Rating | | | |
|---|---|---|---|---|---|
| Watershed Name | Watershed Code | Benefit of designating watershed | Benefit of designating connectivity corridor* | Would Exclusion Significantly Impede Conservation? | Comments |
| Middle North Umpqua | 1710030107 | M | M | Yes | CHART concluded that excluding this watershed would significantly impede conservation, noting that the upper Umpqua River is ecologically unique and is the only Cascade drainage within the range of this ESU. The CHART also noted that this watershed contains important summer rearing (cold water) habitat for coho salmon, the NW Forest Plan identified three Tier 1 key watersheds in this HUC5, upper portions of it have been classified as Aquatic Diversity Areas by the Oregon Chapter of the American Fisheries Society . Also, the exclusion of adjacent low conservation watersheds increases the significance of excluding this particular HUC5. |
| Steamboat Creek | 1710030108 | L | | No | Based on exclusion of entire watershed. |
| Canton Creek | 1710030109 | L | | No | Based on exclusion of entire watershed. |
| Little River | 1710030111 | M | | Yes | CHART concluded that excluding this watershed would significantly impede conservation, noting that the upper Umpqua River is ecologically unique and is the only Cascade drainage within the range of this ESU. The CHART also noted that this watershed contains the majority of tributary spawning habitat for the North Umpqua coho population and the exclusion of adjacent low conservation watersheds increases the significance of excluding this particular HUC5. |
| Upper South Umpqua River | 1710030201 | L | | No | Based on exclusion of entire watershed. |

| | | Conservation Value Rating | | | |
|---|---|---|---|---|---|
| **Watershed Name** | **Watershed Code** | **Benefit of designating watershed** | **Benefit of designating connectivity corridor*** | **Would Exclusion Significantly Impede Conservation?** | **Comments** |
| Jackson Creek | 1710030202 | M | | Yes | CHART concluded that excluding this watershed would significantly impede conservation, noting that the upper Umpqua River is ecologically unique and is the only Cascade drainage within the range of this ESU. Given its location this HUC5 is important for maintaining diversity of the South Umpqua population (historically a productive population) and the Umpqua major population group as a whole. The CHART also noted that this HUC5 is part of one of the largest Tier 1 key watersheds identified in the NW Forest Plan and that upper portions of it have been classified as Aquatic Diversity Areas by the Oregon Chapter of the American Fisheries Society . Also, the exclusion of an upstream low conservation watershed increases the significance of excluding this particular HUC5. |
| Middle South Umpqua River | 1710030203 | M | M | Yes | CHART concluded that excluding this watershed would significantly impede conservation, noting that the upper Umpqua River is ecologically unique and is the only Cascade drainage within the range of this ESU. Given its location this HUC5 is important for maintaining diversity of the South Umpqua population (historically a productive population) and the Umpqua major population group as a whole. The CHART also noted that this HUC5 is part of one of the largest Tier 1 key watersheds identified in the NW Forest Plan and that upper portions of it have been classified as Aquatic Diversity Areas by the Oregon Chapter of the American Fisheries Society . Also, the exclusion of an upstream low conservation watershed increases the significance of excluding this particular HUC5. |

| | | Conservation Value Rating | | | |
|---|---|---|---|---|---|
| **Watershed Name** | **Watershed Code** | **Benefit of designating watershed** | **Benefit of designating connectivity corridor*** | **Would Exclusion Significantly Impede Conservation?** | **Comments** |
| Elk Creek/ South Umpqua | 1710030204 | M | | Yes | CHART concluded that excluding this watershed would significantly impede conservation, noting that the upper Umpqua River is ecologically unique and is the only Cascade drainage within the range of this ESU. Given its location this HUC5 is important for maintaining diversity of the South Umpqua population (historically a productive population) and the Umpqua major population group as a whole. The CHART also noted that this HUC5 is part of one of the largest Tier 1 key watersheds identified in the NW Forest Plan and that the exclusion of an upstream low conservation watershed increases the significance of excluding this particular HUC5. |
| South Umpqua River | 1710030205 | M | M | Yes | CHART concluded that excluding this watershed would significantly impede conservation, noting that the upper Umpqua River is ecologically unique and is the only Cascade drainage within the range of this ESU. Given its location this HUC5 is important for maintaining diversity of the South Umpqua population (historically a productive population) and the Umpqua major population group as a whole. The CHART also noted that this HUC5 is part of one of the largest Tier 1 key watersheds identified in the NW Forest Plan and that the exclusion of an upstream low conservation watershed increases the significance of excluding this particular HUC5. |
| Ollala Creek/ Lookingglass | 1710030212 | M | | Yes | CHART concluded that excluding this watershed would significantly impede conservation, noting that this HUC5 is important for maintaining diversity of the South Umpqua population (historically a productive population) and the Umpqua major population group as a whole. The CHART also noted that this HUC5 has large and contiguous reaches of high intrinsic potential and that the exclusion of an upstream low conservation watershed increases the significance of excluding this particular HUC5. |

| | | Conservation Value Rating | | | |
|---|---|---|---|---|---|
| Watershed Name | Watershed Code | Benefit of designating watershed | Benefit of designating connectivity corridor* | Would Exclusion Significantly Impede Conservation? | Comments |
| Lower South Umpqua River | 1710030213 | M | H | Yes | CHART concluded that excluding this watershed would significantly impede conservation, noting that this HUC5 is important for maintaining diversity of the South Umpqua population (historically a productive population) and the Umpqua major population group as a whole. The CHART also noted that this HUC5 has large and contiguous reaches of high intrinsic potential and that the exclusion of an upstream low conservation watershed increases the significance of excluding this particular HUC5. |
| Upper Umpqua River | 1710030301 | M | H | Yes | CHART concluded that excluding this watershed would significantly impede conservation, noting that this HUC5 is important for maintaining diversity of the Umpqua major population group as a whole. The CHART also noted that this HUC5 contains important rearing habitat for three Umpqua populations (South, North and Middle Umpqua) and that the exclusion of upstream low conservation watersheds increases the significance of excluding this particular HUC5. |
| Lake Creek | 1710030305 | L | | No | Based on exclusion of entire watershed. |
| Lower South Fork Coquille | 1710030501 | L | | No | Based on exclusion of entire watershed. |
| Middle Fork Coquille | 1710030502 | M | | Yes | CHART concluded that excluding this watershed would significantly impede conservation, noting that this HUC5 has a relatively high juvenile occupancy rate for the Coquille population, approximately 2/3 of the occupied reaches have been identified by ODFW as core areas for coho, and that the exclusion of an adjacent low conservation watershed increases the significance of excluding this particular HUC5. |

* Blanks for the conservation value of connectivity corridors indicate that a watershed does not include a rearing and migration corridor serving occupied watersheds upstream (i.e., there are no occupied upstream watersheds).

**Table 4. Summary of Comments and Changes to the Initial CHART Assessment for Oregon Coast Coho Salmon ESU**

The following table summarizes the comments received on the initial CHART assessment and the changes made for specific watersheds. Key changes included: (1) Elevating the conservation value rating for five watersheds in the Umpqua River basin as a result of recent population identification and viability work by the Technical Recovery Team (TRT) (Lawson et al., 2007; Wainwright et al., 2007) that further subdivides this basin into four (versus two) independent populations; (2) changing the delineation of occupied habitat areas in several watersheds based on comments and field surveys by the U.S. Bureau of Land Management (BLM), Oregon Department of Fish and Wildlife (ODFW), and NOAA Fisheries staff indicating that the original coho distribution maps/data were in error; (3) removing Josephine and Jackson counties from the relevant critical habitat table in agency regulations because these counties overlap slightly with upland areas in watersheds occupied by Oregon Coast coho salmon but they do not contain stream reaches designated as critical habitat for this ESU; and (4) as a result of revised economic data for this ESU and our final 4(b)(2) assessment, we are no longer excluding habitat areas in three watersheds that were previously proposed for designation.

| Subbasin | Watershed code | Watershed name | Summary of Comments and Changes |
|---|---|---|---|
| NEHALEM | 1710020206 | Lower Nehalem River/Cook Creek | *NOAA Fisheries GIS staff noted an error in the original GIS data for Neahkahnie Creek.*<br>Response: Added 1.3 miles (2.1 km) of occupied habitat areas in Neahkahnie Creek based on recent habitat access improvements confirmed by ODFW. |
| WILSON/ TRASK/ NESTUCCA | 1710020302 | Nestucca River | *BLM comments noted coho distribution errors associated with the upper Nestucca River.*<br>Response: Added 4.2 miles (6.8 km) of occupied habitat areas in the upper Nestucca River (downstream of McGuire Dam) and Walker Creek, and removed 3 miles (4.8 km) of unoccupied stream reaches above a falls in Elk Creek based on comments from the BLM and feedback from ODFW. |

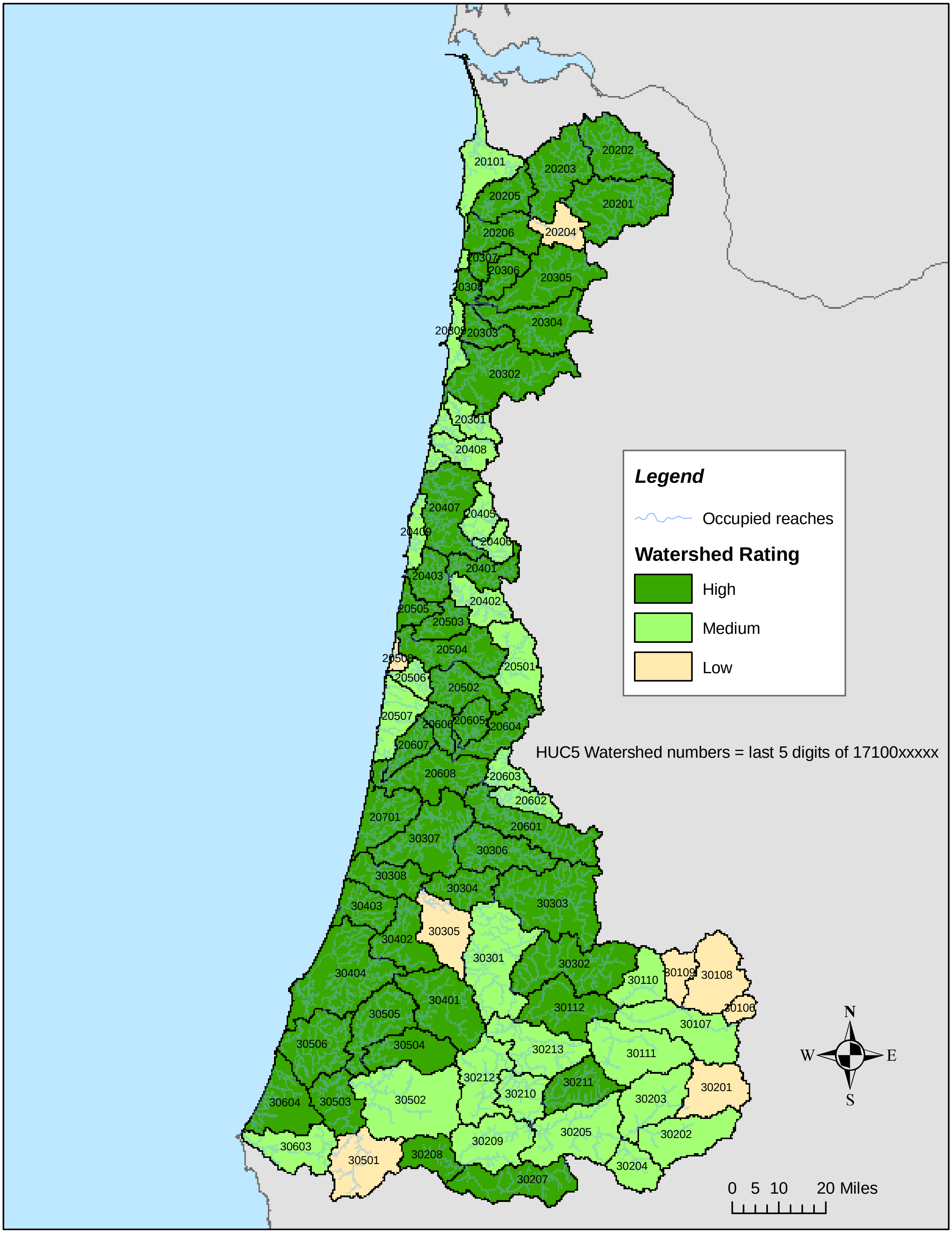
| Subbasin | Watershed code | Watershed name | Summary of Comments and Changes |
|---|---|---|---|
| SILETZ/YAQUINA | 1710020409 | Devils Lake/Moolack Frontal | *Two commenters questioned the "medium" conservation-value rating assigned by the CHART to the habitat area for Devils Lake coho. These areas are within a larger Devils Lake/Moolack Frontal watershed. The commenters cited recent genetic data establishing that coho from Rock Creek/Devils Lake are genetically distinct from other populations in the ESU. The commenters believed that the coho in Devils Lake possess a unique and distinct genetic heritage warranting a "high" conservation value rating.*<br><br>Response: No changes made. The CHART considered these comments along with recent population identification work (Lawson et al., 2007) and genetic analyses by Johnson and Banks (2007). The team maintained that the Devils Lake/Moolack Frontal watershed (which contains Devils Lake) was still of medium conservation value, noting that Devil's Lake coho are one of ten small and dependent populations in this watershed and appear to most closely related to coho in the nearby Siletz River. The team acknowledged that Devils Lake was the most productive of these ten populations but that the overall watershed did not warrant a high conservation value relative to other adjacent watersheds with more extensive habitat areas and functionally independent populations (e.g., the Siletz River and Yaquina River watersheds). Regardless, Devils Lake and all other habitat areas in this watershed are designated as critical habitat for Oregon Coast coho salmon. |
| NORTH UMPQUA | 1710030106 | Boulder Creek | Habitat areas in this watershed (originally proposed for exclusion) are no longer eligible for exclusion from designation due to economic impacts. |

| Subbasin | Watershed code | Watershed name | Summary of Comments and Changes |
|---|---|---|---|
| NORTH UMPQUA | 1710030110 | Rock Creek/North Umpqua River | *BLM comments noted coho distribution errors associated with four tributaries to Rock Creek.*<br><br>Response: Added 1.8 miles (2.9 km) of occupied habitat areas in Miller Creek, Woodstock Creek, Conley Creek and an unnamed creek near Kelly Creek based on comments from the BLM and feedback from ODFW. |
| SOUTH UMPQUA | 1710030202 | Jackson Creek | The CHART elevated this HUC5's conservation value from Low to Medium due to recent TRT population and viability analyses (Lawson et al. 2007, Wainwright et al. 2007) that now identify four functionally independent populations and related biological recovery criteria in the Umpqua River basin. HUC5 no longer excluded from designation. |
| SOUTH UMPQUA | 1710030204 | Elk Creek/South Umpqua | The CHART elevated this HUC5's conservation value from Low to Medium due to recent TRT population and viability analyses (Lawson et al. 2007, Wainwright et al. 2007) that now identify four functionally independent populations and related biological recovery criteria in the Umpqua River basin. HUC5 no longer excluded from designation. |
| SOUTH UMPQUA | 1710030205 | South Umpqua River | *BLM comments noted coho distribution errors associated with two tributaries to the South Umpqua River.*<br><br>Response: Removed 2 miles (3.2 km) of unoccupied stream reaches in Lavadoure Creek and East Fork Poole Creek based on comments from the BLM and feedback from ODFW. |

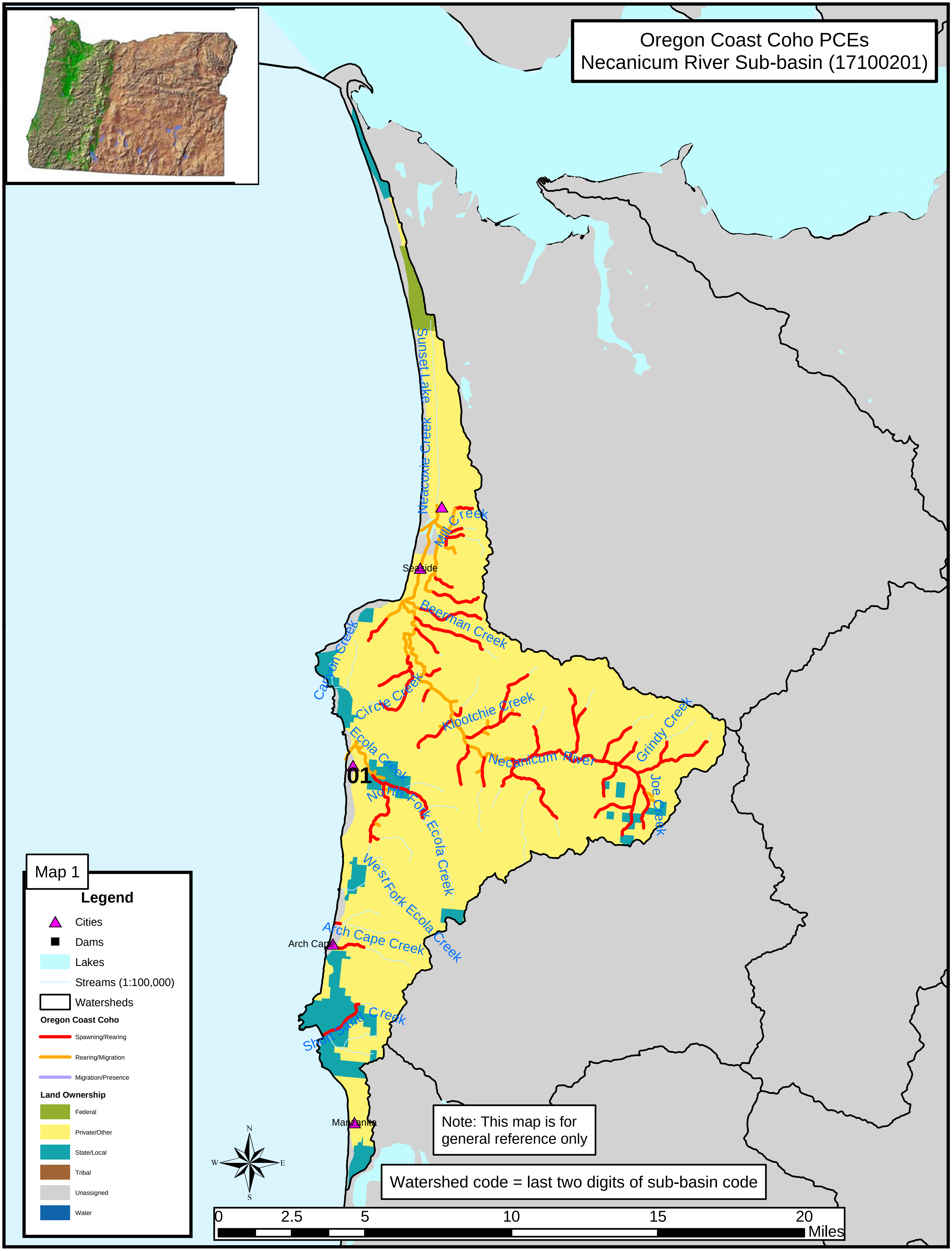
| Subbasin | Watershed code | Watershed name | Summary of Comments and Changes |
|---|---|---|---|
| SOUTH UMPQUA | 1710030207 | Middle Cow Creek | The CHART elevated this HUC5's conservation value from Low to Medium due to recent TRT population and viability analyses (Lawson et al. 2007, Wainwright et al. 2007) that now identify four functionally independent populations and related biological recovery criteria in the Umpqua River basin. |
| SOUTH UMPQUA | 1710030209 | Lower Cow Creek | *BLM comments noted coho distribution errors associated with a tributary to Cow Creek.*<br>Response: Removed 3 miles (4.8 km) of unoccupied stream reaches in Buck Creek based on comments from the BLM and feedback from ODFW. |
| SOUTH UMPQUA | 1710030211 | Myrtle Creek | The CHART elevated this HUC5's conservation value from Medium to High due to recent TRT population and viability analyses (Lawson et al. 2007, Wainwright et al. 2007) that now identify four functionally independent populations and related biological recovery criteria in the Umpqua River basin. HUC5 no longer excluded from designation. |
| UMPQUA | 1710030301 | Upper Umpqua River | *BLM comments noted coho distribution errors associated with two tributaries to the upper Umpqua River.*<br>Response: Removed 2 miles (3.2 km) of unoccupied stream reaches in Bottle Creek and Porter Creek based on comments from the BLM and feedback from ODFW. |

| Subbasin | Watershed code | Watershed name | Summary of Comments and Changes |
|---|---|---|---|
| UMPQUA | 1710030303 | Elk Creek | *BLM comments noted coho distribution errors associated with a tributary to Elk Creek.*<br><br>Response: Removed 1 mile (1.6 km) of unoccupied stream reaches in Brush Creek and Blue Hole Creek based on comments from the BLM and feedback from ODFW. Also, the CHART elevated this HUC5's conservation value from Medium to High due to recent TRT population and viability analyses (Lawson et al. 2007, Wainwright et al. 2007) that now identify four functionally independent populations and related biological recovery criteria in the Umpqua River basin. HUC5 no longer excluded from designation. |
| UMPQUA | 1710030304 | Middle Umpqua River | *BLM comments noted coho distribution errors associated with a tributary to the Umpqua River.*<br><br>Response: Removed 1.5 miles (2.4 km) of unoccupied stream reaches in Mill Creek based on comments from the BLM and feedback from ODFW. |
| UMPQUA | 1710030305 | Lake Creek | *BLM comments noted coho distribution errors associated with the area near Otter Creek Falls.*<br><br>Response: Removed 5.3 miles (8.5 km) of unoccupied stream reaches in Camp Creek based on comments from the BLM and feedback from ODFW. |
| COQUILLE | 1710030504 | East Fork Coquille | *BLM comments noted coho distribution errors associated with a tributary to the East Fork Coquille River.*<br><br>Response: Removed 1.5 miles (2.4 km) of unoccupied stream reaches in Weekly Creek based on comments from the BLM and feedback from ODFW. |

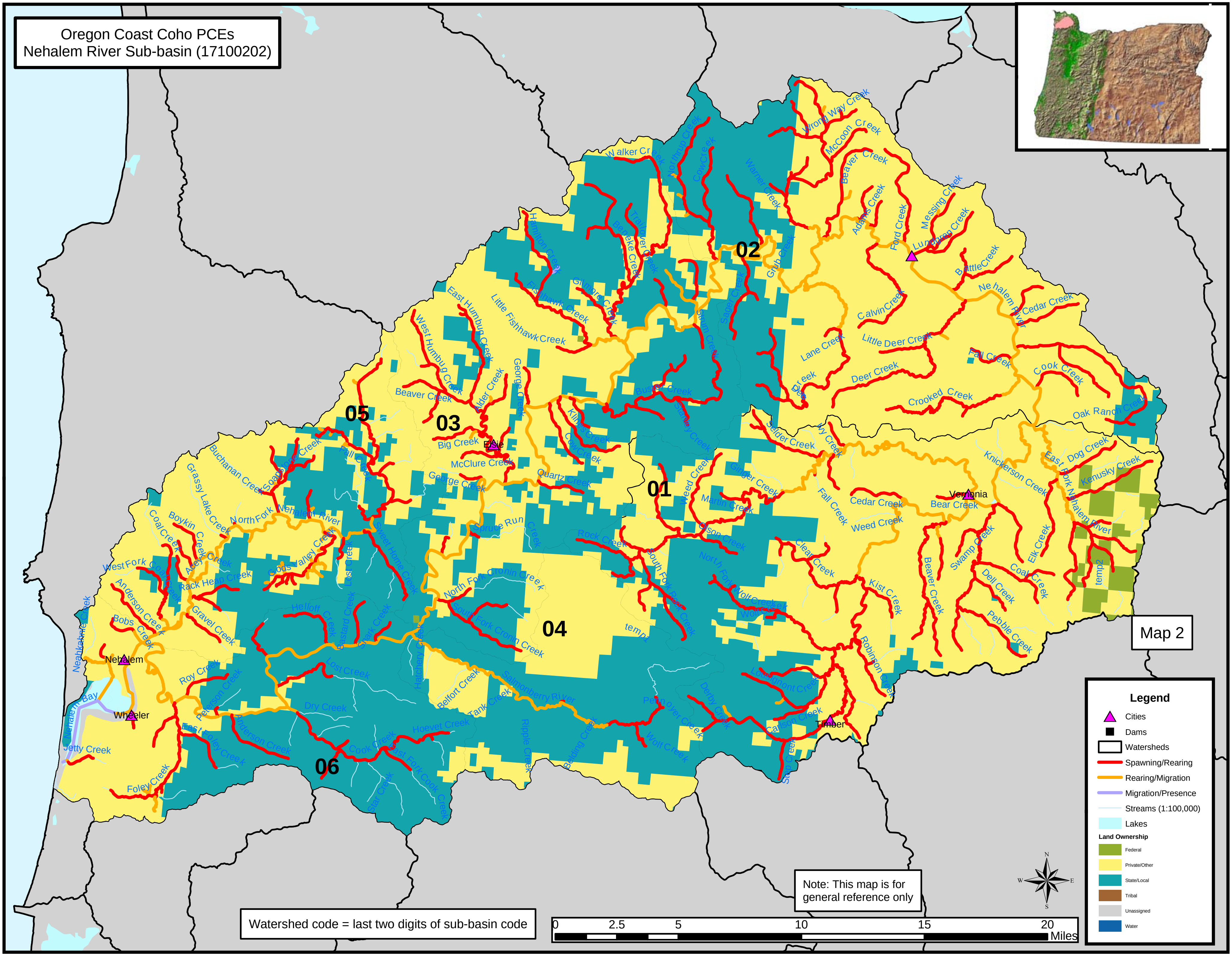
**Figure 3. Final CHART Ratings of Conservation Value for Habitat Areas in HUC5 Watersheds Occupied by the Oregon Coast Coho Salmon ESU**



**Maps 1 through 13. Occupied Habitat Areas Considered for Critical Habitat Designation for the Oregon Coast Coho ESU**



Oregon Coast Coho PCEs
Necanicum River Sub-basin (17100201)
Sunset Lake
Neacoxie Creek
Mill Creek
Seaside
Beerman Creek
Canyon Creek
Circle Creek
Klootchie Creek
Grindy Creek
Ecola Creek
Necanicum River
01
North Fork Ecola Creek
Joe Creek
West Fork Ecola Creek
Arch Cape Creek
Arch Cape
Short Sand Creek
Manzanita
Map 1
Legend
Cities
Dams
Lakes
Streams (1:100,000)
Watersheds
Oregon Coast Coho
Spawning/Rearing
Rearing/Migration
Migration/Presence
Land Ownership
Federal
Private/Other
State/Local
Tribal
Unassigned
Water
N
W
E
S
Note: This map is for general reference only
Watershed code = last two digits of sub-basin code
0
2.5
5
10
15
20
Miles



Oregon Coast Coho PCEs
Nehalem River Sub-basin (17100202)
Map 2
Legend
Cities
Dams
Watersheds
Spawning/Rearing
Rearing/Migration
Migration/Presence
Streams (1:100,000)
Lakes
Land Ownership
Federal
Private/Other
State/Local
Tribal
Unassigned
Water
Note: This map is for general reference only
Watershed code = last two digits of sub-basin code
0
2.5
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10
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Miles
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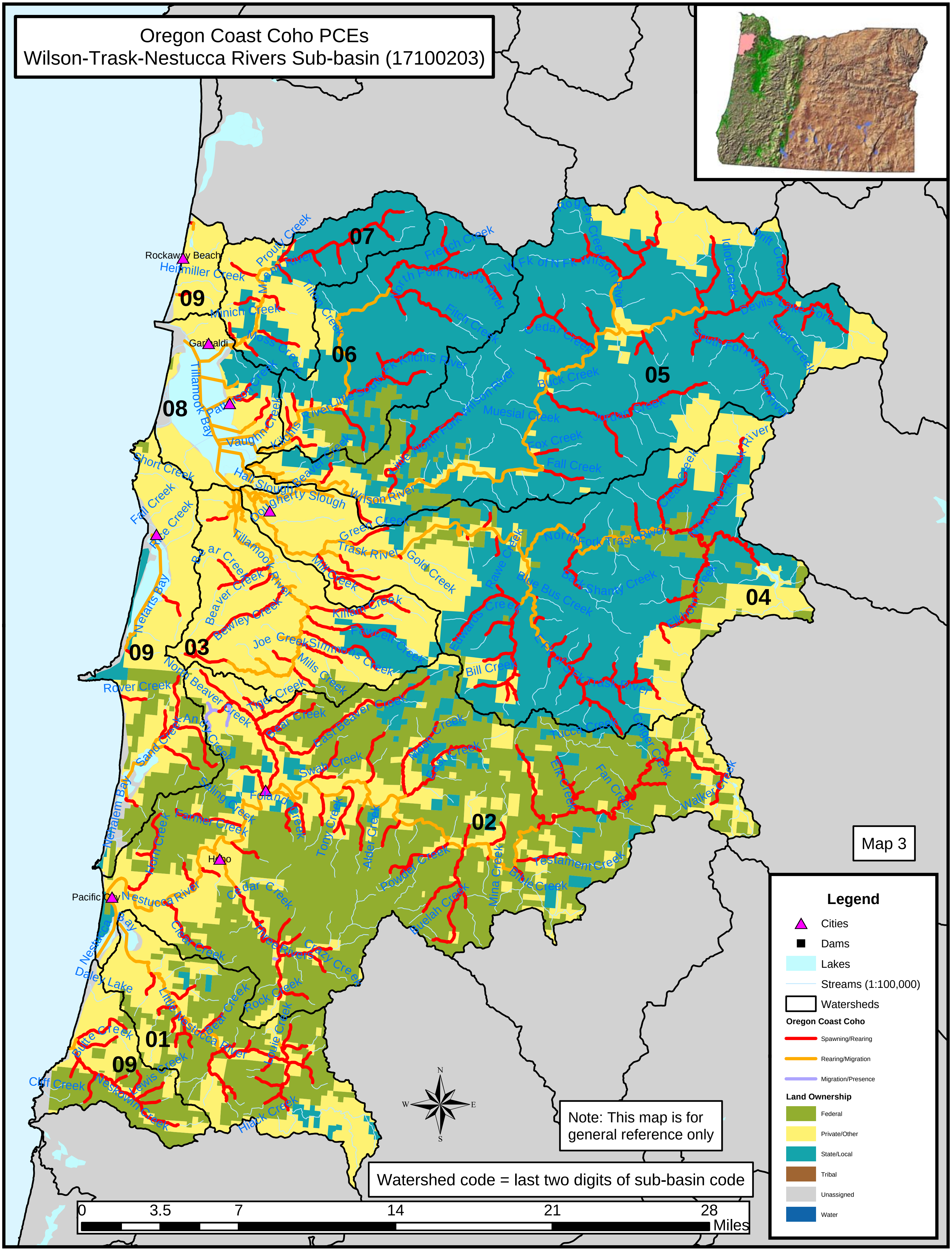
S
E
W
01
02
03
04
05
06
Nehalem
Wheeler
Elsie
Vernonia
Timber
Lundgren Creek
Nehalem Bay
Jetty Creek
Foley Creek
East Foley Creek
Anderson Creek
Roy Creek
Peterson Creek
Gravel Creek
Rock Heap Creek
Bobs Creek
Anderson Creek
Coal Creek
Boykin Creek
Grassy Lake Creek
Buchanan Creek
Soapstone Creek
North Fork Nehalem River
Lost Creek
Dry Creek
Cook Creek
East Fork Cook Creek
Hoevet Creek
Helloff Creek
Bastard Creek
Salmonberry River
Belfort Creek
Tank Creek
Ripple Creek
Belding Creek
Wolf Creek
Derby Creek
Carlson Creek
Lousignont Creek
Robinson Creek
Kist Creek
Clear Creek
Beaver Creek
Swamp Creek
Dell Creek
Pebble Creek
Coal Creek
Elk Creek
Kenusky Creek
Dog Creek
East Fork Nehalem River
Knickerson Creek
Bear Creek
Cedar Creek
Weed Creek
Fall Creek
Oak Ranch Creek
Crooked Creek
Cook Creek
Deer Creek
Little Deer Creek
Lane Creek
Calvin Creek
Cedar Creek
Nehalem River
Battle Creek
Messing Creek
Ford Creek
Adams Creek
Beaver Creek
McCoon Creek
Wrong Way Creek
Grub Creek
Warner Creek
Cow Creek
Northrup Creek
Walker Creek
Hamilton Creek
Fishhawk Creek
Little Fishhawk Creek
East Humbug Creek
West Humbug Creek
Beaver Creek
Big Creek
McClure Creek
George Creek
Quartz Creek
Rock Creek
Spruce Run Creek
North Fork Cronin Creek
South Fork Cronin Creek
Sweet Home Creek
Weed Creek
Martin Creek
Ginger Creek
Selder Creek
Ivy Creek
Stanley Creek
Sager Creek
temp
temp2


Oregon Coast Coho PCEs
Wilson-Trask-Nestucca Rivers Sub-basin (17100203)
Map 3
Legend
Cities
Dams
Lakes
Streams (1:100,000)
Watersheds
Oregon Coast Coho
Spawning/Rearing
Rearing/Migration
Migration/Presence
Land Ownership
Federal
Private/Other
State/Local
Tribal
Unassigned
Water
Note: This map is for general reference only
Watershed code = last two digits of sub-basin code
0
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Miles
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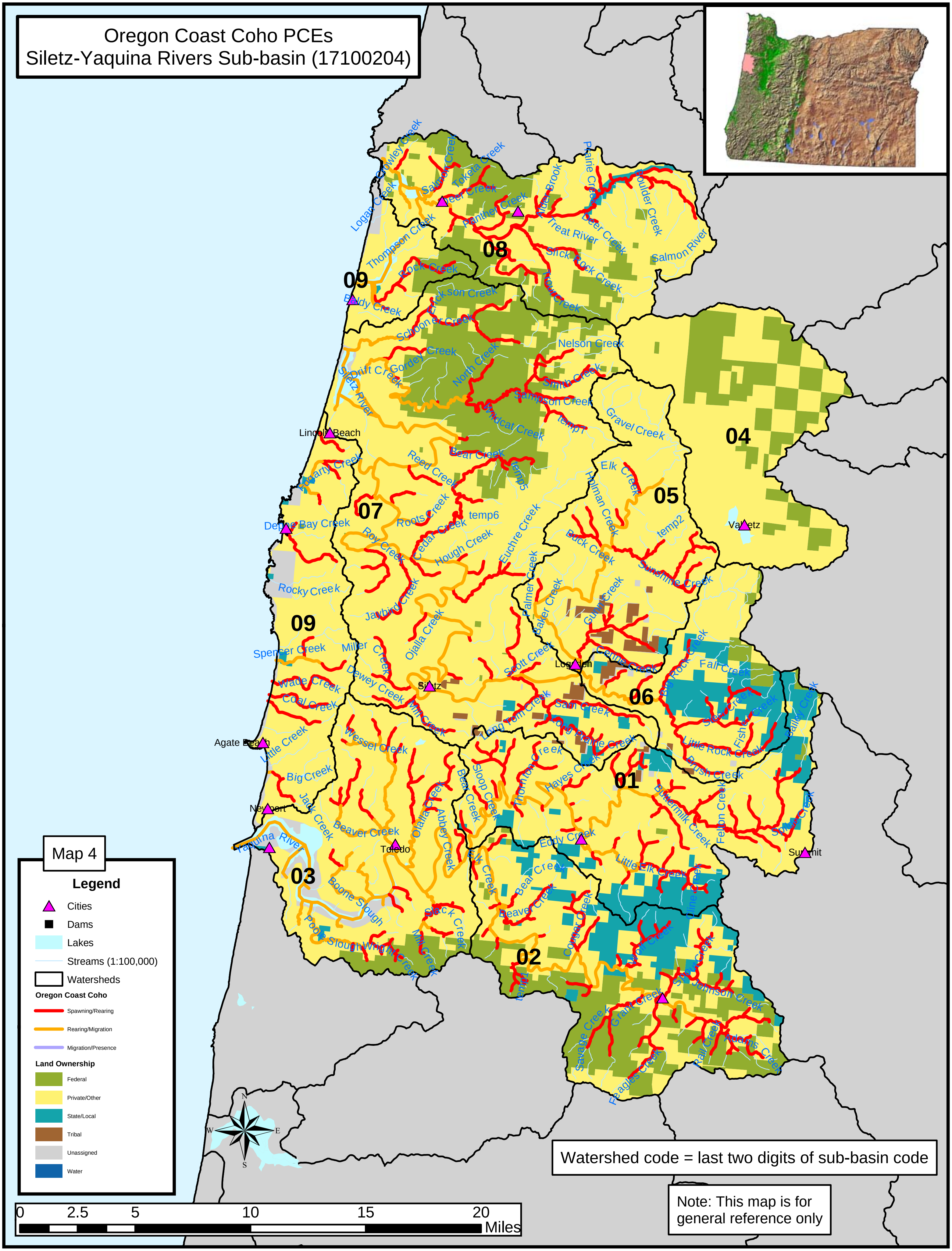
07
08
09
Rockaway Beach
Garibaldi
Hebo
Pacific City
Tillamook Bay
Netarts Bay
Nestucca Bay
Nehalem Bay
Daley Lake
Wilson River
Trask River
North Fork Trask River
Nestucca River
Little Nestucca River
Kilchis River
Miami River
Tillamook River
Hall Slough
Dougherty Slough
South Fork Wilson River
North Fork Kilchis River
Little South Fork Kilchis River
Little North Fork Wilson River
Devils Lake Fork
Prouty Creek
French Creek
Fitch Creek
Cedar Creek
Buck Creek
Muesial Creek
Jordan Creek
Fox Creek
Fall Creek
Rogers Creek
Idiot Creek
Elliott Creek
Green Creek
Gold Creek
Mill Creek
Killam Creek
Fawcett Creek
Simmons Creek
Joe Creek
Mills Creek
Bewley Creek
Beaver Creek
Bear Creek
Rawe Creek
Blue Bus Creek
Bark Shanty Creek
Edwards Creek
Bill Creek
Elkhorn Creek
Clear Creek
Short Creek
Fall Creek
Fire Creek
Sand Creek
Rover Creek
North Beaver Creek
East Beaver Creek
Swab Creek
Farmer Creek
Tony Creek
Alder Creek
Powder Creek
Mina Creek
Testament Creek
Elk Creek
Fan Creek
Walker Creek
Tucca Creek
Ginger Creek
Bible Creek
Buelah Creek
Three Rivers
Crazy Creek
Rock Creek
Cedar Creek
Clear Creek
Butte Creek
Cliff Creek
Neskowin Creek
Lewis Creek
Hiack Creek
Minich Creek
Hermiller Creek
Moss Creek
Patterson Creek
Vaughn Creek
Tillamook Bay


Oregon Coast Coho PCEs
Siletz-Yaquina Rivers Sub-basin (17100204)
Map 4
Legend
Cities
Dams
Lakes
Streams (1:100,000)
Watersheds
Oregon Coast Coho
Spawning/Rearing
Rearing/Migration
Migration/Presence
Land Ownership
Federal
Private/Other
State/Local
Tribal
Unassigned
Water
01
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06
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08
09
Lincoln Beach
Depoe Bay Creek
Agate Beach
Newport
Toledo
Siletz
Logsden
Valsetz
Summit
Siletz River
Yaquina River
Salmon River
Drift Creek
Rocky Creek
Spencer Creek
Big Creek
Beaver Creek
Boone Slough
Poole Slough
Euchre Creek
Sunshine Creek
Gravel Creek
Elk Creek
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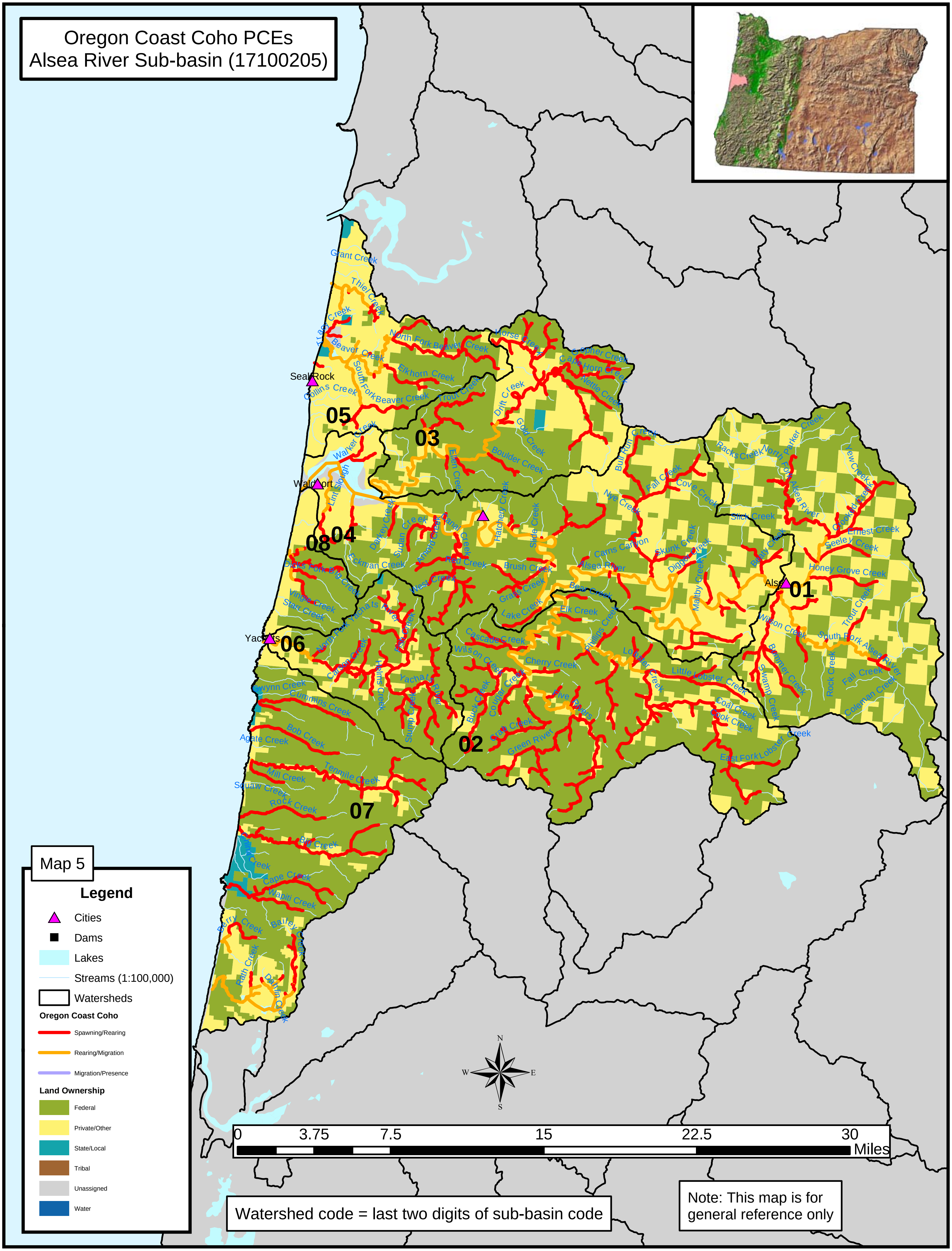
Miles
Watershed code = last two digits of sub-basin code
Note: This map is for general reference only



Oregon Coast Coho PCEs
Alsea River Sub-basin (17100205)
Map 5
Legend
Cities
Dams
Lakes
Streams (1:100,000)
Watersheds
Oregon Coast Coho
Spawning/Rearing
Rearing/Migration
Migration/Presence
Land Ownership
Federal
Private/Other
State/Local
Tribal
Unassigned
Water
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15
22.5
30
Miles
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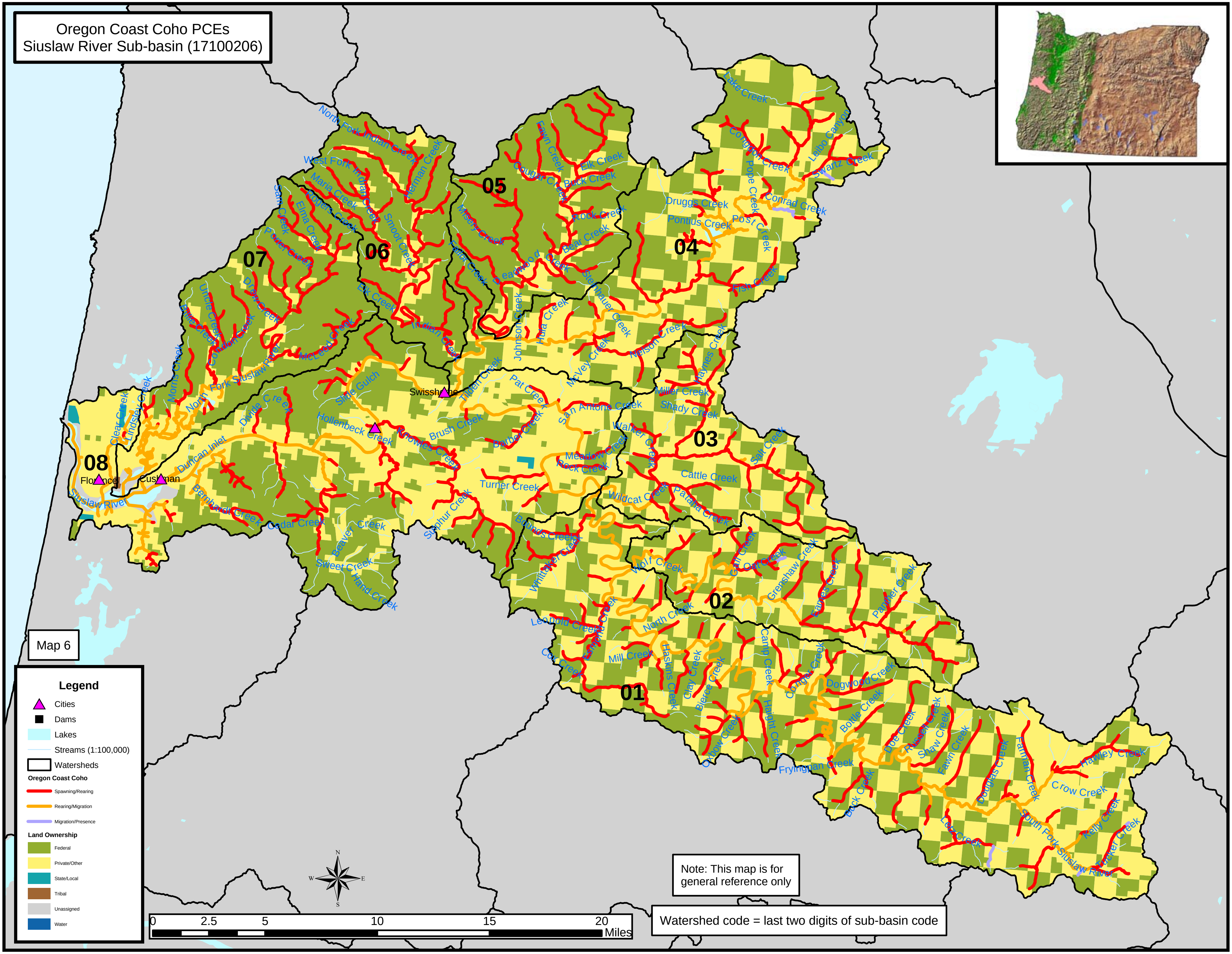
S
E
W
Watershed code = last two digits of sub-basin code
Note: This map is for general reference only
Seal Rock
Waldport
Yachats
Alsea
01
02
03
04
05
06
07
08
Grant Creek
Thiel Creek
Beaver Creek
North Fork Beaver Creek
South Fork Beaver Creek
Elkhorn Creek
Collins Creek
Trout Creek
Horse Creek
Gopher Creek
Nettle Creek
Drift Creek
Gold Creek
Boulder Creek
Walker Creek
Eckman Creek
Darkey Creek
Sudan Creek
Canal Creek
Hatchery Creek
Slide Creek
Red Creek
Brush Creek
West Creek
Grass Creek
Lake Creek
Alsea River
Bear Creek
Elk Creek
Nye Creek
Fall Creek
Cove Creek
Bull Run Creek
Racks Creek
North Fork Alsea River
Yew Creek
Slick Creek
Skunk Creek
Digger Creek
Maltby Creek
Honey Grove Creek
Seeley Creek
Ernest Creek
Crooked Creek
Wilson Creek
South Fork Alsea River
Trout Creek
Rock Creek
Fall Creek
Coleman Creek
Swamp Creek
Cascade Creek
Cherry Creek
Phillips Creek
Lobster Creek
Little Lobster Creek
Five Rivers
Buck Creek
Cougar Creek
Green River
Coal Creek
Cook Creek
East Fork Lobster Creek
North Fork Yachats River
Yachats River
Helms Creek
Stump Creek
Gwynn Creek
Cummins Creek
Bob Creek
Agate Creek
Tenmile Creek
Mill Creek
Squaw Creek
Rock Creek
Big Creek
Cape Creek
Wapiti Creek
Bailey Creek
Berry Creek
Rath Creek
Dahlin Creek
Vingie Creek
Starr Creek


Oregon Coast Coho PCEs
Siuslaw River Sub-basin (17100206)
Map 6
Legend
Cities
Dams
Lakes
Streams (1:100,000)
Watersheds
Oregon Coast Coho
Spawning/Rearing
Rearing/Migration
Migration/Presence
Land Ownership
Federal
Private/Other
State/Local
Tribal
Unassigned
Water
Note: This map is for general reference only
Watershed code = last two digits of sub-basin code
0
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Miles
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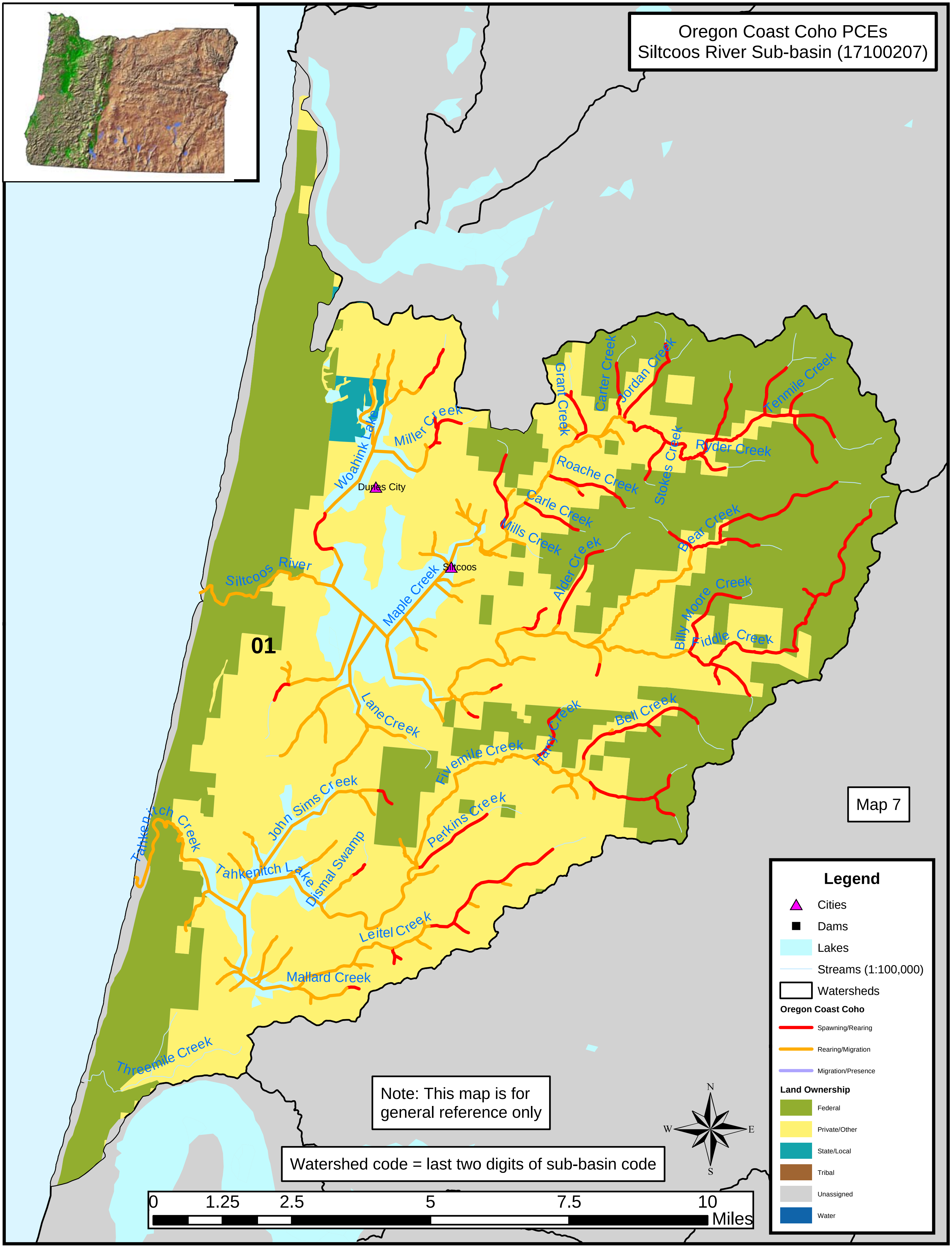
06
07
08
Florence
Cushman
Swisshome
Siuslaw River
North Fork Siuslaw River
South Fork Siuslaw River
Lake Creek
Duncan Inlet
Clear Creek
Lindsley Creek
Morris Creek
Bernhardt Creek
Cedar Creek
Beaver Creek
Sweet Creek
Hand Creek
Divide Creek
Hollenbeck Creek
Knowles Creek
Slide Gulch
Brush Creek
Sulphur Creek
Turner Creek
Barber Creek
Tilden Creek
Pat Creek
San Antone Creek
Meadow Creek
Rock Creek
Walker Creek
Wildcat Creek
Patalla Creek
Bounds Creek
Whittaker Creek
Wolf Creek
North Creek
Leopold Creek
Cox Creek
Mill Creek
Haskins Creek
Clay Creek
Bierce Creek
Oxbow Creek
Camp Creek
Haight Creek
Fryingpan Creek
Buck Creek
Dogwood Creek
Bottle Creek
Doe Creek
Russell Creek
Shaw Creek
Fawn Creek
Douglas Creek
Farman Creek
Lane Creek
Hawley Creek
Crow Creek
Kelly Creek
Grenshaw Creek
Panther Creek
Gall Creek
Cattle Creek
Salt Creek
Shady Creek
Miller Creek
Haynes Creek
Nelson Creek
McVey Creek
Johnson Creek
Hula Creek
Steinhauer Creek
Fish Creek
Post Creek
Pontius Creek
Druggs Creek
Conrad Creek
Congdon Creek
Pope Creek
Swartz Creek
Leibo Canyon
Elk Creek
Buck Creek
Cougar Creek
Fawn Creek
Rock Creek
Bear Creek
Wilson Creek
Indian Creek
Herman Creek
Smoot Creek
West Fork Indian Creek
North Fork Indian Creek
Maria Creek
Rogers Creek
Sam Creek
Elma Creek
Porter Creek
Drew Creek
Uncle Creek
Bailey Creek
Condon Creek
McLeod Creek


Oregon Coast Coho PCEs
Siltcoos River Sub-basin (17100207)
Map 7
01
Dunes City
Siltcoos
Woahink Lake
Miller Creek
Grant Creek
Carter Creek
Jordan Creek
Tenmile Creek
Ryder Creek
Stokes Creek
Roache Creek
Carle Creek
Mills Creek
Alder Creek
Bear Creek
Siltcoos River
Maple Creek
Billy Moore Creek
Fiddle Creek
Lane Creek
Harry Creek
Bell Creek
Fivemile Creek
John Sims Creek
Perkins Creek
Tahkenitch Creek
Tahkenitch Lake
Dismal Swamp
Leitel Creek
Mallard Creek
Threemile Creek
Legend
Cities
Dams
Lakes
Streams (1:100,000)
Watersheds
Oregon Coast Coho
Spawning/Rearing
Rearing/Migration
Migration/Presence
Land Ownership
Federal
Private/Other
State/Local
Tribal
Unassigned
Water
Note: This map is for general reference only
Watershed code = last two digits of sub-basin code
0 1.25 2.5 5 7.5 10 Miles
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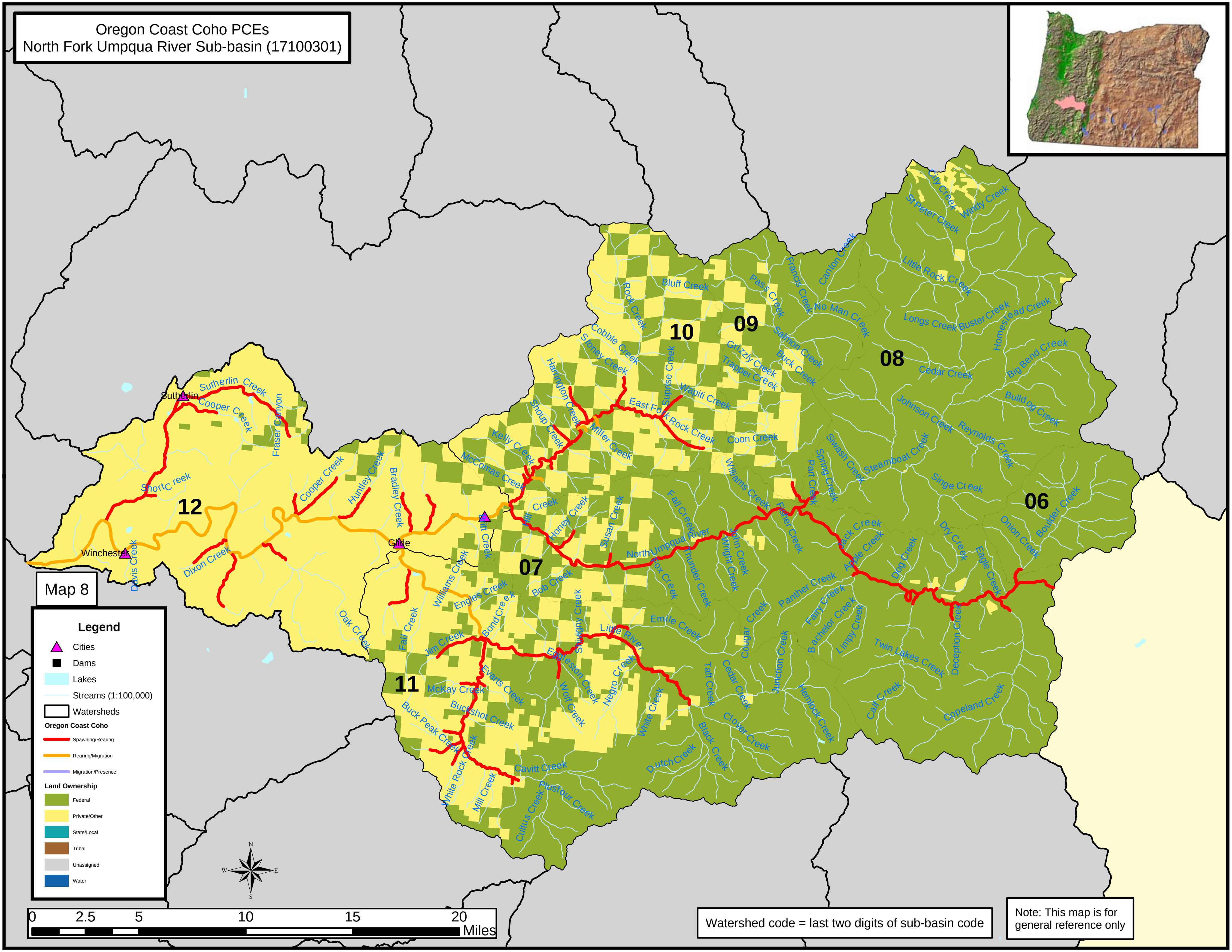
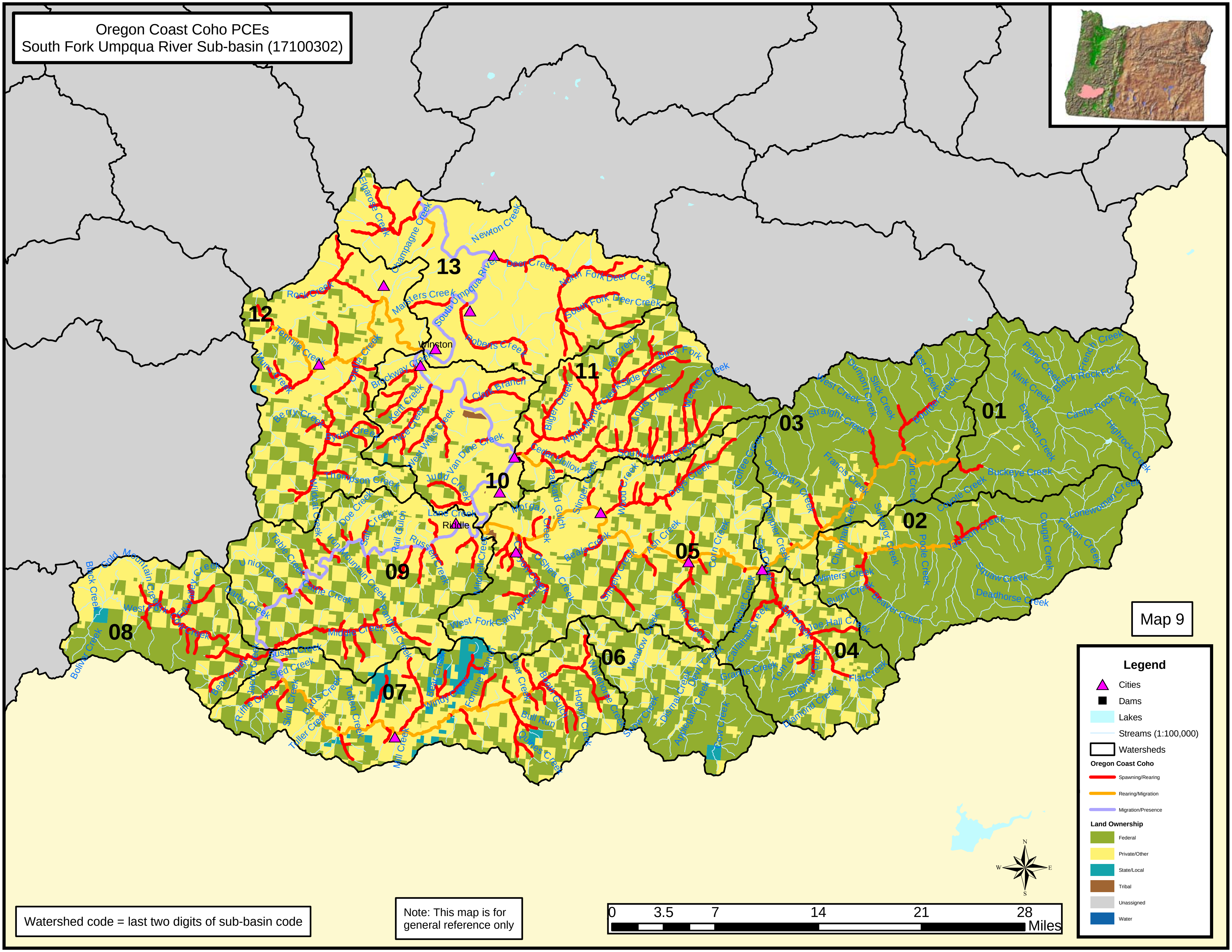
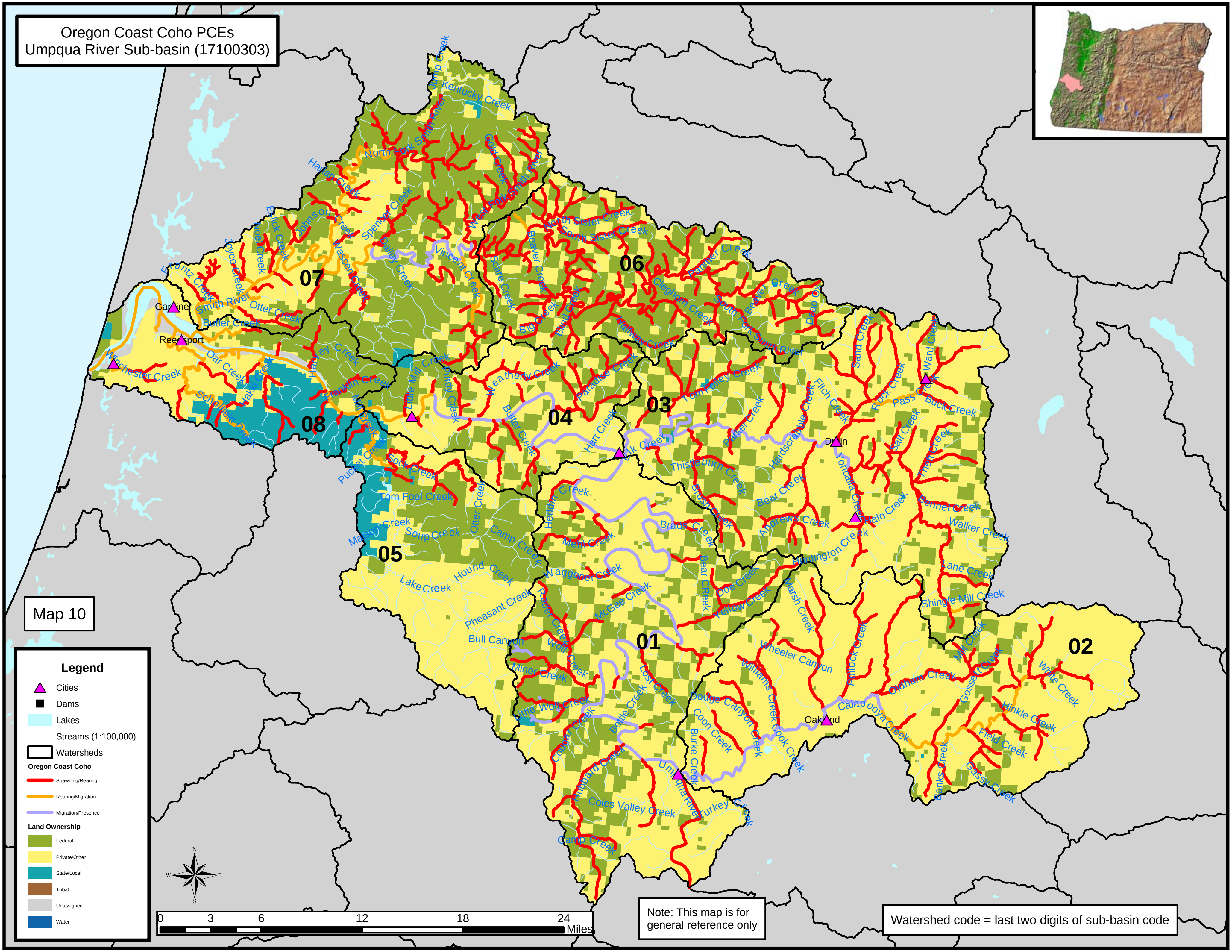
E
W



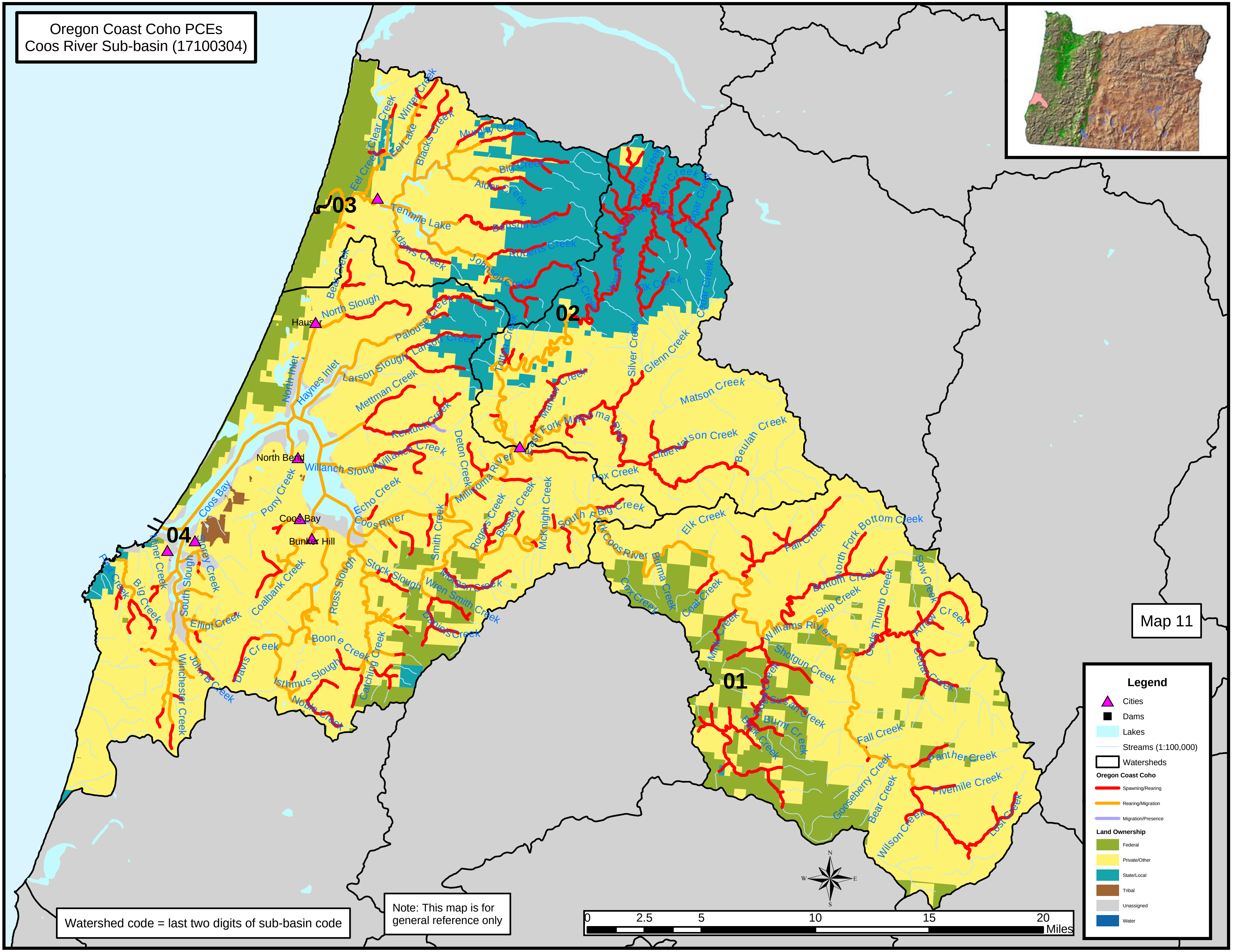
Oregon Coast Coho PCEs
North Fork Umpqua River Sub-basin (17100301)
Map 8
Legend
Cities
Dams
Lakes
Streams (1:100,000)
Watersheds
Oregon Coast Coho
Spawning/Rearing
Rearing/Migration
Migration/Presence
Land Ownership
Federal
Private/Other
State/Local
Tribal
Unassigned
Water
0 2.5 5 10 15 20
Miles
N
S
E
W
Watershed code = last two digits of sub-basin code
Note: This map is for general reference only
06
07
08
09
10
11
12
Sutherlin
Winchester
Glide
Sutherlin Creek
Cooper Creek
Fraser Canyon
Short Creek
Davis Creek
Dixon Creek
Cooper Creek
Huntley Creek
Bradley Creek
Oak Creek
Fall Creek
Williams Creek
Engles Creek
Bond Creek
Jim Creek
McKay Creek
Evans Creek
Buckshot Creek
Buck Peak Creek
White Rock Creek
Mill Creek
Cavitt Creek
Plusfour Creek
Cultus Creek
Little River
Egleston Creek
Wolf Creek
Negro Creek
White Creek
Dutch Creek
Black Creek
Clover Creek
Tar Creek
Cedar Creek
Cougar Creek
Junction Creek
Hemlock Creek
Emile Creek
Bob Creek
Honey Creek
Susan Creek
Kelly Creek
McComas Creek
Shoup Creek
Harrington Creek
Miller Creek
Stoney Creek
Cobble Creek
Rock Creek
Bluff Creek
East Fork Rock Creek
Surprise Creek
Wapiti Creek
Coon Creek
Williams Creek
Fall Creek
North Umpqua River
Fox Creek
Thunder Creek
Wright Creek
Fisher Creek
Panther Creek
Fairy Creek
Bachelor Creek
Limpy Creek
Apple Creek
Dog Creek
Dry Creek
Twin Lakes Creek
Deception Creek
Calf Creek
Copeland Creek
Eagle Creek
Onion Creek
Boulder Creek
Singe Creek
Steamboat Creek
Spring Creek
Part Creek
Siwash Creek
Reynolds Creek
Johnson Creek
Bulldog Creek
Cedar Creek
Big Bend Creek
Homestead Creek
Buster Creek
Longs Creek
No Man Creek
Little Rock Creek
Canton Creek
Francis Creek
Pass Creek
Salmon Creek
Buck Creek
Grizzly Creek
Trapper Creek
St Peter Creek
City Creek
Windy Creek



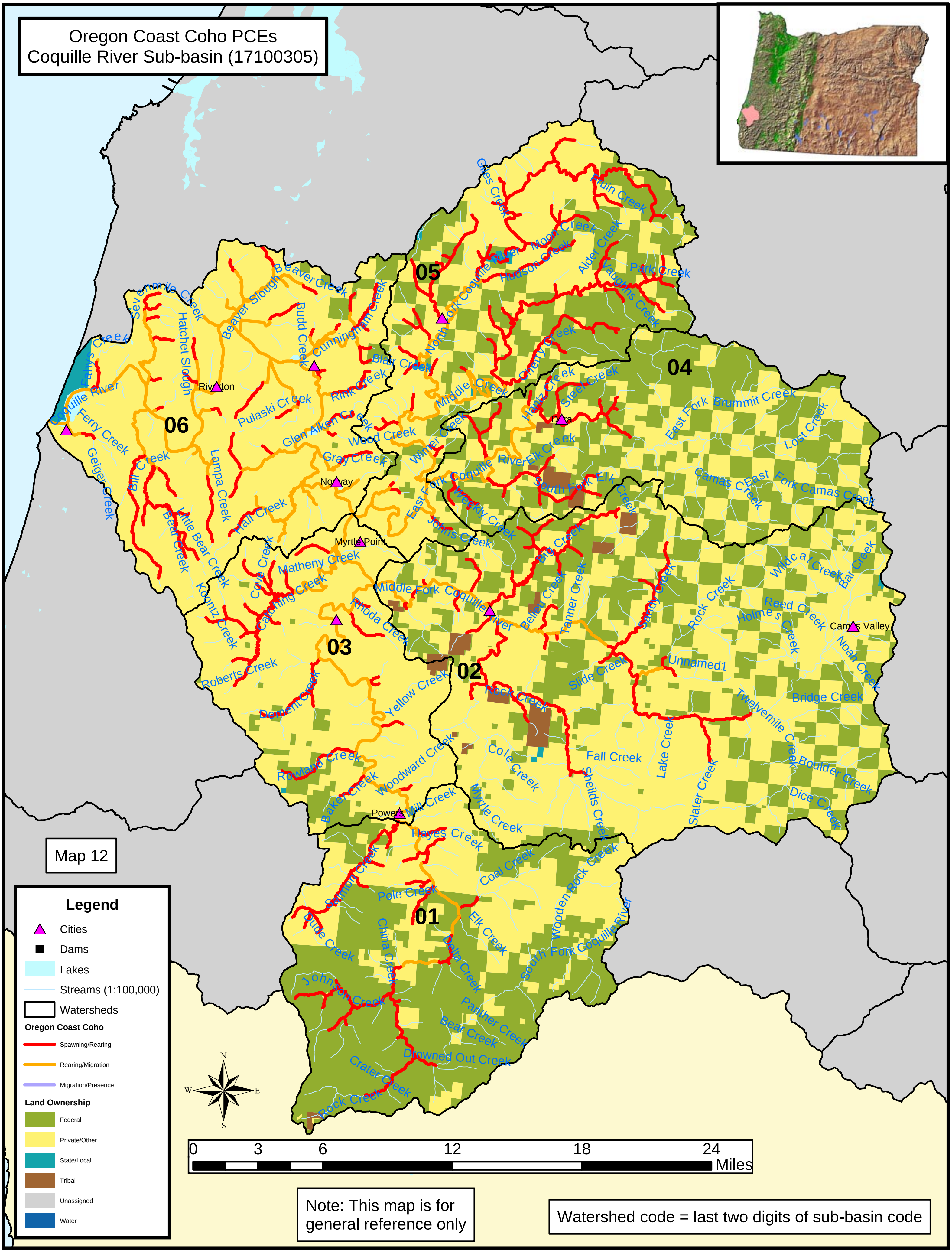
Oregon Coast Coho PCEs
South Fork Umpqua River Sub-basin (17100302)
01
02
03
04
05
06
07
08
09
10
11
12
13
Winston
Riddle
Map 9
Legend
Cities
Dams
Lakes
Streams (1:100,000)
Watersheds
Oregon Coast Coho
Spawning/Rearing
Rearing/Migration
Migration/Presence
Land Ownership
Federal
Private/Other
State/Local
Tribal
Unassigned
Water
N
S
E
W
0
3.5
7
14
21
28
Miles
Watershed code = last two digits of sub-basin code
Note: This map is for general reference only



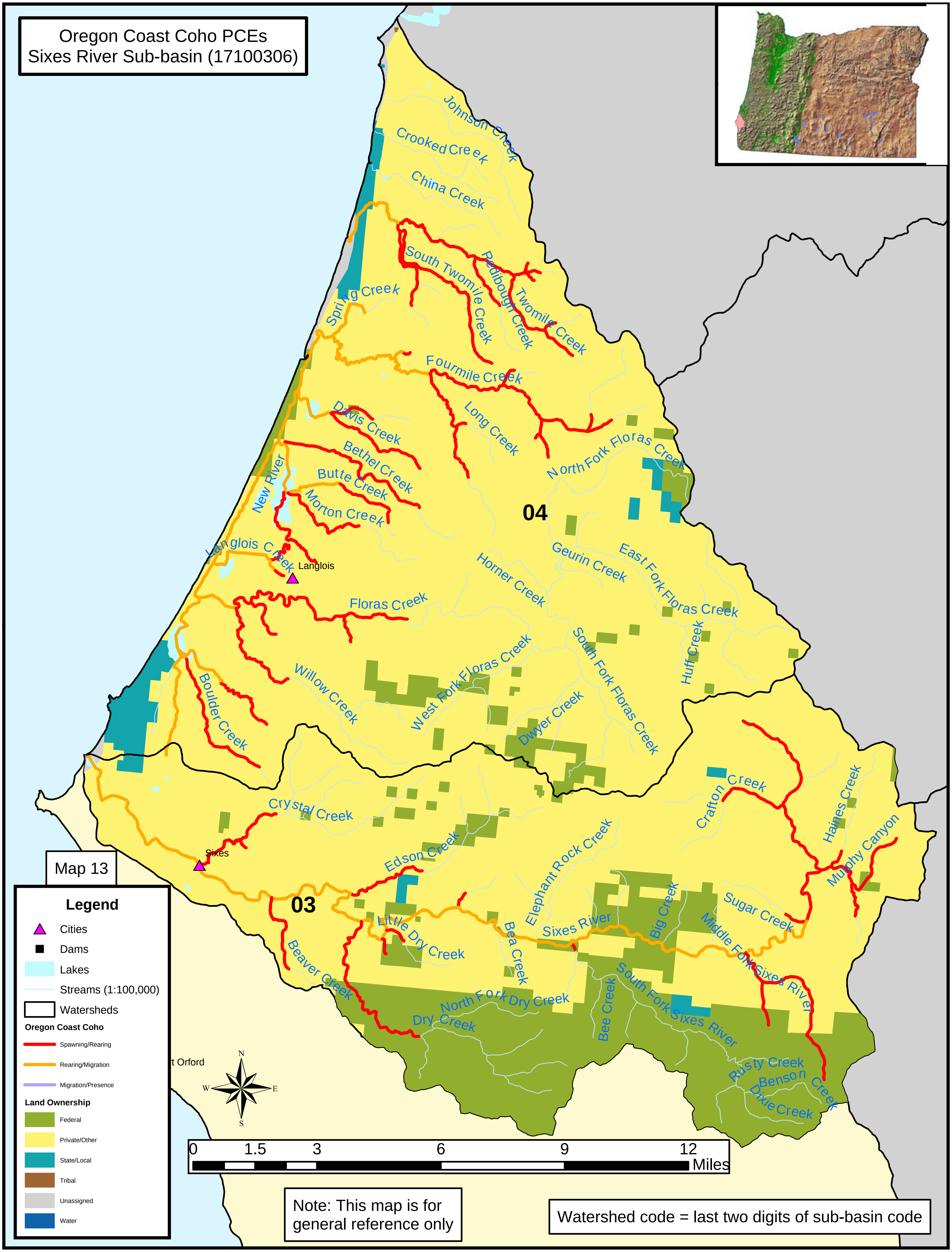
Oregon Coast Coho PCEs
Umpqua River Sub-basin (17100303)
Map 10
Legend
Cities
Dams
Lakes
Streams (1:100,000)
Watersheds
Oregon Coast Coho
Spawning/Rearing
Rearing/Migration
Migration/Presence
Land Ownership
Federal
Private/Other
State/Local
Tribal
Unassigned
Water
N
S
E
W
0
3
6
12
18
24
Miles
Note: This map is for general reference only
Watershed code = last two digits of sub-basin code
01
02
03
04
05
06
07
08
Gardiner
Reedsport
Drain
Oakland
Kentucky Creek
North Fork Smith River
Harlan Creek
Spencer Creek
Johnson Creek
Joyce Creek
Frantz Creek
Smith River
Otter Creek
Butler Creek
Winchester Creek
Oar Creek
Schofield Creek
Franklin Creek
Hardy Creek
Little Mill Creek
Vincent Creek
Beaver Creek
North Sister Creek
South Sister Creek
Cleghorn Creek
Weatherly Creek
Paradise Creek
Butler Creek
Hart Creek
Elk Creek
Tom Folley Creek
Fitch Creek
Sand Creek
Rock Creek
Pass Creek
Buck Creek
Salt Creek
Bennet Creek
Walker Creek
Lane Creek
Shingle Mill Creek
Yoncalla Creek
Halo Creek
Huntington Creek
Andrews Creek
Bear Creek
Thistleburn Creek
Hardscrabble Creek
Brads Creek
Heddin Creek
Mehl Creek
Waggoner Creek
McGee Creek
Bear CReek
Doe Creek
Yellow Creek
Marsh Creek
Wheeler Canyon
Williams Creek
Bullock Creek
Oldham Creek
Gossett Creek
Mill Creek
Calapooya Creek
Hinkle Creek
Field Creek
Gassy Creek
Banks Creek
White Creek
Dodge Canyon Creek
Coon Creek
Burke Creek
Cook Creek
Umpqua River
Turkey Creek
Coles Valley Creek
Camp Creek
Hubbard Creek
Little Wolf Creek
Miner Creek
Wolf Creek
Lost Creek
Bottle Creek
Bull Canyon
Pheasant Creek
Lake Creek
Hound Creek
Camp Creek
Soup Creek
Mattox Creek
Otter Creek
Tom Fool Creek
Sock Creek
Puckett Creek



Oregon Coast Coho PCEs
Coos River Sub-basin (17100304)
Map 11
Watershed code = last two digits of sub-basin code
Note: This map is for general reference only
Legend
Cities
Dams
Lakes
Streams (1:100,000)
Watersheds
Oregon Coast Coho
Spawning/Rearing
Rearing/Migration
Migration/Presence
Land Ownership
Federal
Private/Other
State/Local
Tribal
Unassigned
Water
0
2.5
5
10
15
20
Miles
N
S
E
W
01
02
03
04
Hauser
North Bend
Coos Bay
Bunker Hill
Tenmile Lake
Eel Lake
Eel Creek
Clear Creek
Winter Creek
Blacks Creek
Murphy Creek
Big Creek
Alder Creek
Benson Creek
Roberts Creek
Johnson Creek
Adams Creek
Knife Creek
Fish Creek
Cougar Creek
Elk Creek
Cedar Creek
Silver Creek
Glenn Creek
Matson Creek
Little Matson Creek
Beulah Creek
Fox Creek
North Slough
Palouse Creek
Larson Creek
Larson Slough
Haynes Inlet
North Inlet
Mettman Creek
Kentuck Creek
Willanch Slough
Willanch Creek
Deton Creek
Millicoma River
East Fork Millicoma River
Marlow Creek
Totten Creek
Coos Bay
Pony Creek
Echo Creek
Coos River
Smith Creek
Rogers Creek
Bessey Creek
McKnight Creek
South Fork Coos River
Big Creek
Elk Creek
Fall Creek
North Fork Bottom Creek
Bottom Creek
Skip Creek
Cox Creek
Burma Creek
Coal Creek
Williams River
Mink Creek
Shotgun Creek
Susan Creek
Burnt Creek
Bear Creek
Sow Creek
Arrow Creek
Cedar Creek
Fall Creek
Panther Creek
Fivemile Creek
Gooseberry Creek
Wilson Creek
Lost Creek
Stock Slough
Morgan Creek
Wren Smith Creek
Daniels Creek
Ross Slough
Coalbank Creek
Elliot Creek
Boone Creek
Catching Creek
Isthmus Slough
Noble Creek
Davis Creek
John B Creek
Winchester Creek
South Slough
Joe Ney Creek
Big Creek



Oregon Coast Coho PCEs
Coquille River Sub-basin (17100305)
Map 12
Legend
Cities
Dams
Lakes
Streams (1:100,000)
Watersheds
Oregon Coast Coho
Spawning/Rearing
Rearing/Migration
Migration/Presence
Land Ownership
Federal
Private/Other
State/Local
Tribal
Unassigned
Water
N
S
E
W
0
3
6
12
18
24
Miles
Note: This map is for general reference only
Watershed code = last two digits of sub-basin code
01
02
03
04
05
06
Riverton
Norway
Myrtle Point
Powers
Dora
Camas Valley
Coquille River
Ferry Creek
Geiger Creek
Bill Creek
Fahys Creek
Sevenmile Creek
Hatchet Slough
Beaver Slough
Beaver Creek
Budd Creek
Cunningham Creek
Blair Creek
Rink Creek
Pulaski Creek
Glen Aiken Creek
Wood Creek
Gray Creek
Lampa Creek
Little Bear Creek
Bear Creek
Hall Creek
Matheny Creek
Cove Creek
Catching Creek
Koontz Creek
Rhoda Creek
Roberts Creek
Dement Creek
Yellow Creek
Rowland Creek
Baker Creek
Woodward Creek
Mill Creek
Middle Fork Coquille River
Johns Creek
East Fork Coquille River
Weekly Creek
Winter Creek
Middle Creek
North Fork Coquille River
Giles Creek
Fruin Creek
Moon Creek
Hudson Creek
Alder Creek
Park Creek
Vaughns Creek
Cherry Creek
Hantz Creek
Steel Creek
Elk Creek
South Fork Elk Creek
Brummit Creek
East Fork Brummit Creek
Lost Creek
Camas Creek
East Fork Camas Creek
Bill Creek
Belieu Creek
Tanner Creek
Sandy Creek
Rock Creek
Wildcat Creek
Bar Creek
Reed Creek
Holmes Creek
Noah Creek
Unnamed1
Slide Creek
Bridge Creek
Twelvemile Creek
Boulder Creek
Dice Creek
Slater Creek
Lake Creek
Fall Creek
Shields Creek
Cole Creek
Myrtle Creek
Hayes Creek
Coal Creek
Rock Creek
Salmon Creek
Pole Creek
Dude Creek
China Creek
Elk Creek
Wooden Rock Creek
South Fork Coquille River
Johnson Creek
Panther Creek
Bear Creek
Drowned Out Creek
Crater Creek
Rock Creek



Oregon Coast Coho PCEs
Sixes River Sub-basin (17100306)
Johnson Creek
Crooked Creek
China Creek
South Twomile Creek
Redibough Creek
Twomile Creek
Spring Creek
Fourmile Creek
Davis Creek
Long Creek
Bethel Creek
Butte Creek
North Fork Floras Creek
New River
Morton Creek
04
Langlois Creek
Langlois
Geurin Creek
Horner Creek
East Fork Floras Creek
Floras Creek
Huff Creek
South Fork Floras Creek
Willow Creek
West Fork Floras Creek
Boulder Creek
Dwyer Creek
Crafton Creek
Haines Creek
Crystal Creek
Murphy Canyon
Elephant Rock Creek
Sixes
Edson Creek
Map 13
03
Big Creek
Sugar Creek
Little Dry Creek
Bea Creek
Sixes River
Middle Fork Sixes River
Beaver Creek
South Fork Sixes River
North Fork Dry Creek
Bee Creek
Dry Creek
Rusty Creek
Benson Creek
Dixie Creek
Legend
Cities
Dams
Lakes
Streams (1:100,000)
Watersheds
Oregon Coast Coho
Spawning/Rearing
Rearing/Migration
Migration/Presence
Land Ownership
Federal
Private/Other
State/Local
Tribal
Unassigned
Water
N
W
E
S
0 1.5 3 6 9 12
Miles
Note: This map is for general reference only
Watershed code = last two digits of sub-basin code

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# 4. APPENDIX A: DESCRIPTION OF THE DECISION SUPPORT SYSTEM (DSS) USED BY THE OREGON COAST CHART

**Introduction**

During the development of a critical habitat designation for the Oregon Coast coho salmon ESU the CHART was asked by policy makers to develop criteria for evaluating and rating the conservation value of HUC5 watersheds within the ESU's range. The usual approach to developing such criteria has been to combine modeled goals with expert opinion assessments of the status of populations and their habitats in relation to these goals. This development process can be difficult to document and apply consistently over many populations. The CHART chose to use a combination of aids to assist in this development, including data analysis, computer models, and expert opinion integrated onto a decision support system (DSS). The DSS assists in ensuring that expert opinion will be well documented, repeatable, and transparent. Results from the DSS can provide guidance to policy makers in evaluating which areas warrant designation or exclusion as critical habitat under the ESA. This appendix provides an overview of DSS development for this effort and key sources of information used by the CHART.

**Software Packages**

Four software packages were used in developing the DSS: ArcGIS 8.3 from Environmental Systems Research Institute, Inc., Access 2002 from Microsoft, Netweaver Developer 16.2.3 from Rules of Thumb, Inc., and Ecosystem Management Decision Support 3.0.2 (EMDS) from the U.S. Forest Service. ArcGIS is a Geographical Information Systems (GIS) software suite providing the ability to analyze and manage spatial data. Access is a relational database management system used for tabular data management and analysis. Netweaver is a fuzzy logic-based development system used for building the logical structure of the DSS. EMDS integrates the logic structure from Netweaver into the ArcGIS environment and evaluates GIS data via the DSS.

**Data Analyzed**

The DSS evaluated data on the extent of coho distribution, spawner escapement, stream habitat conditions, and geomorphic suitability. CHART members collaborated to develop methods of aggregating each dataset fifth-field watersheds. The team designed the aggregation functions to highlight differences and relationships between watersheds. This allowed the results to be consistent with the intent of the DSS to inform the team's recommendations. Coho distribution is available from the Oregon Department of Fish and Wildlife as a vector digital dataset. ODFW developed this dataset with the assistance of their district biologists throughout the state. It is digitized on the Pacific Northwest Reach File 1:100,000 scale stream network managed by Streamnet (2005), and includes information on how coho are known, or believed, to be using the areas of distribution. The DSS evaluates the proportion of digitized streams being used by coho salmon as an indicator of how widely distributed coho salmon are throughout each watershed. Coho spawner survey data is also available from ODFW. The DSS incorporates random coho spawn survey data from 1990 through 2002. When the CHART chose to include this data, they designed the DSS to highlight the differences between those watersheds that were consistently more productive than others. To do so, the DSS evaluates how the average annual spawner density of each watershed compares to the rest of the ESU within each year.

Aquatic habitat support for various life history stages is evaluated in the DSS with stream survey data provided by ODFW and USFS. The DSS evaluated support for spawning, winter rearing, and summer rearing by applying fuzzy logic curves to several measured parameters. These included average density of large woody debris, average residual pool depth, and availability of spawning gravel.

The CLAMS project at Oregon State University's Forestry Science Laboratory provided a measure of geomorphic suitability for supporting coho salmon in their Intrinsic Potential (IP) dataset for the Oregon Coast. IP is a computer-modeled expression of the suitability of the gradient, confinement, and flow characteristics of stream reaches for the rearing and migration of coho salmon. The CHART developed an IP index that expresses the relative amount and suitability of habitat in each watershed, as expressed by the IP dataset. This dataset serves both as an indicator of potential of areas to support the restoration of coho salmon populations and an indicator of the potential availability of habitat components in non-surveyed areas of each watershed.

**Decision Support System Structure**

The DSS uses a network of data nodes and operators to evaluate each watershed, resulting in a final score that reflects the various inputs. It consists of three major evaluation networks: biological features, habitat rating, and restoration potential (Figure 1). The three networks are combined with an AND operator, with the biological features network assigned twice the weight of the other networks. After the AND operator is applied, the system checks for coho use in each watershed, assigning a final truth value of -1 to watersheds outside the coho distribution.

The CHART chose to assign additional weight to the biological features network because they felt the fish were the most important indicator of which areas are essential to the ESU's survival. This additional weight is not enough to cause the biological features to override the other network results in all cases, but does reflect the expert decision making process.

**Biological Features Network**

The Biological Features topic of the Oregon Coast CHART knowledge base was intended to evaluate how well each watershed satisfies the condition that it contains biological features that require special management considerations. This evaluation considers habitat utilization, productivity, and the presence of unique population characteristics. Utilization and productivity are expressed as truth values, derived with a fuzzy logic curve, and aggregated with an AND operator. The output of this AND operator is compared to the truth value of the uniqueness component with an OR operator (Figure 2).

**Utilization**

Utilization is expressed as the proportion of stream length in the watershed that is identified as having current coho salmon use. The source data for stream length is the 1:100,000 scale PNW Reach File maintained by Streamnet (reference i). The source data for the coho distribution is the Oregon Department of Fish and Wildlife's 1:100,000 scale coho distribution layer version 11 (reference ii). We calculated the proportion of utilization by summing the total length of current, nondisputed coho distribution features (using the spawning & rearing and rearing & migration use types) in each watershed and dividing the result by the total length of Streamnet stream features.

The coho distribution features are a subset of the Streamnet stream features, allowing direct calculation of the proportion of stream length being used by coho. The 1:100,000 scale Streamnet streams layer is a wide-area coverage that should have consistent density across the area of interest. Watershed utilization proportions range from 0.0 (watersheds with no documented coho use) to over 0.9 (Figure 3). We inserted these data into the knowledge base input layer and built a use proportion curve with a truth value of -1 at 0.0 and truth value of 1 at utilization of 1.0 (Figure 4). There are clear spatial patterns of utilization proportion, with concentrations in the Nehalem, Siuslaw, Lower Umpqua, and Coos River basins (Figure 5).

**Productivity**

The model evaluates productivity based on a spawner density index that indicates areas with consistently higher than average spawner abundance, as measured by ODFW's random spawn surveys (reference iii). We calculated spawner density for each spawn survey by dividing the area under the curve (AUC) by the total survey length. We averaged the resulting AUC per mile (weighted by survey length) for each watershed within each spawning year. We then computed the average AUC per mile and standard deviation for the entire ESU within each year (based on the watershed averages). Within each spawning year, we calculated the standard deviations from the ESU mean for each watershed. Finally, we averaged the standard deviations for each ESU across all spawning years. The result of these calculations provided an indicator of which watersheds were consistently above or below the average spawner density, while compensating for year-to-year differences in return size. Clear spatial patterns emerged from spawning concentration index calculation (Figure 6). The mid-south coast area, particularly the lake systems, showed consistent and considerable densities greater than the ESU mean. The consistently highly productive systems also strongly influence the index distribution (Figure 7). Most watersheds tend to be somewhat below the ESU mean, but not substantially. We assigned a truth value to each watershed according to the curve shown in Figure 8, with the system assigning false (-1) at an IP index of -0.5 or lower and true (1) at an IP index of 0.5 or higher.

**Intrinsic Potential**

Intrinsic potential (IP) is a computer-modeled evaluation of the potential for the physical landscape to support populations of coho salmon. IP is expressed for each evaluated stream reach as a score between 0 and 1, indicating no potential for support to full potential, respectively. Each reach also has length and width data. Reaches with gradient above 7 percent are considered outside the range of potential for coho use, as are those reaches above 7 percent or greater gradient reaches and natural barriers. Coverage for the entire Oregon Coast ESU was provided by the Coastal Landscape Analysis and Modeling Study (CLAMS) (reference iv).

Intrinsic potential is an indicator of freshwater habitat only. Estuaries are not modeled in the calculation of the underlying streams, so must be considered separately. The major lake systems are assigned an IP of either 1 or 0 (reference v), and area calculated from a separate ArcInfo coverage (reference vi). Reaches with IP assigned do account for historically impassable, natural barriers to coho salmon. Dams and other human-induced blockages are not considered, nor are fishways that provide access to historically unavailable habitat reflected by the IP model (reference vii). The IP index of each watershed in this system is calculated by multiplying the IP value of each reach in the watershed by its area, then taking the sum of all reaches in the watershed and dividing by watershed area. The resulting index indicates the relative abundance of high quality reaches in each watershed while controlling for watershed size, resulting in the spatial distribution seen in Figure 9. One drawback to this index is the absence of estuarine areas from the IP dataset, leading to artificially depressed scores for the small, coastal watersheds that are dominated by estuaries. The Tillamook Bay watershed is an one such watershed.

Overall, the IP index values for all watersheds are distributed as shown in (Figure 10). We assigned a truth value to each watershed according to the curve shown in Figure 11, with the system assigning false (-1) at an IP index of 0 and true (1) at an IP index of approximately 0.01. These truth values reflect the high variability of IP of stream reaches distributed across the ESU.

**Habitat Rating**

Habitat rating is expressed as a truth value for the proposition that the streams in a watershed, on average, contain high levels of desirable habitat components relative to other watersheds in the ESU. Rather than directly evaluating the habitat conditions in each watershed against a set of benchmarks, this rating evaluates where each watershed ranks in the distribution of all watersheds for each habitat component. This avoids inappropriate application of reach-level benchmarks to watershed average conditions. It also allows the system to express a wide range of values that reflect the current conditions of habitat available to coho in the ESU.

The habitat rating truth value is the result of an AND operation on the truth values of three habitat rating networks: spawning habitat, summer rearing habitat, and winter rearing habitat. Each network uses area-weighted averages of stream habitat parameters from the habitat inventories for each watershed.

We used ODFW's basin-wide aquatic habitat inventories for watersheds in the ESU from 1990 through 2002 (reference viii). As needed, we supplemented this data with USFS level 2 stream survey data from the Siuslaw, Siskiyou, and Umpqua National Forest (reference ix). Differences in the ODFW and USFS survey protocols, particularly in the evaluation and tabulation of large woody debris, require different evaluation criteria for each agency's stream survey data. The Habitat Rating network is designed to evaluate which agency had more data available (Figure 12) and choose the appropriate network (Figure 13). Of the 82 watersheds in the ESU, 10 had more USFS data than ODFW, and 4 had no survey data available (Figure 14).

**Gradient Index**

The gradient index is an expression of the relative availability of stream reaches with a gradient appropriate for spawning and winter rearing. We calculate the gradient index from the modeled streams used for the calculation of the intrinsic potential values. For each watershed, we find the total length of all reaches with a mean gradient between 1 and 3 percent, then divide by watershed area. The resulting gradient index is nearly normally distributed, as seen in Figure 15. The curve for assigning truth values to the gradient index, shown in Figure 16, will return a false (-1) value at 0 and true (1) at about 0.00058. Figure 17 shows the spatial distribution of gradient index values.

**Spawning Habitat**

The Spawning Habitat topic receives a truth value from the AND operator combining truth values from the average percentage of gravel in riffles and the gradient index (Figure 18). Gravel is defined as particles between 2 and 64 mm in diameter in both ODFW (reference x) and USFS (reference xi) data, and we considered only the percentage of the substrate in riffles which was composed of gravel. Figure 19 shows the distribution of gravel in riffles, with a mean around 38 percent. Gravel is given a truth value based on the curve in Figure 20, and the gradient index is given the value based on the curve in Figure 16. The final truth values for spawning habitat (for ODFW data only) are shown on the map in Figure 21.

**Summer Habitat**

The Summer Habitat topic receives a truth value from the AND operator combining truth values from the average residual pool depth and the number of pieces of large woody debris (LWD) per 100 meters of stream surveyed (Figure 22). Each is given a truth value based on a curve with a score of 0 evaluating to false (-1) and the maximum value for that parameter (among all watersheds) evaluating to true (1). The CHART selected LWD per 100 meters as an analytical component because of the cumulative impact of all LWD, regardless of size, on the availability of summer rearing habitat. The ODFW survey data includes all LWD with a diameter of 15 cm or greater and length of 3 m or more (reference viii). USFS survey data (for forests west of the High Cascades) only includes LWD greater than 12 inches (30.5 cm) in diameter and 25 ft (7.6 m) long (reference ix). Using the ODFW survey dataset, watersheds average around 11 pieces per 100 meters (Figure 23). The curve for LWD, shown in Figure 24, will return false (-1) at 0 pieces per 100 m and return true (1) at about 30.14 pieces per 100 m. Average residual pool depth averages 0.7 m across all watersheds and is distributed as shown in Figure 25. The curve for residual pool depth will return false (-1) at 0.3 m (the minimum measured) and return true (1) at 1.7 m, as shown in Figure 26.

The final truth values from the ODFW summer habitat network are displayed in Figure 27. All watersheds scored below zero, indicating only poor to moderate support for the presence of both high LWD and residual pool depth. A few watersheds have accumulations of both parameters and received truth values as high as -0.069.

**Winter Habitat**

The Winter Habitat topic receives a truth value from an AND operator combining truth values from the gradient index with an OR operator combining the average number of key pieces of large woody debris per 100 meters of stream surveyed, and average percentage of reach area that is in sheltered pools (Figure 28). The gradient index is given the value based on the curve in Figure 15.

This network uses an OR operator to pass the higher truth value from evaluating the number of pieces of key LWD per 100 m and the percent of stream area in sheltered pools. The CHART believed these two factors provide similar functions in winter survival and should be evaluated based on which is more prevalent.

The CHART selected key pieces of LWD per 100 m for evaluation as winter habitat because of the strong relationship between very large LWD and appropriate winter rearing for juvenile coho. ODFW's key pieces of LWD measure is roughly equivalent to the USFS medium and large LWD measures combined, with minimum sizes of 0.6 m diameter and 10 m long versus 24 inches (0.61 m) diameter and 35 ft. (10.7 m) long, respectively. Most watersheds contain few key pieces of large wood, as indicated in Figure 29. The truth value for key pieces of wood is assigned based on the curve shown in Figure 30, with false (-1) at 0 pieces per 100 m and true (1) at 1.72 pieces per 100 m.

Sheltered pools are defined as backwaters, eddies, isolated pools, alcoves, beaver dams, and pools on secondary channels. The average percentage of surveyed stream area in sheltered pools for each watershed varies from 0 to 58 percent, shown in Figure 31. The result for each watershed is given a truth value based on the curve shown in Figure 32, returning false (-1) at 0 percent and true (1) at 58 percent.

The resulting truth values, shown on the map in Figure 33, are mostly below zero. The lowest truth value is -0.995 and the highest is 0.864. Sixty-two of the sixty-nine watersheds received a winter habitat truth value below zero, indicating poor to moderate support for the proposition that these watersheds have accumulations of all factors for winter habitat.

**Combined Habitat Rating**

Combining the results of the ODFW and USFS habitat rating networks (Figures 34 and 35) produces an overall habitat rating for most watersheds (Figure 36). All watersheds (among those with enough data to be rated) received a combined truth value below zero, as shown in . However, there is variation between watersheds throughout the ESU, shown in Figure 37. A key underlying factor in the combined habitat rating is the way the decision support system evaluate the habitat data. In order for a watershed to score well in the combined habitat rating, it must be among the best watersheds for all habitat rating parameters. This condition is not present in any of the rated watersheds, leading to the overall very poor scores seen in the rating. If we were to evaluate the combined habitat rating using a series of OR nodes instead of AND nodes, the final scores would probably be much higher. However, the team expressed a desire to identify those watersheds with the best of all conditions. Evaluating all the habitat parameters in a single evaluation node (i.e., discarding the individual habitat type ratings) would identify those watersheds with the highest levels of combined habitat parameters, but would not lend any insight to which watersheds have best support for each life history stage.

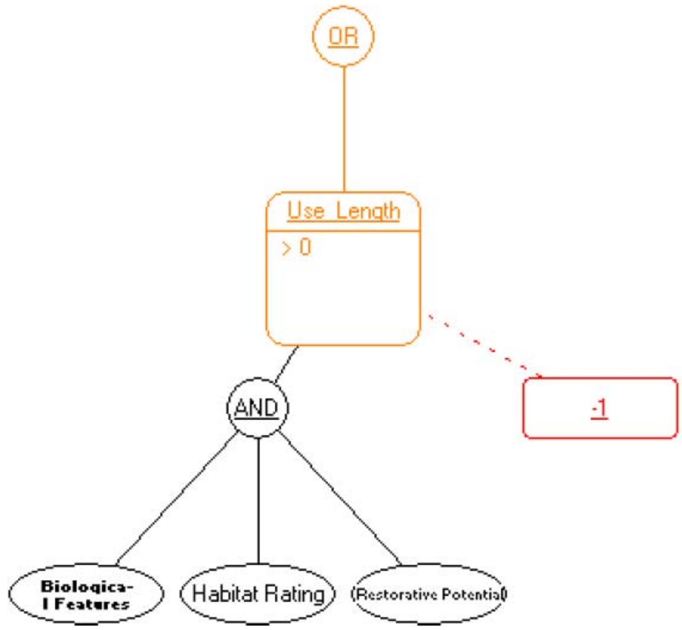


Figure 1. The top levels of the DSS test for coho distribution within each watershed and combine the scores of the lower networks.

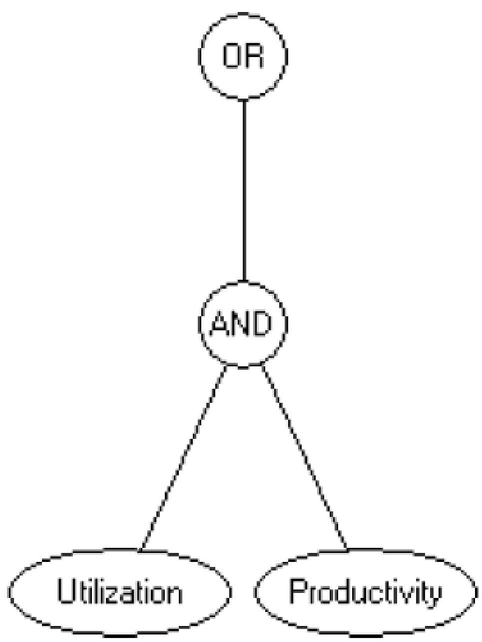


Figure 2. The truth values for Utilization and Productivity are aggregated with the AND operator, then compared with the Uniqueness truth value with an OR operator.

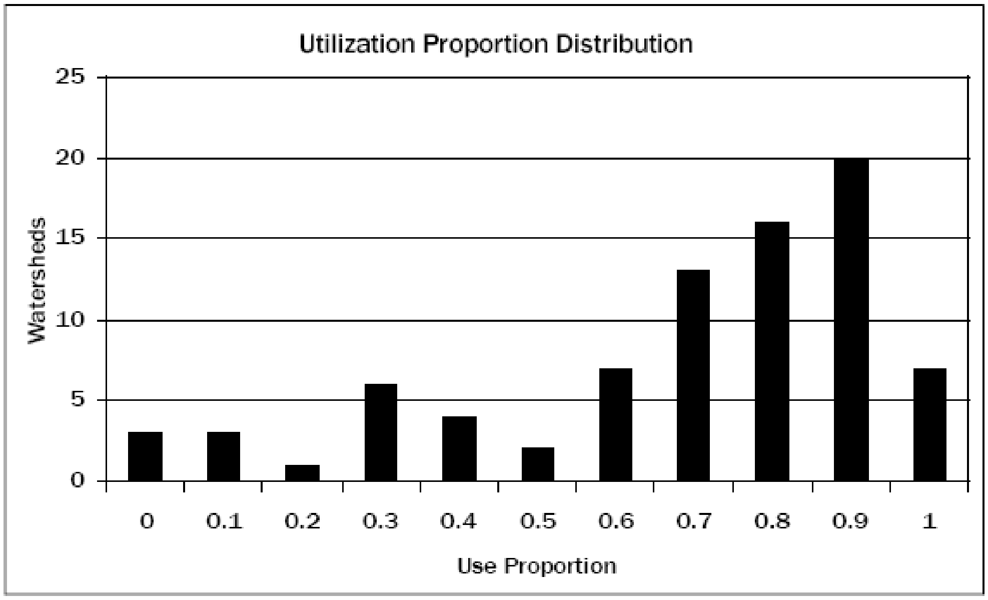


Figure 3. The proportion of coho utilization ranges from 0 to over 0.9, with the majority above 0.5.

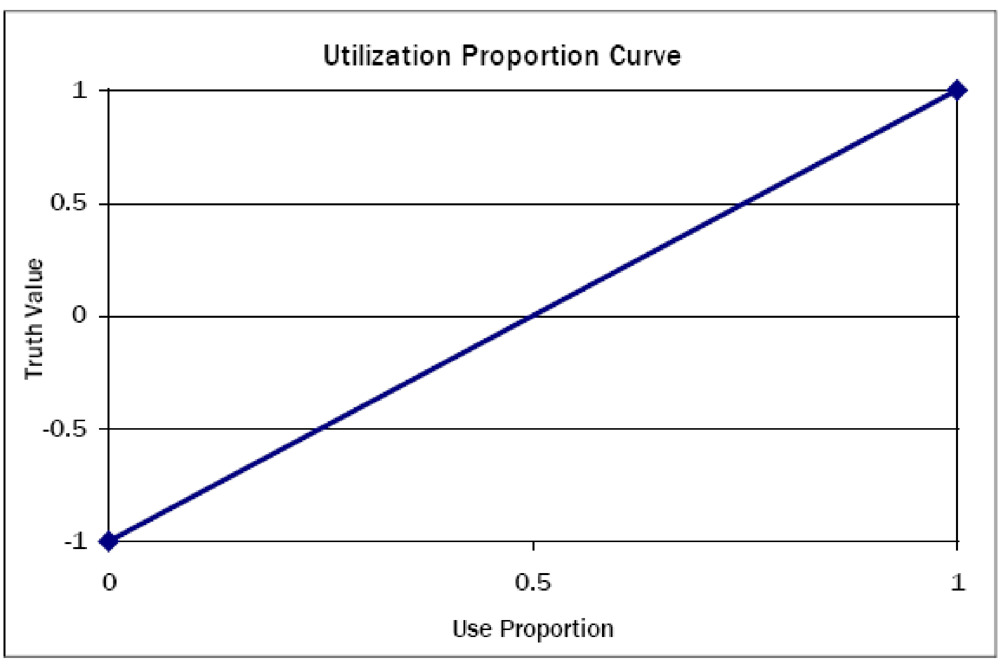


Figure 4. The utilization proportion curve is defined with truth value -1 at 0.0 utilization and 1 at 1.0 utilization.

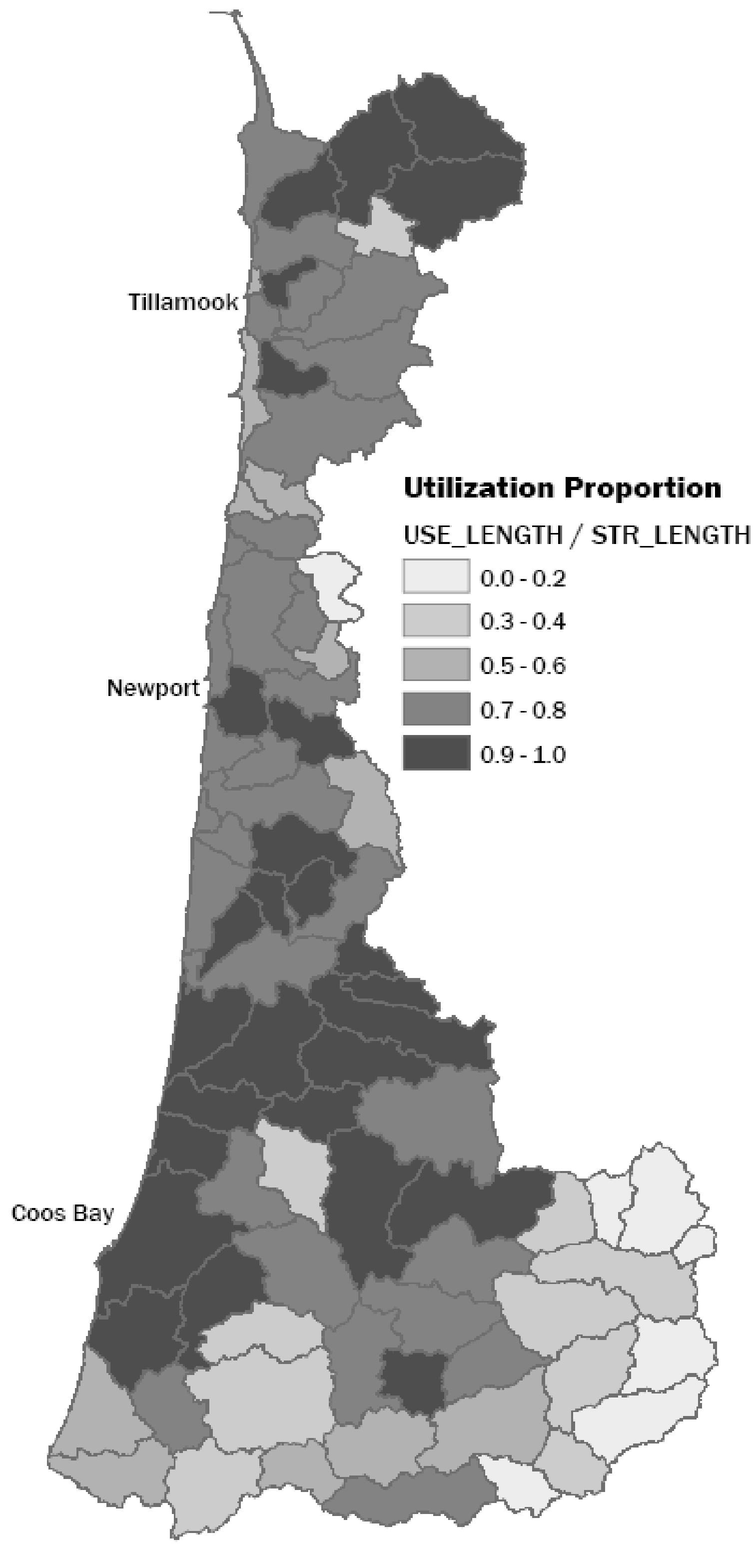


Figure 5. This map illustrates the spatial distribution of utilization proportion values throughout the Oregon coast coho ESU.

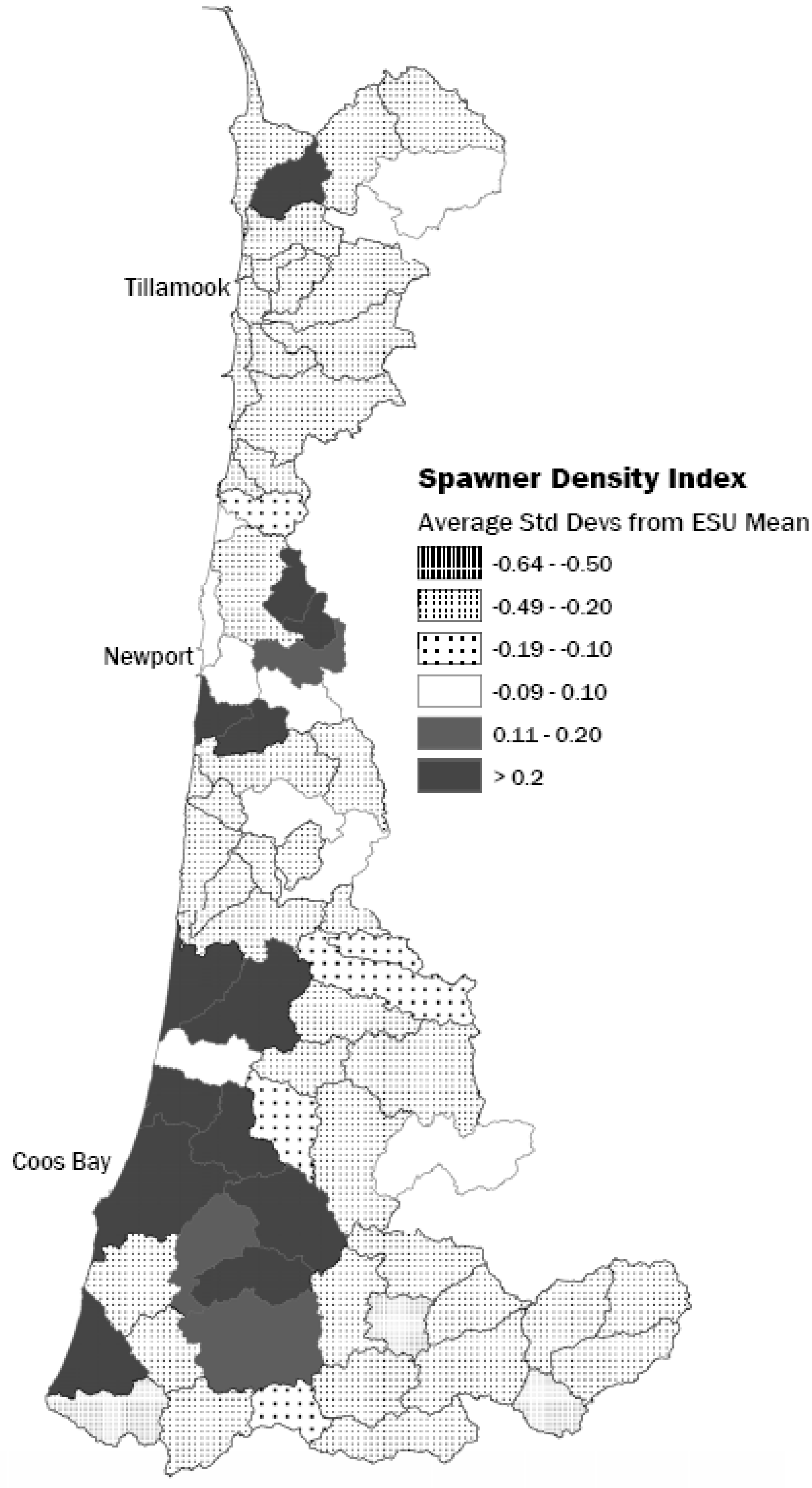


Figure 6. This map illustrates the areas with consistently above or below average spawning densities.

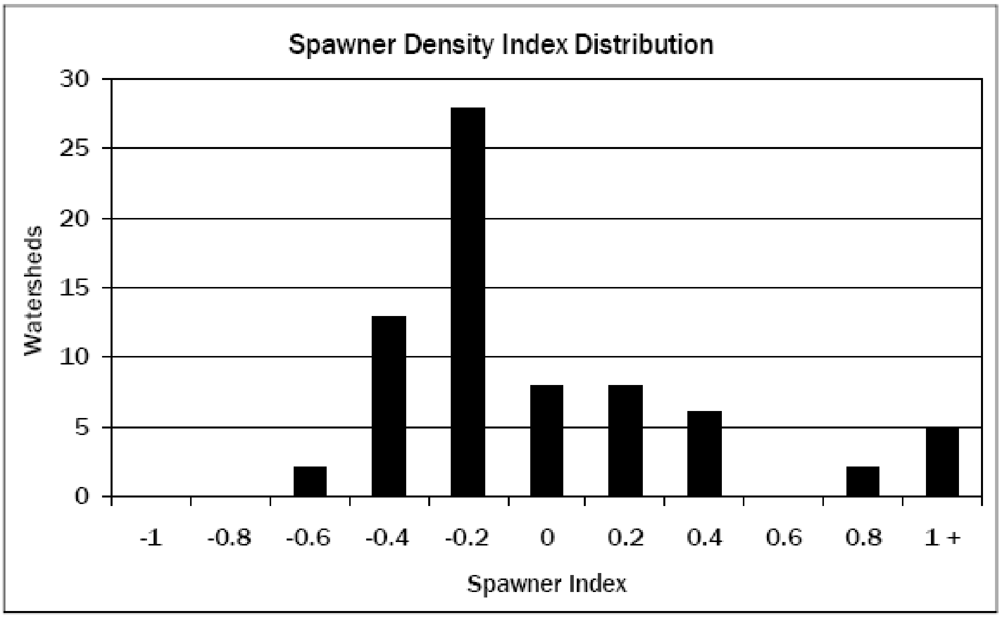


Figure 7. The spawner density index distribution reflects the large impact of a few highly productive systems on the mean spawner abundance.

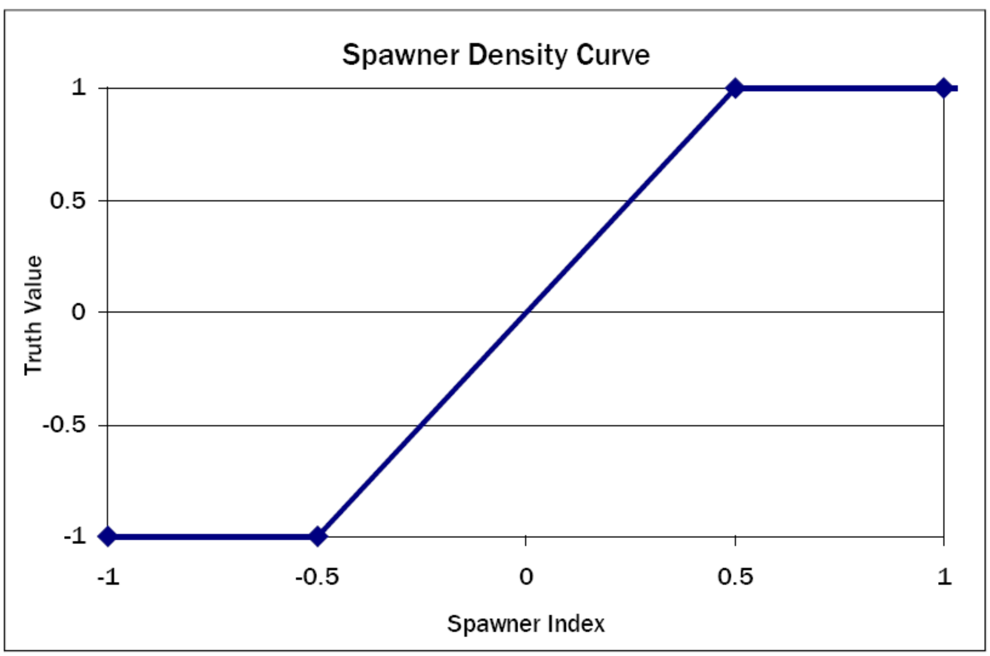


Figure 8. The spawner density index curve returns false (-1) for values below -0.5 and true (1) for values above 0.5.

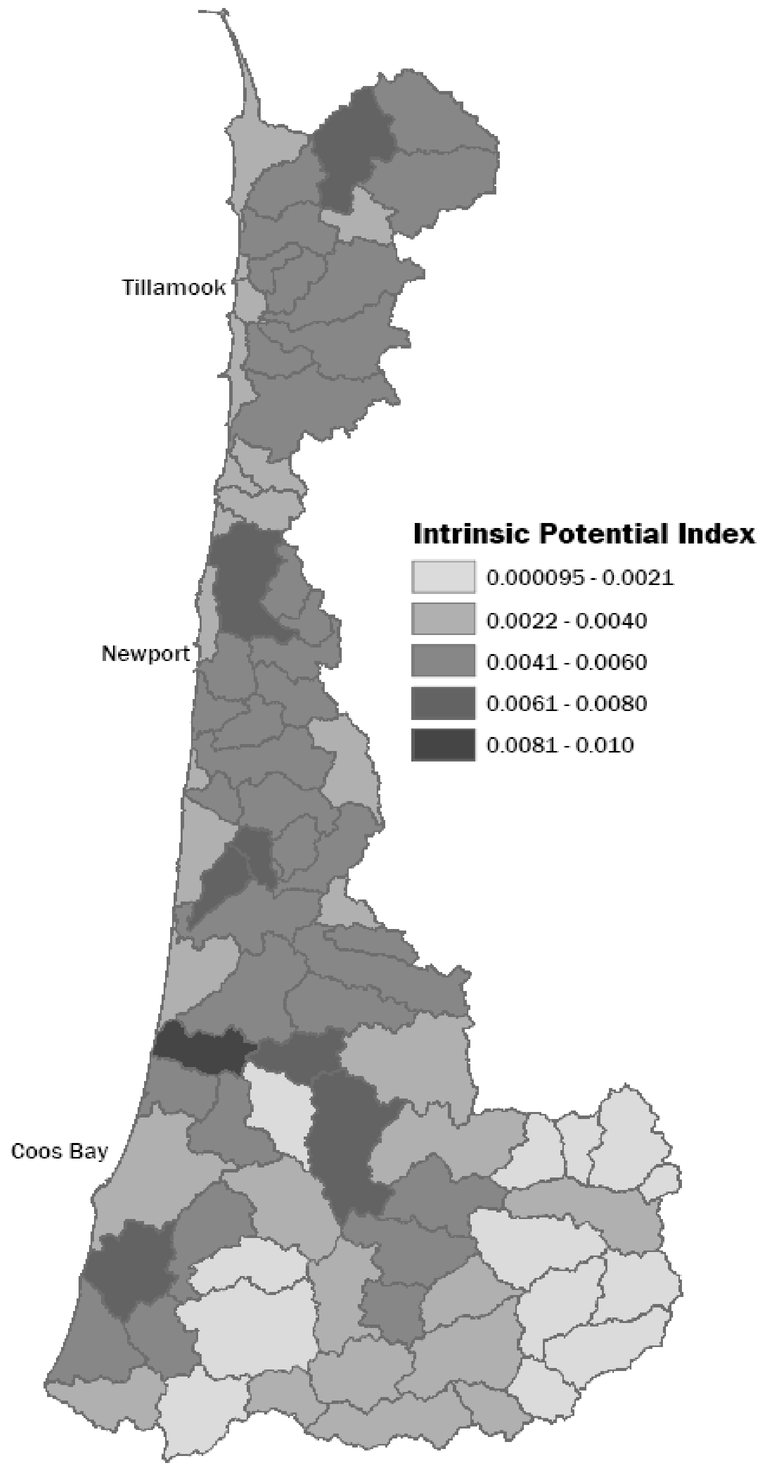


Figure 9. The intrinsic potential index is distributed across the landscape with higher values in areas with large, low gradient, unconfined stream reaches. Lake areas are not taken into consideration in this map.

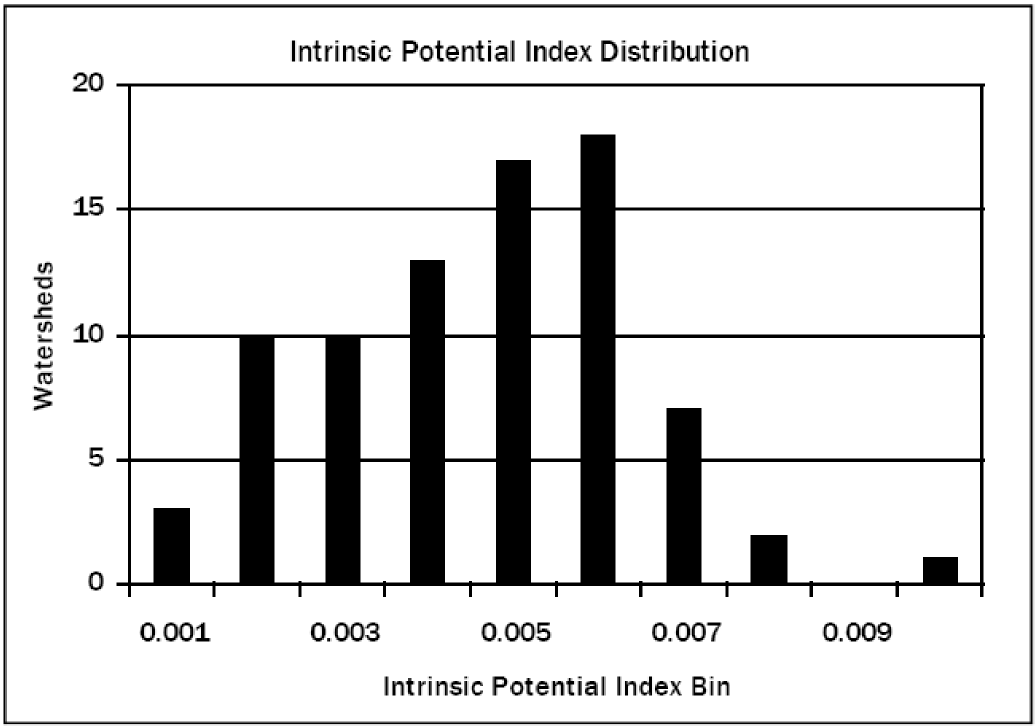


Figure 10. The intrinsic potential index distribution reflects the high abundance of mid-potential streams in most watersheds.

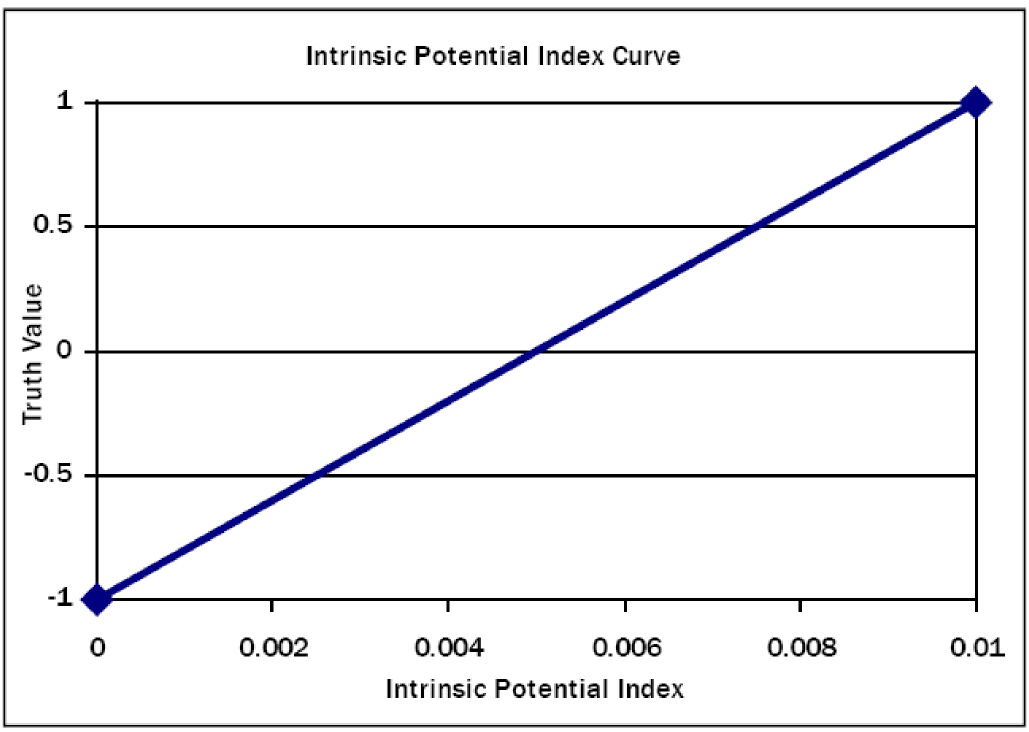


Figure 11. The intrinsic potential curve is false (-1) at 0 and true (1) at about 0.01

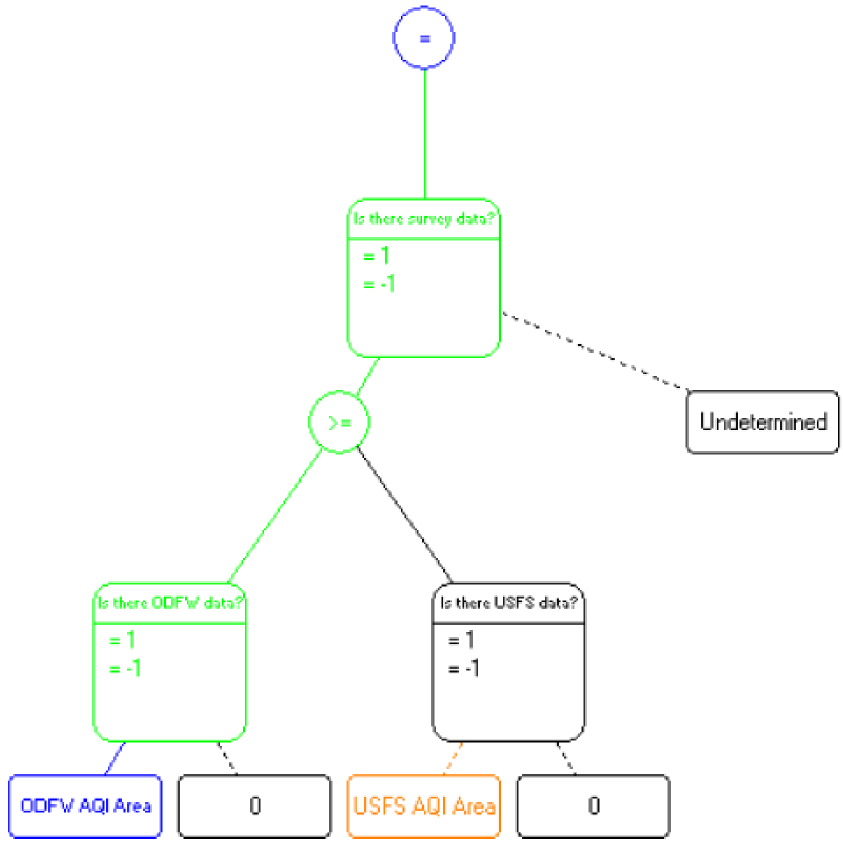


Figure 12. The "Is there more ODFW AQI area or USFS" data switch first tests if any survey data exists, then compares each agency's survey area to the other.

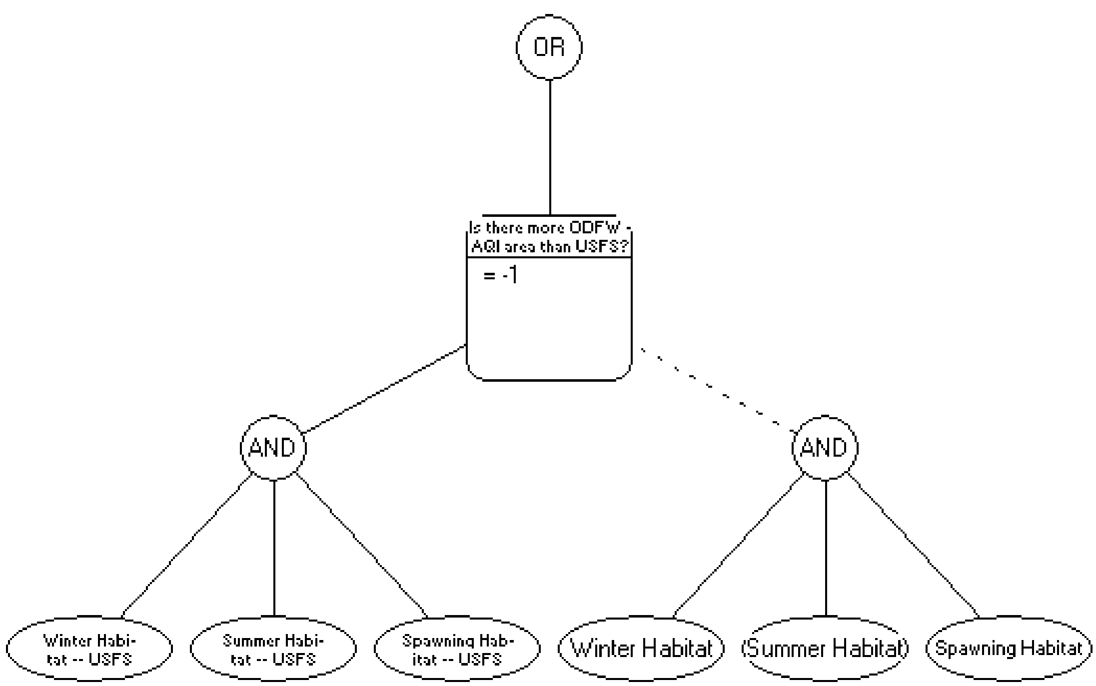


Figure 13. The Habitat Rating network evaluates ODFW and USFS stream survey data separately, depending on which group of data has a greater area surveyed.

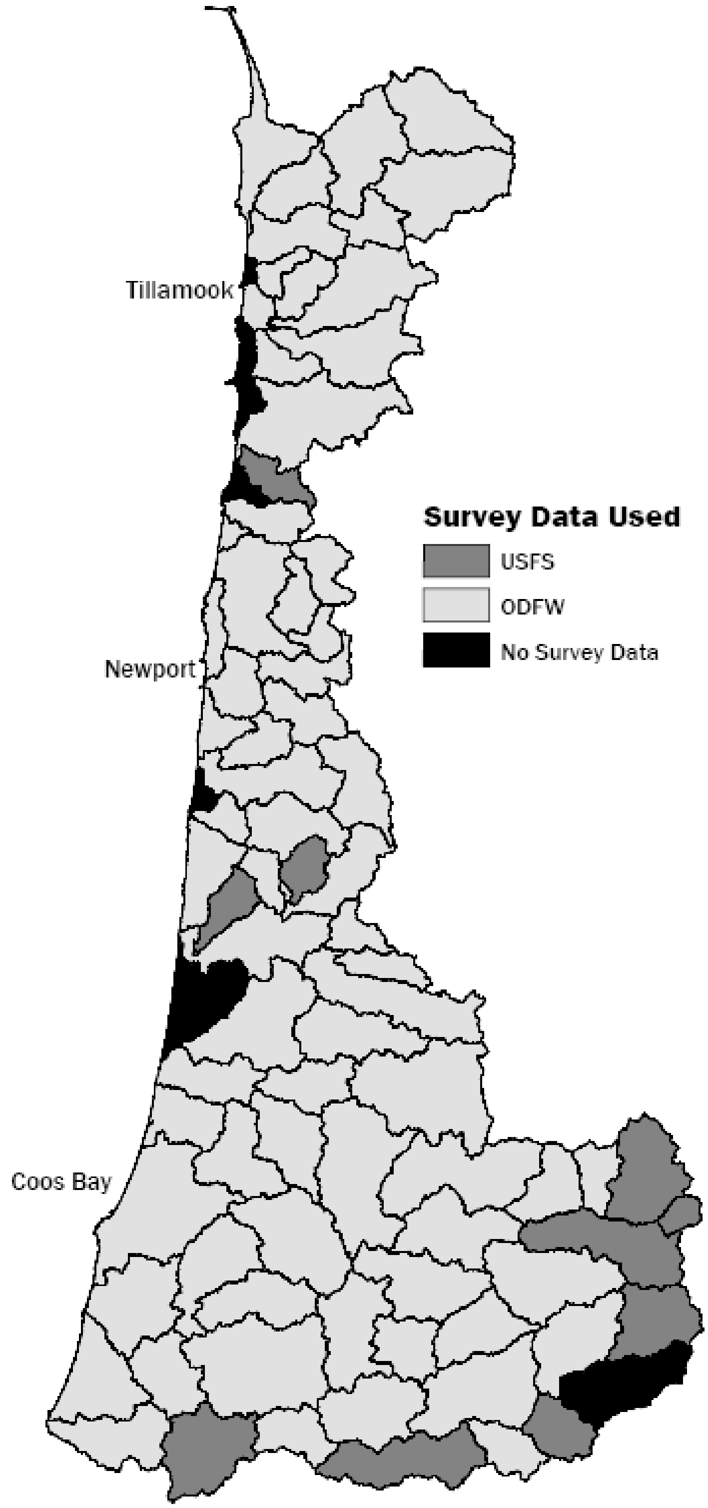


Figure 14. Only four watersheds have neither USFS nor ODFW stream survey data. For other watersheds, the system chose the data with the greatest survey area in the watershed.

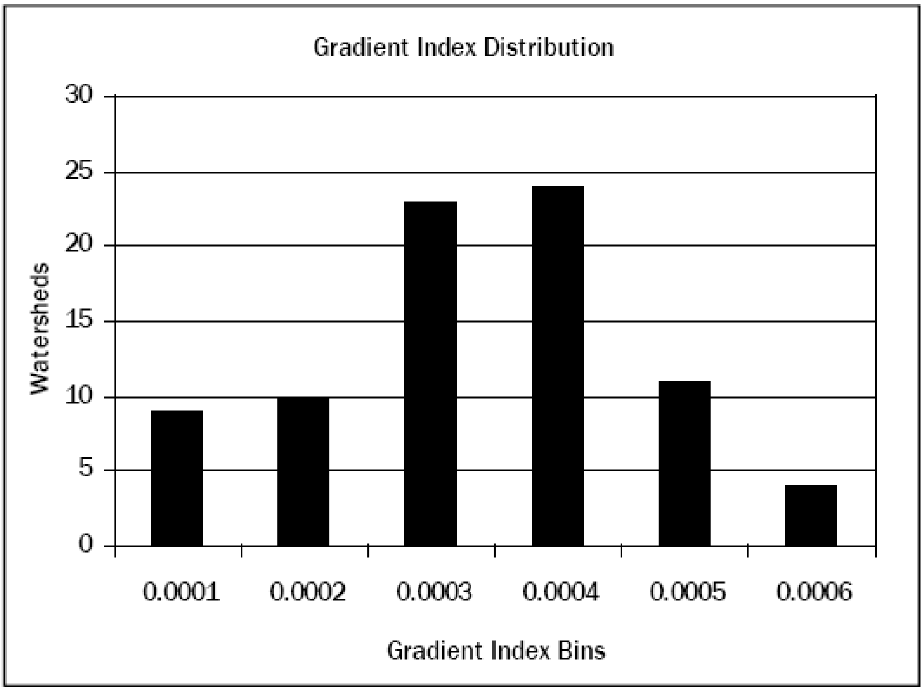


Figure 15. Gradient index is approximately normally distributed. This distribution indicates a range of availability of reaches with appropriate gradient for spawning and rearing.

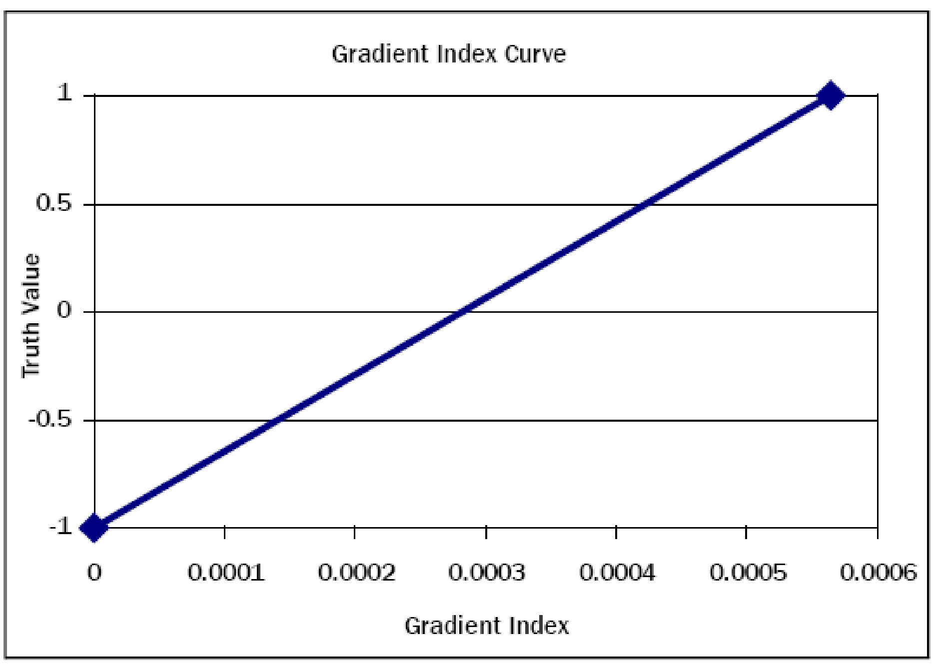


Figure 16. The gradient index will return a false (-1) truth value at 0 and a true (1) value at approximately 0.00058.

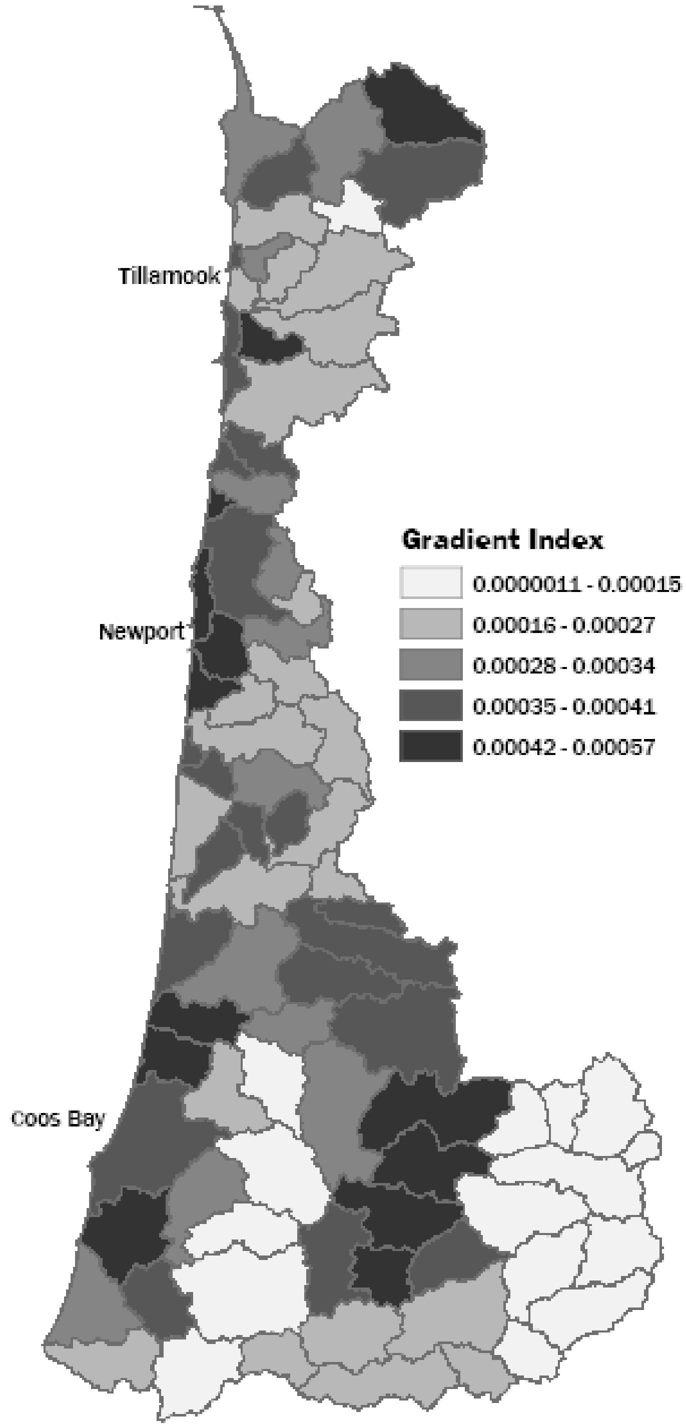


Figure 17. The gradient index indicates the relative abundance of stream reaches with gradient between 1 and 3 percent.

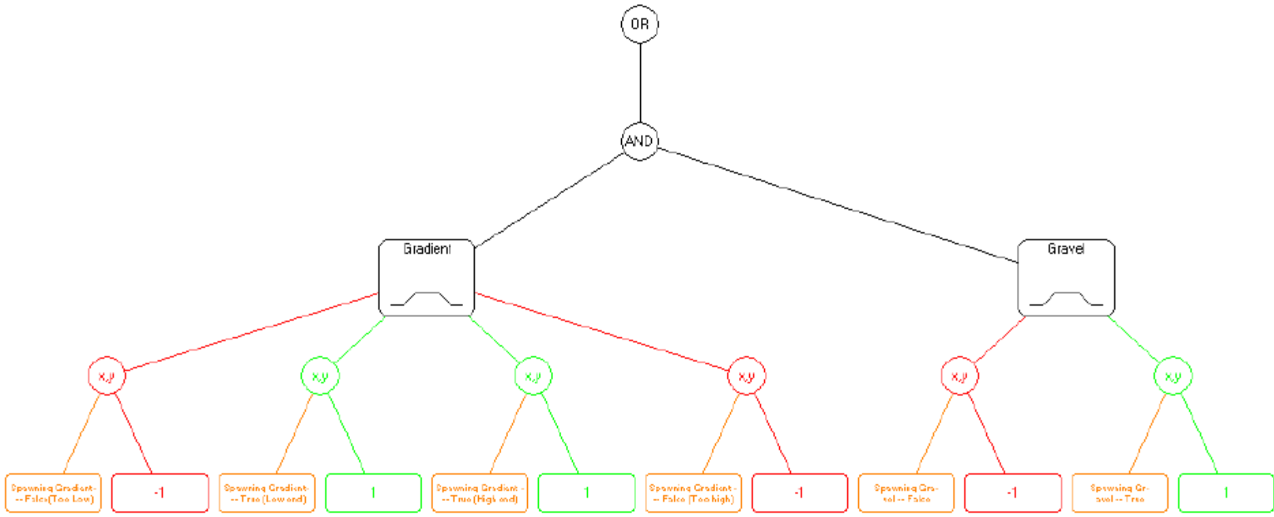


Figure 18. The network for Spawning Habitat evaluates both gradient and gravel in riffles.

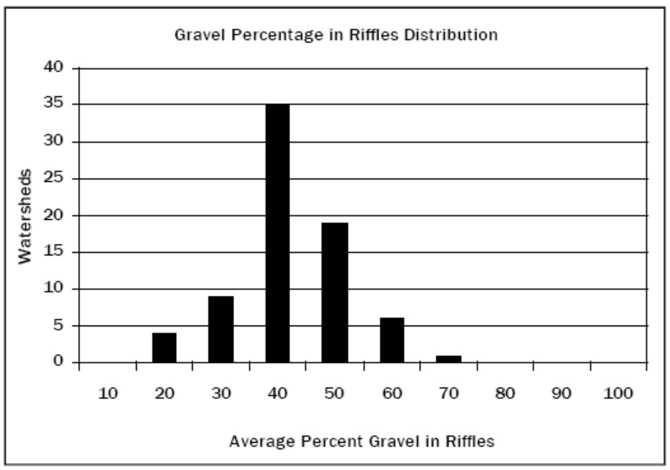


Figure 19. The average percentage of gravel in riffles is an indication of availability of suitable spawning sites, and is nearly normally distributed.

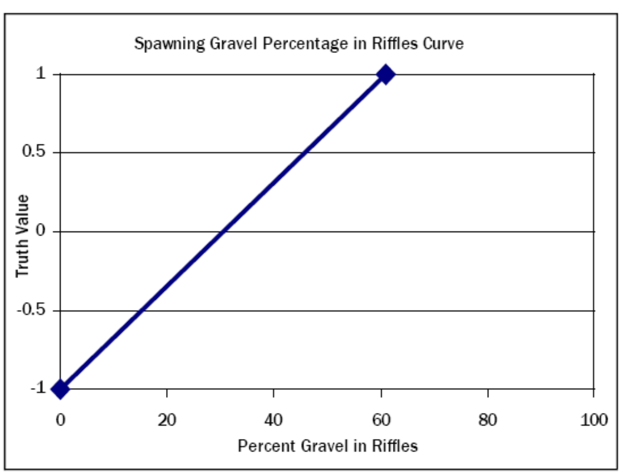


Figure 20. The spawning gravel truth value will be false (-1) for 0 percent and true (1) for 61 percent.

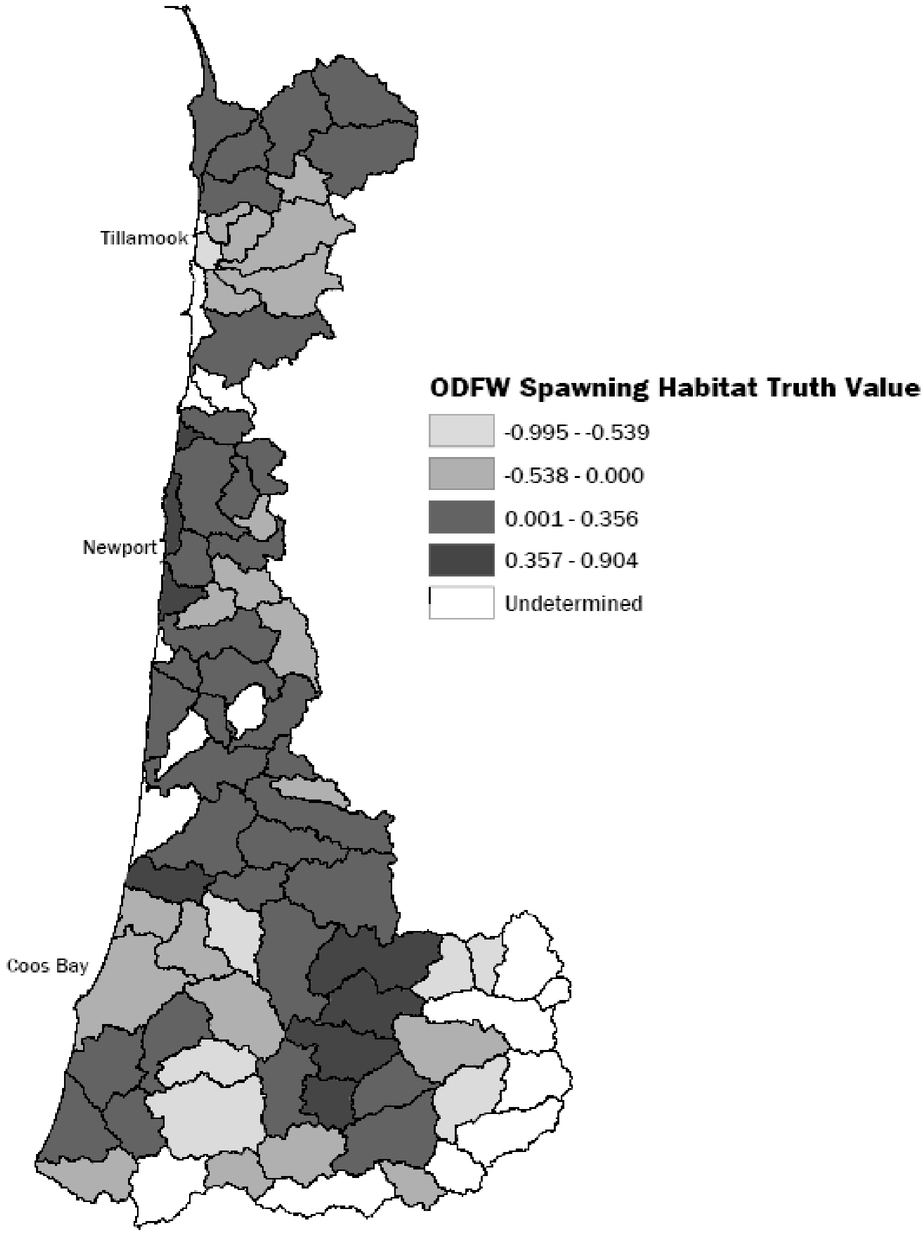


Figure 21. Distribution of ODFW Spawning Habitat truth values.

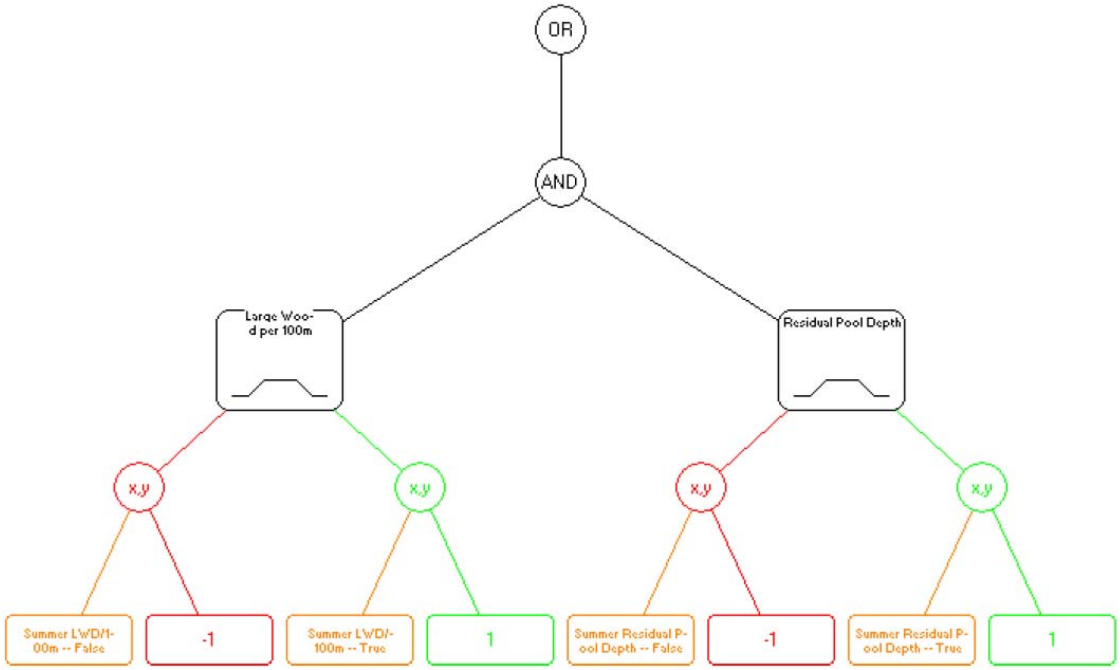


Figure 22. The Summer Habitat network evaluates the number of pieces of large wood per 100 meters and the average residual pool depth.

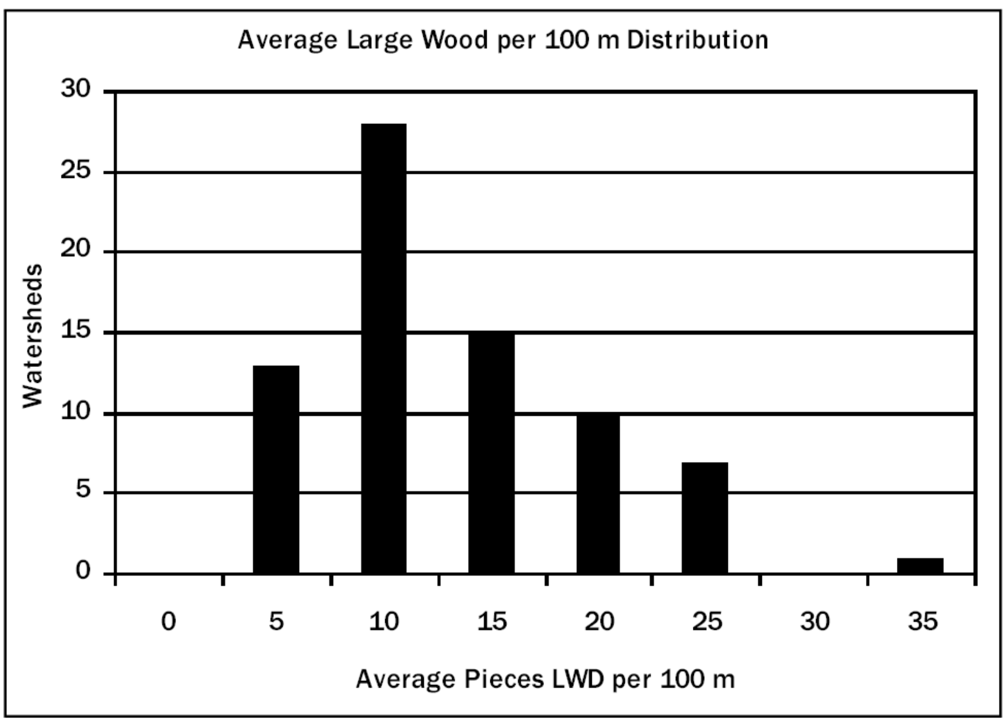


Figure 23. The average number of pieces of large wood (in the ODFW records) per 100 meters is mostly distributed below 20 pieces per 100 meters.

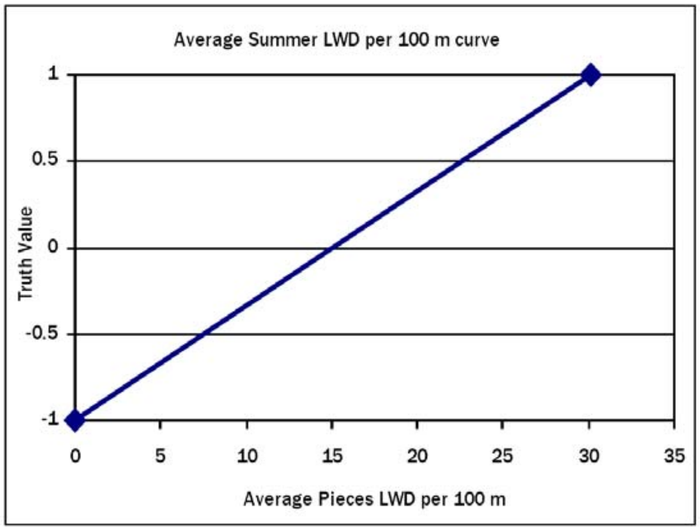


Figure 24. The Summer large wood curve will return a false value (-1) on 0 pieces of wood per 100 m and true (1) on values of about 31 pieces.

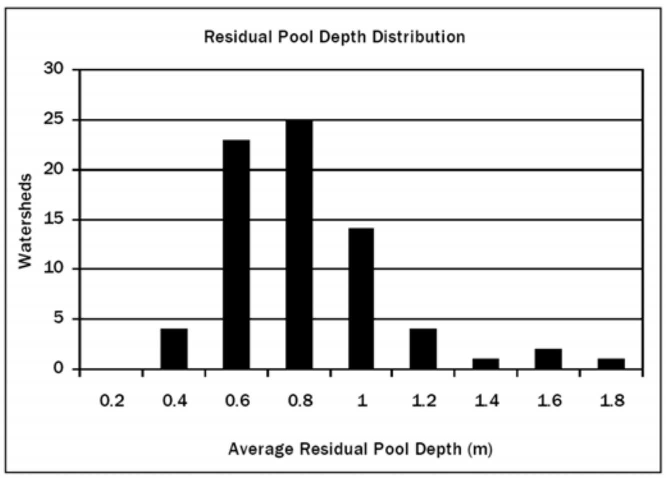


Figure 25. Residual pool depth is approximately normally distributed, with a mean around 0.7 meters.

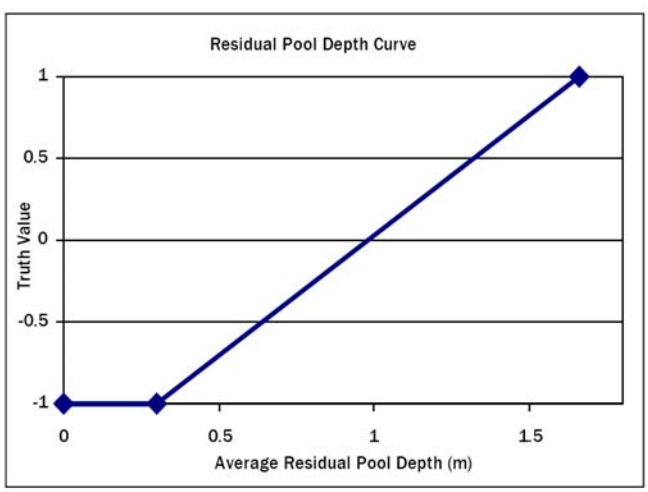


Figure 26. The ODFW residual pool depth curve will be false below 0.3 m (the minimum measured in the ODFW dataset) and true at 1.72.

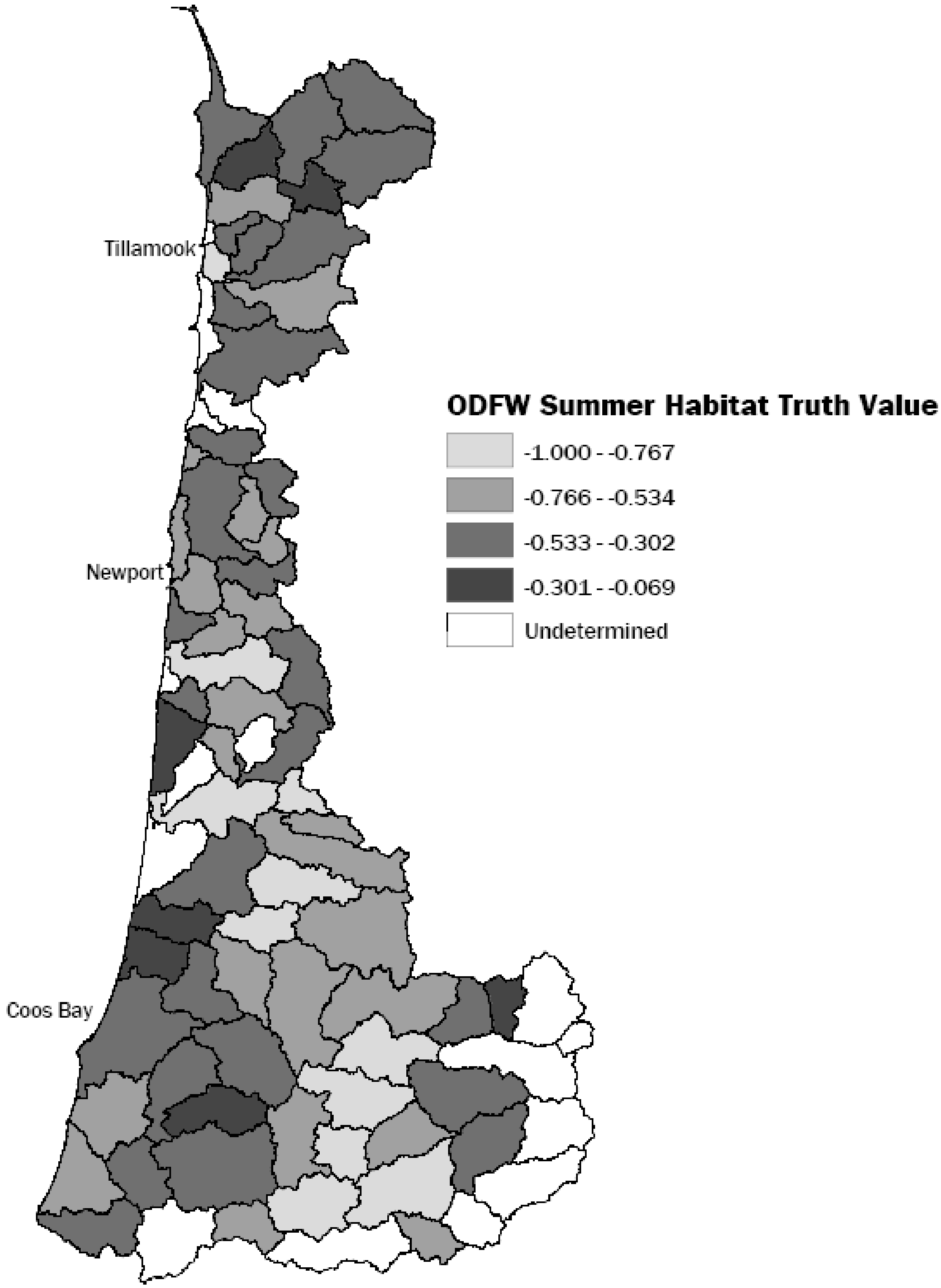


Figure 27. Distribution of all truth values for summer habitat are below zero.
The highest value is about -0.007.

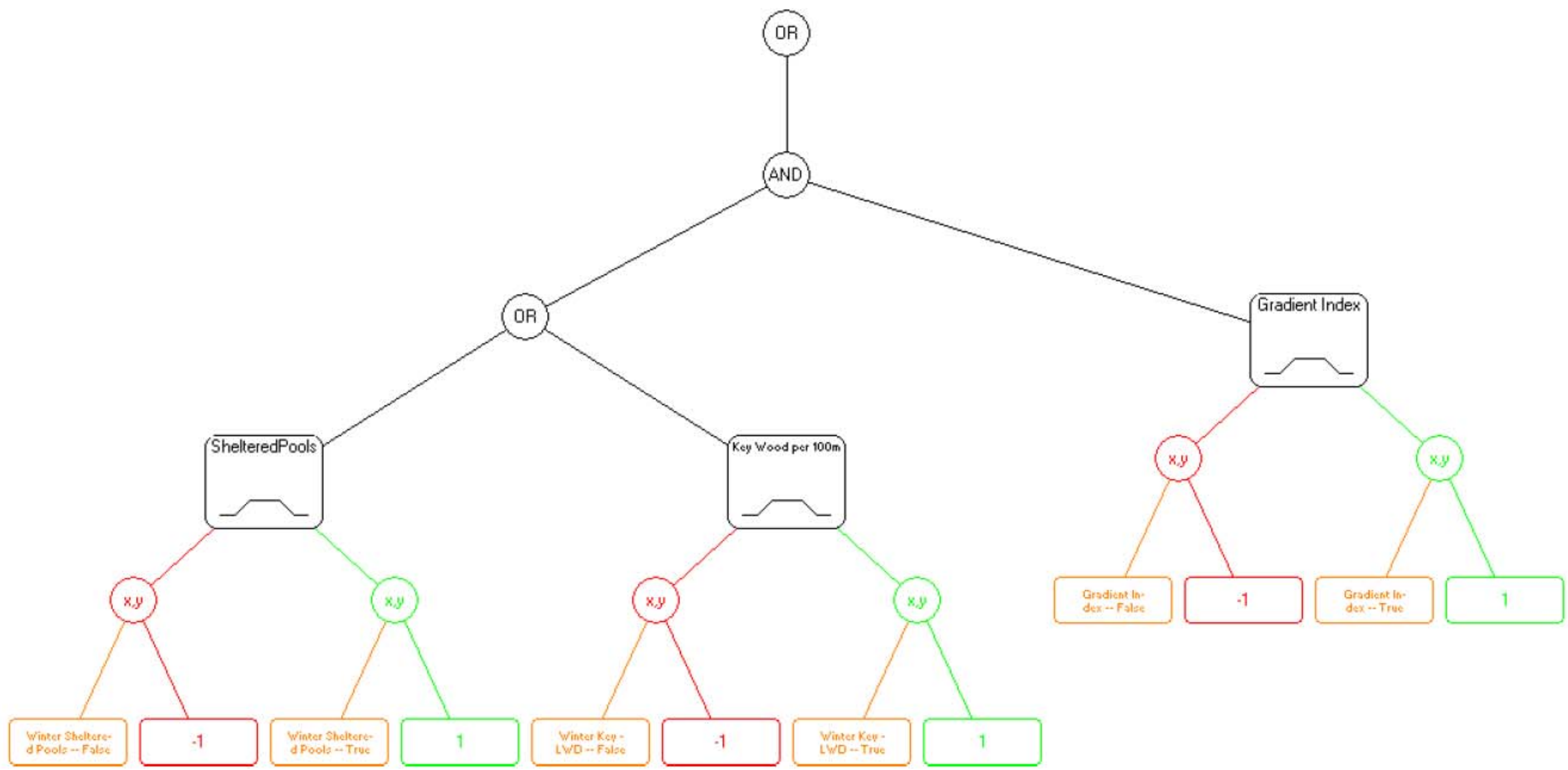


Figure28. The Winter Habitat network evaluates gradient, percentage of area in sheltered pools, and large woody debris per 100 m. The gradient rating curve for winter habitat is different from the spawning habitat curve to reflect the different habitat needs of overwintering juvenile coho from incubating eggs.

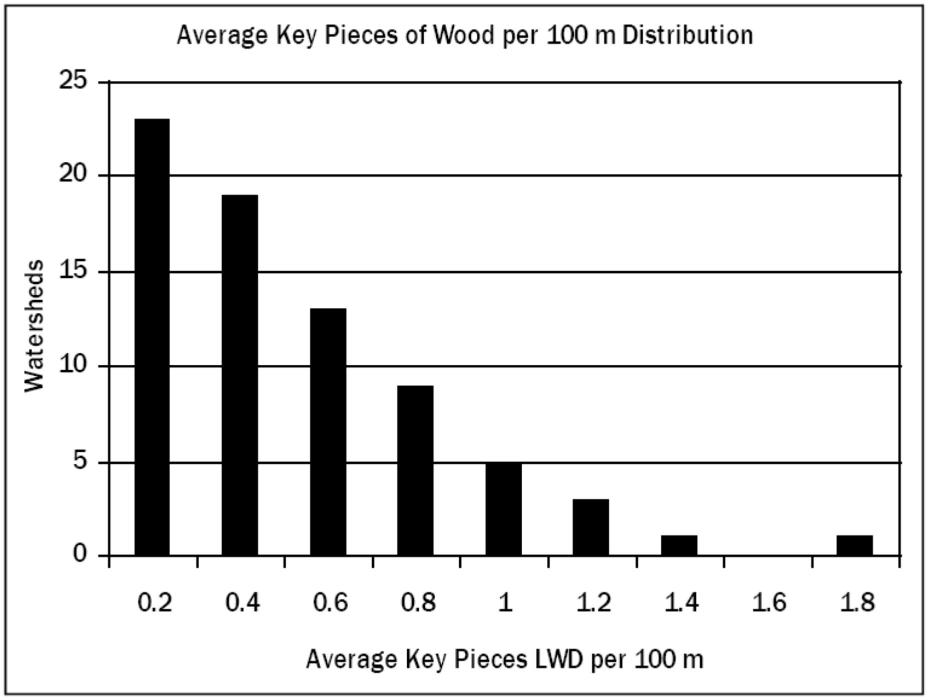


Figure 29. Most watersheds average below 0.6 pieces of key large woody debris per 100 meters of stream channel.

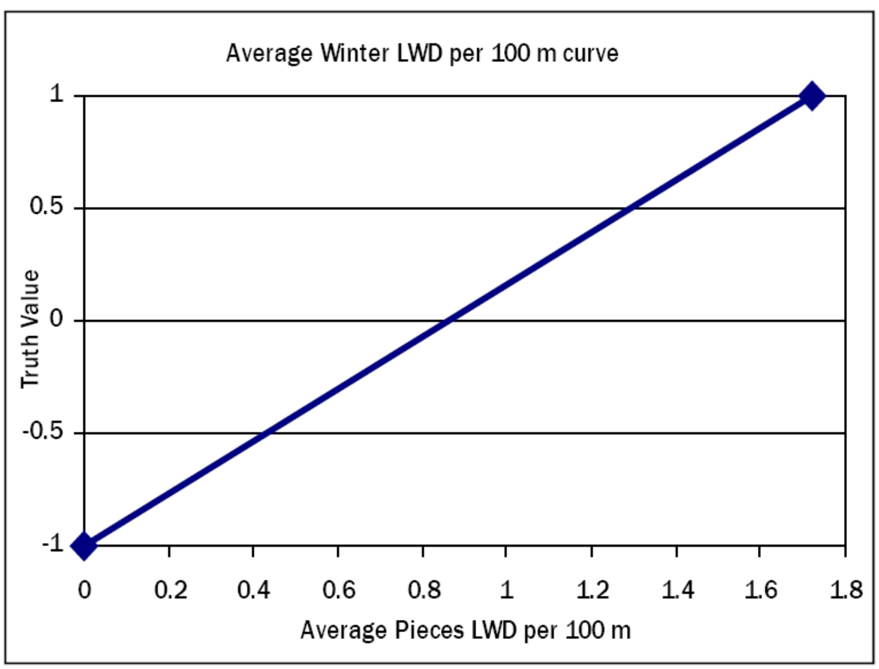


Figure 30. The winter key large woody debris curve will return a truth value of false (-1) for watersheds at 0 key pieces per 100 m, and true (1) for inputs at 1.62 pieces per 100 m.

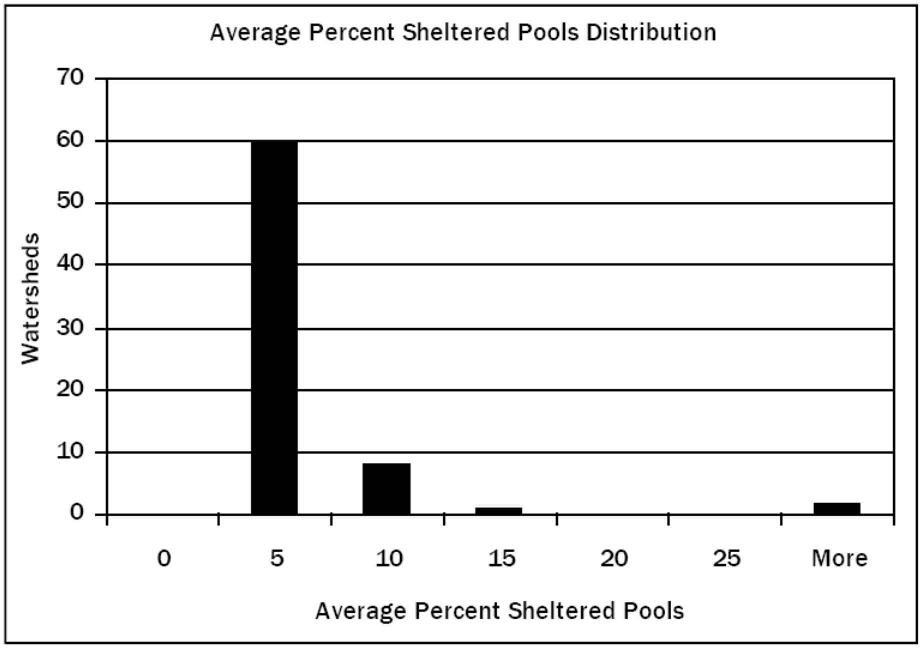


Figure 31. Most watersheds average less than five percent of channel area in sheltered pools. These pools include backwaters, beaver dams, secondary channel pools, and alcoves.

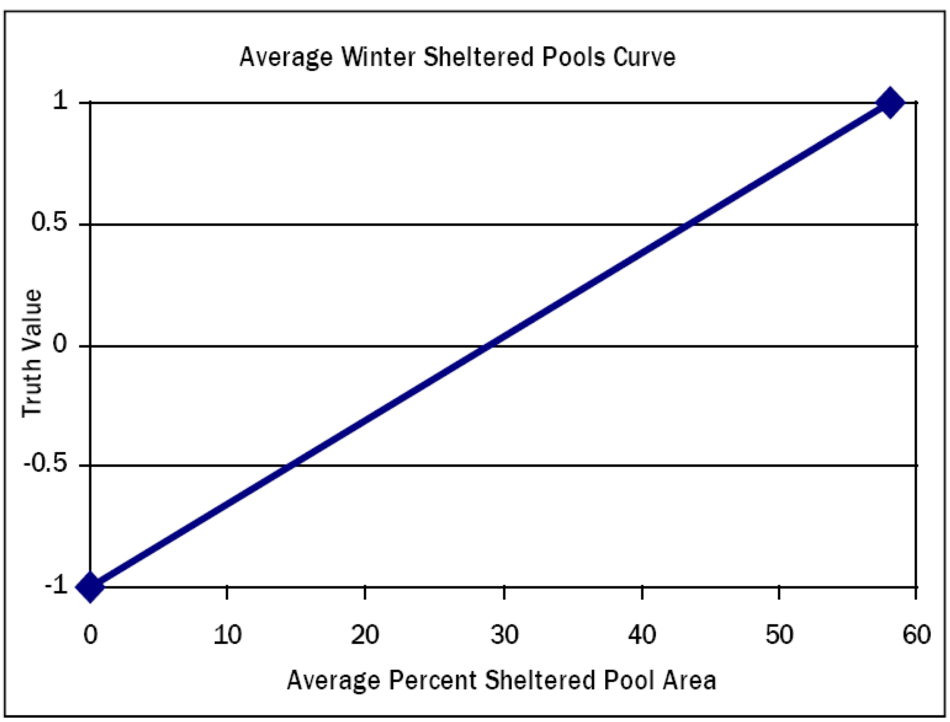


Figure 32. The winter sheltered pools curve will return a truth value of false (-1) for watersheds with 0 percent of channel area in sheltered pools, and true (1) for those with about 58 percent. If the two highest data points (58 and 27 percent) were removed as outliers, the true value would occur at about 14 percent.

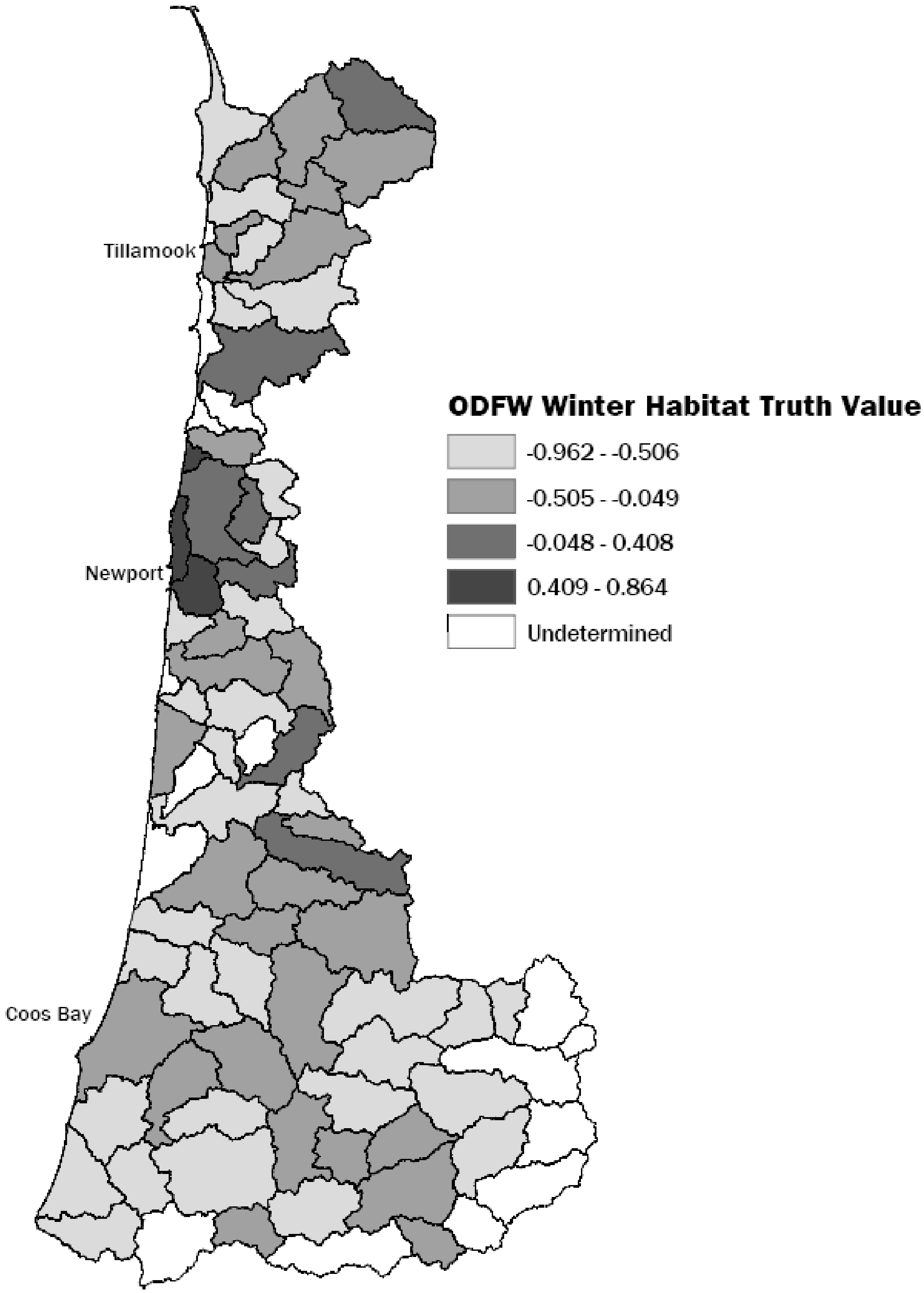


Figure 33. Winter habitat is distributed across the ESU with most watersheds receiving poor or moderate support.

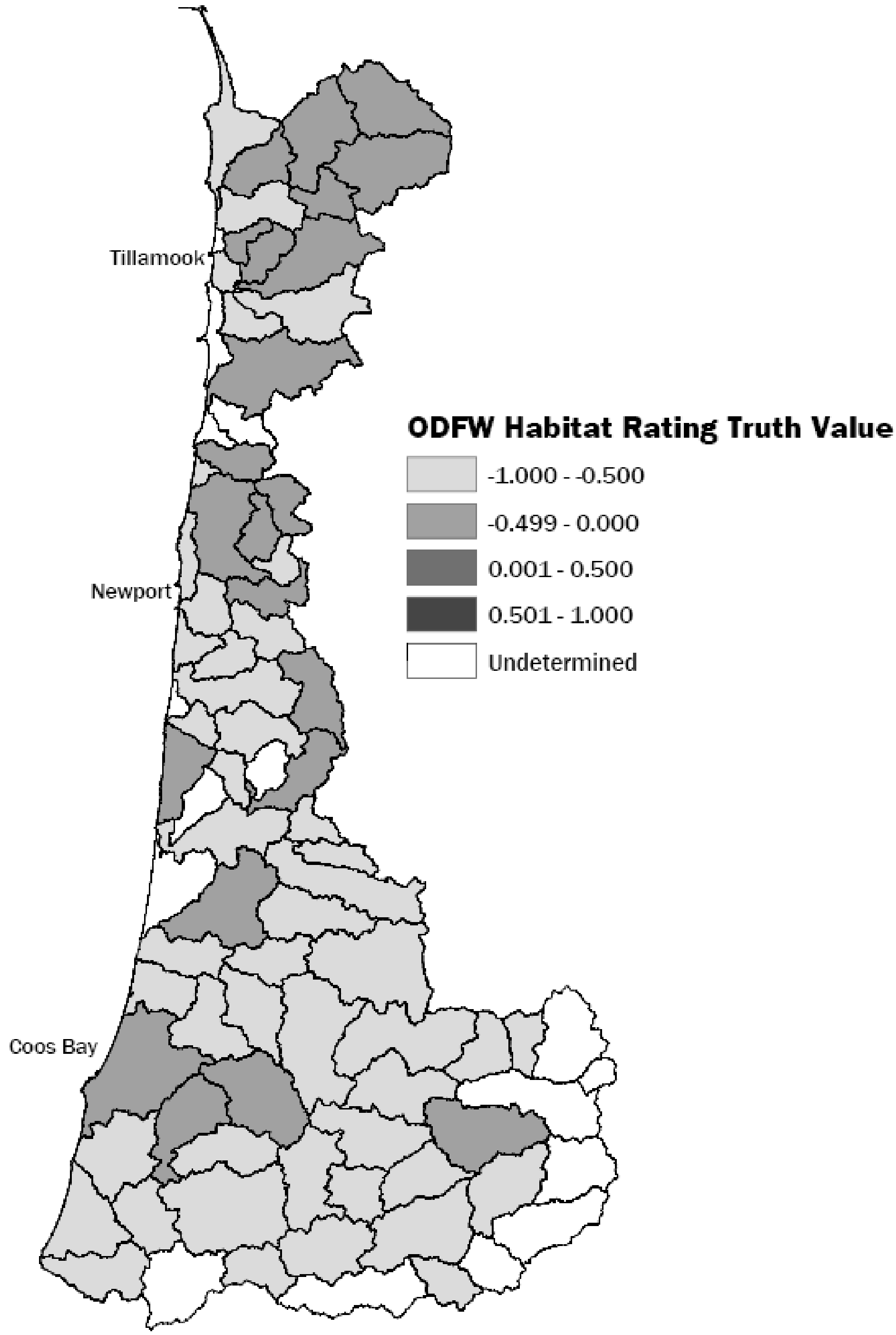


Figure 34. The ODFW habitat rating network returns truth values below zero for all watersheds evaluated.

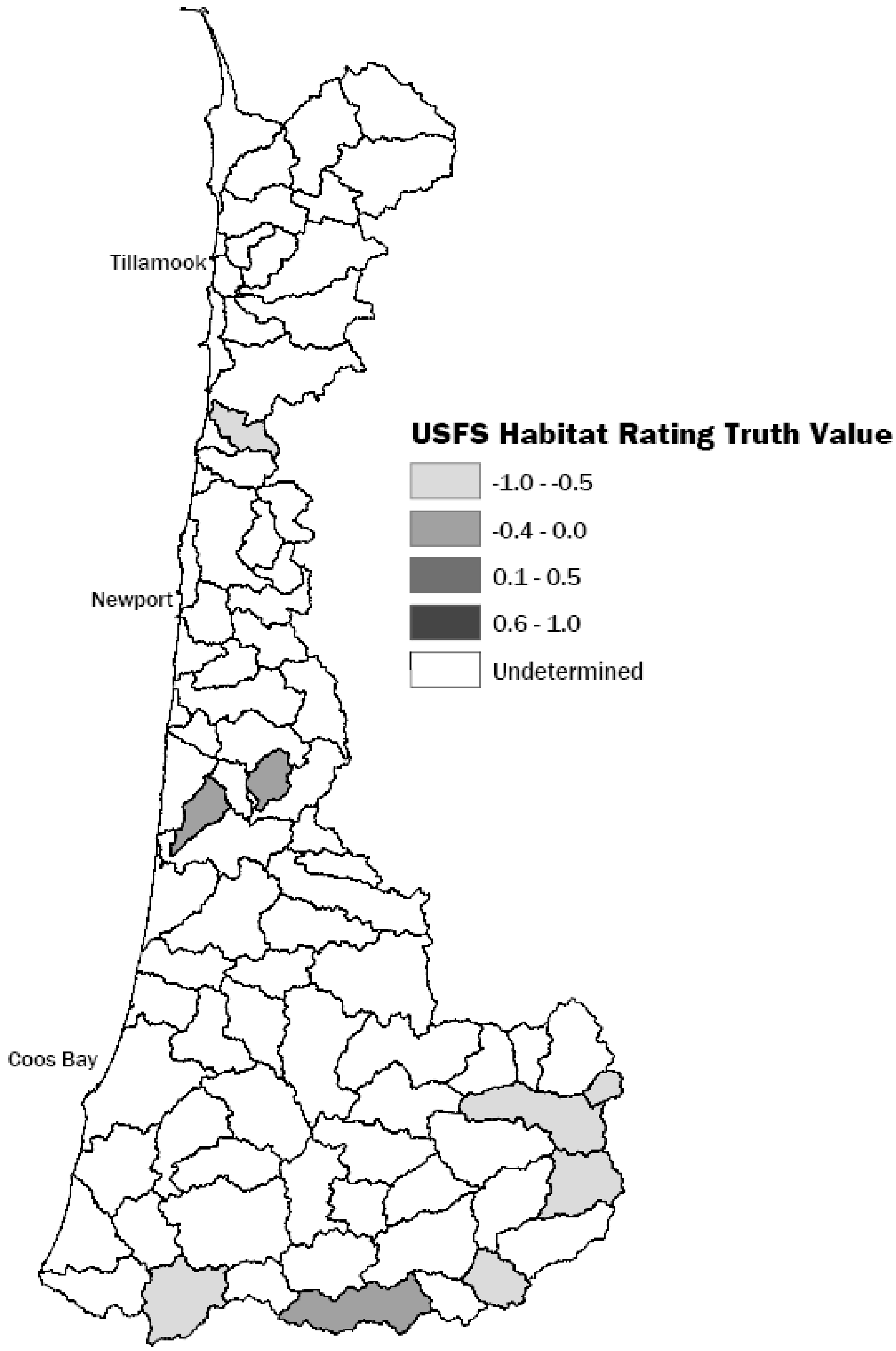


Figure 35. The USFS habitat rating network returns truth values below zero for all watersheds.

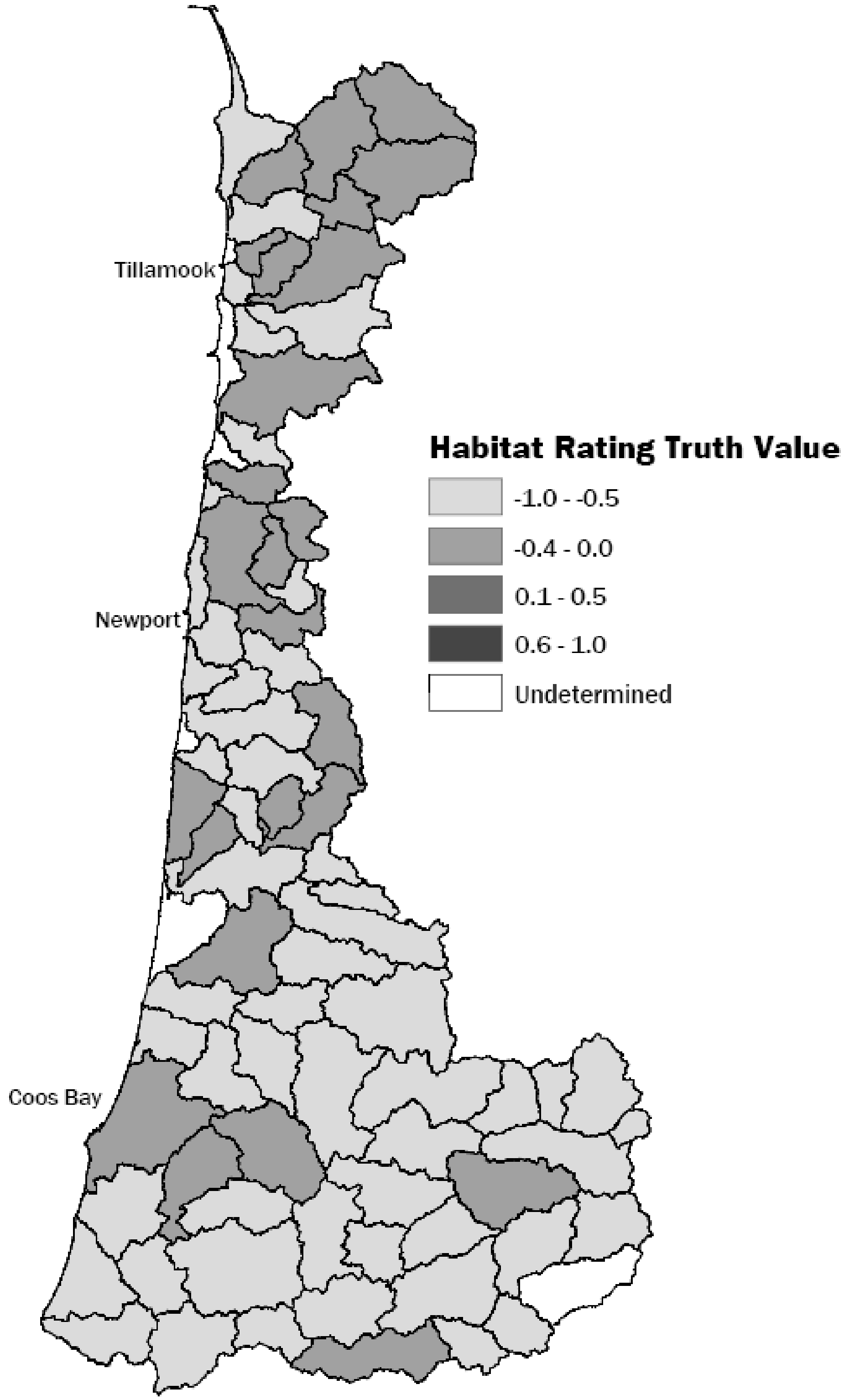


Figure 36. The combined habitat rating, using both the USFS and ODFW habitat survey data, returns habitat truth values below zero for all watersheds evaluated. Five watersheds did not have enough data to be evaluated under either network.

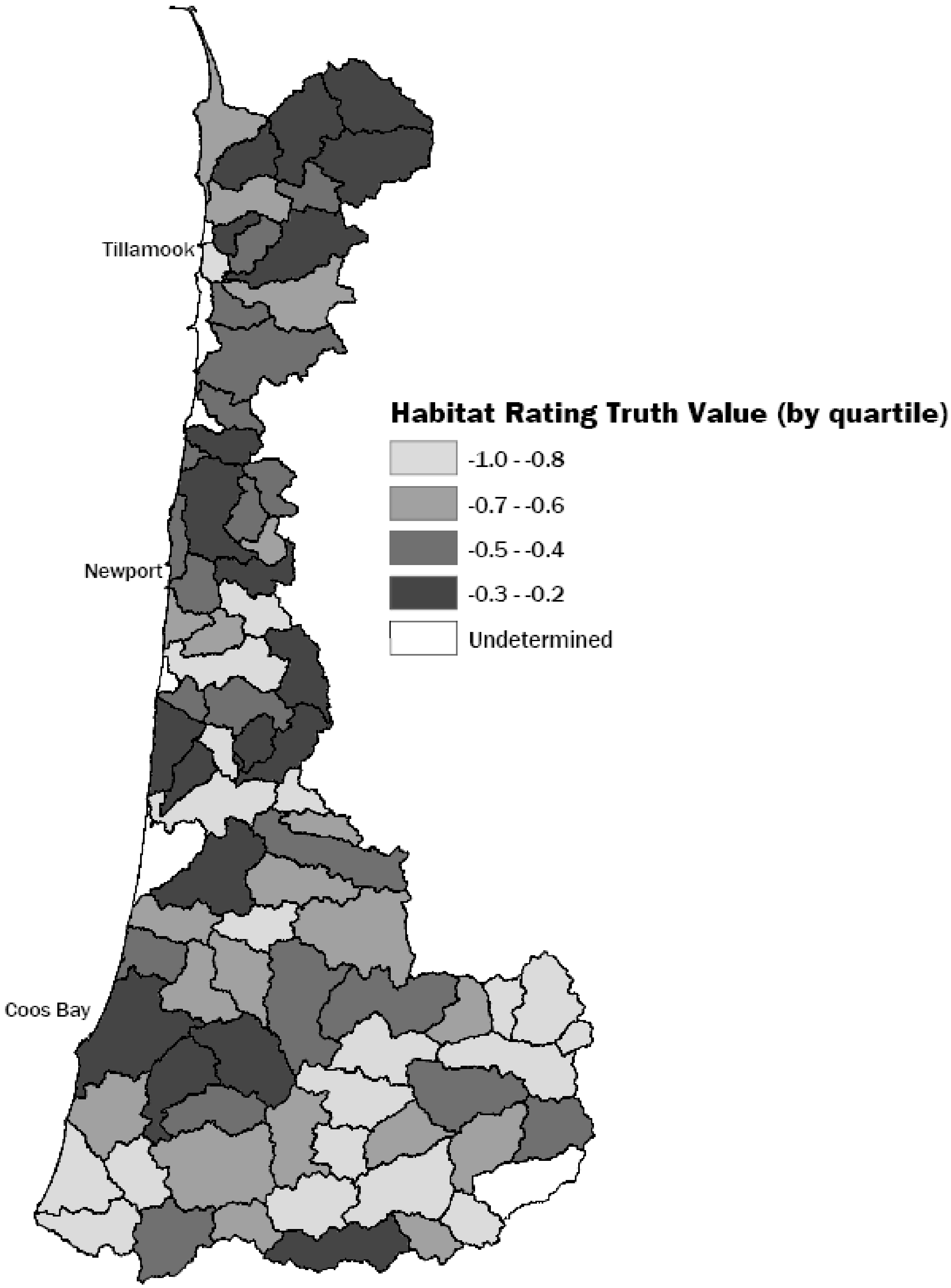


Figure 37. Variation between habitat rating truth values becomes apparent when watersheds are classified by quartiles.

## Watershed-Based Truth Values

**Fourth-field watershed:** Alsea

| HUC | Watershed | CH | CH U | Bio | Habitat | Rest | Util | Prod | IP | Agenc | Win | Sum | Spawn |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1710020501 | Upper Alsea River | -0.685 | -0.538 | -0. | -0.3 | -0.3 | -0. | -0.7 | 3.047 | ODFW | -0.1 | -0.3 | -0.1 |
| 1710020502 | Five Rivers / Lobster Creek | -0.373 | 0.02 | 0.2 | -0.5 | 0.056 | 0. | 0.123 | 5.266 | ODFW | -0.5 | -0.5 | 0.19 |
| 1710020503 | Drift Creek | -0.452 | 0.13 | 0.5 | -0.5 | 0.133 | 0. | 0.509 | 5.654 | ODFW | -0.3 | -0.6 | -0.2 |
| 1710020504 | Lower Alsea River | -1 | -0.586 | -0. | -1 | 0.171 | 0. | -0.8 | 5.843 | ODFW | -9.8 | -1 | 0.11 |
| 1710020505 | Beaver Creek / Waldport Bay | -0.567 | 0.03 | 0.4 | -0.6 | -0.1 | 0. | 0.668 | 4.365 | ODFW | -0.7 | -0.3 | 0.61 |
| 1710020506 | Yachats River | -0.698 | -0.524 | -0. | -0.5 | -0.11 | 0. | -0.7 | 4.439 | ODFW | -0.5 | -0.4 | 0.28 |
| 1710020507 | Cummins Creek / Tenmile Creek / Mercer Lake Frontal | -0.789 | -0.613 | -0. | -0.3 | -0.5 | 0. | -0.8 | 2.435 | ODFW | -0.3 | -0.2 | 3.99 |
| 1710020508 | Big Creek / Vingie Creek | -0.557 | -0.412 | -0. | 0 | -0.4 | -0. | -0.6 | 2.698 | None | | | |

**Fourth-field watershed:** Coos

| HUC | Watershed | CH | CH U | Bio | Habitat | Rest | Util | Prod | IP | Agenc | Win | Sum | Spawn |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1710030401 | South Fork Coos | -0.278 | 0.08 | 0.5 | -0.4 | -0.4 | 0. | 1 | 2.980 | ODFW | -0.4 | -0.3 | -0.4 |
| 1710030402 | Millicoma River | -0.468 | 0.06 | 0.5 | -0.6 | -0.1 | 0. | 1 | 4.183 | ODFW | -0.6 | -0.4 | -0.1 |
| 1710030403 | Lakeside Frontal | -0.43 | 0.23 | 0.8 | -0.5 | -0.2 | 0. | 1 | 3.804 | ODFW | -0.6 | -0.2 | -0.4 |
| 1710030404 | Coos Bay | -0.245 | 0.20 | 0.7 | -0.4 | -0.2 | 0. | 1 | 3.671 | ODFW | -7.0 | -0.5 | -1.3 |

**Fourth-field watershed:** Coquille

| HUC | Watershed | CH | CH U | Bio | Habitat | Rest | Util | Prod | IP | Agenc | Win | Sum | Spawn |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1710030501 | Coquille S Fk, Lwr | -0.668 | -0.631 | -0. | -0.5 | -0.6 | -0. | -0.7 | 1.827 | USFS | -0.5 | -0.1 | -0.4 |
| 1710030502 | Middle Fork Coquille | -0.706 | -0.465 | -0. | -0.7 | -0.6 | -0. | 0.228 | 1.727 | ODFW | -0.7 | -0.4 | -0.7 |
| 1710030503 | Middle Main Coquille | -0.793 | -0.49 | -0. | -0.8 | 0.167 | 0. | -0.7 | 5.822 | ODFW | -0.8 | -0.5 | 0.20 |
| 1710030504 | East Fork Coquille | -0.543 | -0.272 | 0.0 | -0.5 | -0.6 | -0. | 1 | 1.949 | ODFW | -0.5 | -0.2 | -0.5 |
| 1710030505 | North Fork Coquille | -0.244 | 0.17 | 0.4 | -0.4 | 0.177 | 0. | 0.351 | 5.871 | ODFW | -0.1 | -0.5 | 0.21 |
| 1710030506 | Lower Coquille | -0.628 | -0.375 | -0. | -0.65 | 0.504 | 0. | -0.7 | 7.504 | ODFW | -0.6 | -0.6 | 0.11 |

**Fourth-field watershed:** Necanicum

| HUC | Watershed | CH | CH U | Bio | Habitat | Rest | Util | Prod | IP | Agenc | Win | Sum | Spawn |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1710020101 | Necanicum River | -0.694 | -0.434 | -0. | -0.7 | -0.2 | 0. | -0.4 | 3.835 | ODFW | -0.7 | -0.5 | 0.14 |

**Fourth-field watershed:** Nehalem

| HUC | Watershed | CH | CH U | Bio | Habitat | Rest | Util | Prod | IP | Agenc | Win | Sum | Spawn |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1710020201 | Upper Nehalem River | -0.306 | -0.003 | 0.1 | -0.4 | 0.057 | 0. | -0.04 | 5.274 | ODFW | -0.1 | -0.5 | 0.22 |
| 1710020202 | Middle Nehalem River | -0.255 | -0.186 | -0. | -0.2 | 0.119 | 0. | -0.4 | 5.583 | ODFW | 0.0 | -0.4 | 0.35 |
| 1710020203 | Lower Nehalem River | -0.333 | -0.172 | -0. | -0.4 | 0.223 | 0. | -0.41 | 6.102 | ODFW | -0.1 | -0.4 | 0.22 |
| 1710020204 | Salmonberry River | -0.513 | -0.441 | -0. | -0.4 | -0.5 | -0. | 0 | 2.322 | ODFW | -0.4 | -6.8 | -0.4 |
| 1710020205 | North Fork Of Nehalem River | -0.054 | 0.23 | 0.5 | -0.2 | 0.09 | 0. | 0.464 | 5.438 | ODFW | -0.3 | -0.2 | 0.24 |
| 1710020206 | Lower Nehalem River / Cook Creek | -0.965 | -0.627 | -0. | -0.6 | 0.094 | 0. | -0.9 | 5.457 | ODFW | -0.6 | -0.6 | 2.09 |

**Fourth-field watershed:** North Umpqua

| HUC | Watershed | CH | CH U | Bio | Habitat | Rest | Util | Prod | IP | Agenc | Win | Sum | Spawn |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1710030106 | Boulder Creek | -1 | -0.947 | -1 | -0.9 | -0.8 | -1 | 0 | 7.818 | USFS | -0.7 | -0.2 | -0.9 |
| 1710030107 | Middle North Umpqua | -0.74 | -0.534 | -0. | -0.7 | -0.5 | -0. | 0 | 2.475 | USFS | -0.7 | -0.3 | -0.7 |
| 1710030108 | Steamboat Creek | -0.995 | -0.987 | -0. | -0.9 | -0.9 | -0. | 0 | 9.539 | USFS | -0.9 | 0.5 | -0.9 |
| 1710030109 | Canton Creek | -1 | -1 | -1 | -0.9 | -0.9 | -1 | 0 | 1.135 | ODFW | -0.9 | -0.1 | -0.9 |
| 1710030110 | Rock Creek / North Umpqua River | -0.634 | -0.543 | -0. | -0.6 | -0.6 | -0. | 0 | 1.730 | ODFW | -0.6 | -0.4 | -0.6 |
| 1710030111 | Little River | -0.619 | -0.497 | -0. | -0.4 | -0.6 | -0. | 0 | 1.768 | ODFW | -0.5 | -0.4 | -0.4 |
| 1710030112 | Lower North Umpqua River | -0.782 | -0.15 | 0.0 | -0.8 | 0.046 | 0. | 0 | 5.218 | ODFW | -0.8 | -0.8 | 0.44 |

**Fourth-field watershed:** Siletz / Yaquina

| HUC | Watershed | CH | CH U | Bio | Habitat | Rest | Util | Prod | IP | Agenc | Win | Sum | Spawn |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1710020401 | Upper Yaquina River | -0.258 | 0.12 | 0.4 | -0.4 | 0.111 | 0. | 0.351 | 5.544 | ODFW | 8.6 | -0.5 | 0.17 |
| 1710020402 | Big Elk Creek | -0.689 | -0.047 | 0.2 | -0.7 | 0.027 | 0. | 0.127 | 5.126 | ODFW | -0.7 | -0.5 | -0.3 |
| 1710020403 | Lower Yaquina River | -0.411 | -0.115 | 0.0 | -0.5 | 0.003 | 0. | -0.1 | 5.006 | ODFW | 0.8 | -0.6 | 0.20 |
| 1710020404 | Upper Siletz River | -1 | -1 | -1 | -0.47 | -1 | -1 | 0 | | ODFW | -0.5 | -0.4 | 2.70 |
| 1710020405 | Middle Siletz River | -0.335 | 0.00 | 0.2 | -0.4 | 0.015 | 0. | 0.453 | 5.065 | ODFW | -8.9 | -0.5 | 0.11 |
| 1710020406 | Rock Creek / Siletz River | -0.624 | -0.068 | 0.2 | -0.7 | -0.1 | 0. | 0.618 | 4.215 | ODFW | -0.5 | -0.7 | -3.7 |
| 1710020407 | Lower Siletz River | -0.489 | -0.261 | -0. | -0.4 | 0.464 | 0. | -0.6 | 7.302 | ODFW | 4.5 | -0.5 | 0.26 |
| 1710020408 | Salmon River / Siletz / Yaquina Bay | -0.384 | -0.313 | -0. | -0.4 | -0.22 | 0. | -0.3 | 3.892 | ODFW | -0.1 | -0.4 | 0.10 |
| 1710020409 | Devils Lake / Moolack Frontal | -0.469 | -0.199 | 0.0 | -0.5 | -0.42 | 0. | 0.051 | 2.891 | ODFW | 0.7 | -0.6 | 0.38 |

**Fourth-field watershed:** Siltcoos

| HUC | Watershed | CH | CH U | Bio | Habitat | Rest | Util | Prod | IP | Agenc | Win | Sum | Spawn |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1710020701 | Waohink River / Siltcoos River / Tahkenitch Lake Frontal | 0.02 | 0.39 | 0.8 | 0 | -0.2 | 0. | 1 | 3.931 | None | | | |

**Fourth-field watershed:** Siuslaw

| HUC | Watershed | CH | CH U | Bio | Habitat | Rest | Util | Prod | IP | Agenc | Win | Sum | Spawn |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1710020601 | Upper Siuslaw River | -0.465 | -0.167 | -0. | -0.5 | 0.076 | 0. | -0.3 | 5.369 | ODFW | 6.1 | -0.6 | 0.22 |
| 1710020602 | Wolf Creek | -0.623 | -0.213 | -0. | -0.6 | -0.1 | 0. | -0.2 | 4.457 | ODFW | -0.2 | -0.7 | -0.3 |
| 1710020603 | Wildcat Creek | -0.756 | -0.585 | -0. | -0.7 | -0.1 | 0. | -0.7 | 4.030 | ODFW | -0.8 | -0.8 | 0.13 |
| 1710020604 | Lake Creek | -0.214 | -0.021 | 0.1 | -0.3 | -0.0 | 0. | -0.0 | 4.959 | ODFW | -2.8 | -0.4 | 8.60 |
| 1710020605 | Deadwood Creek | -0.423 | -0.286 | -0. | -0.3 | 0.143 | 0. | -0.6 | 5.704 | USFS | -0.1 | -0.4 | 7.59 |
| 1710020606 | Indian Creek / Lake Creek | -0.888 | -0.349 | -0. | -0.9 | 0.285 | 0. | -0.5 | 6.411 | ODFW | -0.9 | -0.7 | 0.28 |
| 1710020607 | North Fork Siuslaw River | -0.355 | -0.22 | -0. | -0.4 | 0.316 | 0. | -0.5 | 6.568 | USFS | -0.4 | -0.3 | 0.11 |
| 1710020608 | Lower Siuslaw River | -0.926 | -0.452 | -0. | -0.9 | -0.0 | 0. | -0.5 | 4.958 | ODFW | -0.6 | -0.9 | 6.89 |

**Fourth-field watershed:** Sixes

| HUC | Watershed | CH | CH U | Bio | Habitat | Rest | Util | Prod | IP | Agenc | Win | Sum | Spawn |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1710030603 | Sixes River | -1 | -0.748 | -1 | -0.8 | -0.19 | 0. | -1 | 4.044 | ODFW | -0.8 | -0.4 | -0.0 |
| 1710030604 | New River Frontal | -0.685 | -0.08 | 0.2 | -0.7 | -0.1 | 0. | 1 | 4.371 | ODFW | -0.8 | -0.5 | 0.15 |

**Fourth-field watershed:** South Umpqua

| HUC | Watershed | CH | CH U | Bio | Habitat | Rest | Util | Prod | IP | Agenc | Win | Sum | Spawn |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1710030201 | Upper South Umpqua River | -0.945 | -0.8 | -0. | -0.5 | -0.7 | -0. | -0.6 | 1.133 | USFS | -0.5 | 3.2 | -0.5 |
| 1710030202 | Jackson Creek | -0.973 | -0.68 | -0. | 0 | -0.7 | -0. | -0.9 | 1.175 | None | | | |
| 1710030203 | Middle South Umpqua River | -0.699 | -0.641 | -0. | -0.7 | -0.6 | -0. | -0.6 | 1.793 | ODFW | -0.7 | -0.4 | -0.6 |
| 1710030204 | Elk Creek / South Umpqua | -1 | -0.873 | -1 | -0.7 | -0.6 | -0. | -1 | 1.499 | USFS | -0.3 | -0.3 | -0.8 |
| 1710030205 | South Umpqua River | -0.763 | -0.633 | -0. | -0.7 | -0.3 | 0. | -0.7 | 3.169 | ODFW | -5.2 | -0.8 | 1.89 |
| 1710030206 | Upper Cow Creek | -1 | -1 | -1 | -0.6 | -0.4 | -1 | 0 | 2.790 | ODFW | -0.3 | -0.7 | -8.5 |
| 1710030207 | Middle Cow Creek | -0.511 | -0.434 | -0. | -0.2 | -0.3 | 0. | -0.61 | 3.077 | USFS | -0.3 | -0.1 | 0 |
| 1710030208 | West Fork Cow Creek | -0.659 | -0.452 | -0. | -0.6 | -0.4 | -0. | -0.3 | 2.660 | ODFW | -0.3 | -0.7 | -0.2 |
| 1710030209 | Lower Cow Creek | -0.773 | -0.657 | -0. | -0.7 | -0.4 | -0. | -0.7 | 2.967 | ODFW | -0.6 | -0.8 | -0.2 |
| 1710030210 | Middle South Umpqua River | -1 | -0.729 | -1 | -0.92 | 0.005 | 0. | -1 | 5.015 | ODFW | -0.2 | -0.9 | 0.48 |
| 1710030211 | Myrtle Creek | -0.771 | -0.624 | -0. | -0.6 | -0.3 | 0. | -0.8 | 3.446 | ODFW | -0.3 | -0.6 | 0.15 |
| 1710030212 | Ollala Creek / Lookingglass | -0.954 | -0.738 | -0. | -0.6 | -0.3 | 0. | -0.9 | 3.130 | ODFW | -0.2 | -0.7 | 0.20 |
| 1710030213 | Lower South Umpqua River | -0.913 | -0.683 | -0. | -0.8 | -0.0 | 0. | -0.9 | 4.771 | ODFW | -0.8 | -0.8 | 0.90 |

**Fourth-field watershed:** Umpqua

| HUC | Watershed | CH | CH U | Bio | Habitat | Rest | Util | Prod | IP | Agenc | Win | Sum | Spawn |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1710030301 | Upper Umpqua River | -0.545 | -0.37 | -0. | -0.5 | 0.23 | 0. | -0.6 | 6.138 | ODFW | -0.3 | -0.5 | 9.70 |
| 1710030302 | Calapooya Creek | -0.411 | -0.115 | 0.1 | -0.5 | -0.2 | 0. | 0.061 | 3.647 | ODFW | -0.5 | -0.5 | 0.45 |
| 1710030303 | Elk Creek | -0.867 | -0.661 | -0. | -0.6 | -0.2 | 0. | -0.9 | 3.661 | ODFW | -0.4 | -0.6 | 0.33 |
| 1710030304 | Middle Umpqua River | -0.71 | -0.408 | -0. | -0.7 | 0.372 | 0. | -0.7 | 6.845 | ODFW | -0.4 | -0.7 | 0.17 |
| 1710030305 | Lake Creek | -0.731 | -0.634 | -0. | -0.7 | -0.71 | -0. | -0.3 | 1.447 | ODFW | -0.7 | -0.5 | -0.7 |
| 1710030306 | Upper Smith River | -0.687 | -0.365 | -0. | -0.7 | -0.0 | 0. | -0.5 | 4.612 | ODFW | -0.2 | -0.7 | 0.30 |
| 1710030307 | Lower Smith River | -0.188 | 0.22 | 0.5 | -0.3 | 0.143 | 0. | 0.544 | 5.703 | ODFW | -0.1 | -0.4 | 0.11 |
| 1710030308 | Lower Umpqua River | -0.599 | 0.18 | 0.2 | -0.7 | 1 | 0. | 0.078 | 9.979 | ODFW | -0.7 | -8.2 | 0.56 |

**Fourth-field watershed:** Wilson / Trask / Nestucca

| HUC | Watershed | CH | CH U | Bio | Habitat | Rest | Util | Prod | IP | Agenc | Win | Sum | Spawn |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1710020301 | Little Nestucca River | -0.75 | -0.583 | -0. | -0.5 | -0.2 | 0. | -0.8 | 3.753 | USFS | 0.2 | -0.6 | 5.60 |
| 1710020302 | Nestucca River | -0.444 | -0.376 | -0. | -0.4 | -0.1 | 0. | -0.5 | 4.395 | ODFW | -0.0 | -0.5 | 4.50 |
| 1710020303 | Tillamook River | -0.875 | -0.545 | -0. | -0.5 | 0.204 | 0. | -0.9 | 6.009 | ODFW | -0.6 | -0.3 | -7.6 |
| 1710020304 | Trask River | -0.587 | -0.471 | -0. | -0.6 | -0.1 | 0. | -0.6 | 4.456 | ODFW | -0.6 | -0.6 | -0.1 |
| 1710020305 | Wilson River | -0.436 | -0.338 | -0. | -0.2 | -0.1 | 0. | -0.5 | 4.328 | ODFW | -0.1 | -0.3 | -0.1 |
| 1710020306 | Kilchis River | -0.573 | -0.426 | -0. | -0.4 | -0.01 | 0. | -0.6 | 4.940 | ODFW | -0.5 | -0.3 | -0.2 |
| 1710020307 | Miami River | -0.706 | -0.499 | -0. | -0.3 | -0.1 | 0. | -0.8 | 4.165 | ODFW | -0.4 | -0.3 | -4.0 |
| 1710020308 | Tillamook Bay | -0.863 | -0.687 | -0. | -0.8 | -0.4 | 0. | -0.7 | 2.630 | ODFW | -0.2 | -0.8 | -0.5 |
| 1710020309 | Spring Creek / Sand Lake / Neskowin Creek Frontal | -0.953 | -0.604 | -0. | 0 | -0.4 | 0. | -0.9 | 2.507 | None | | | |

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