Designation of Critical Habitat for Lower Columbia River Coho Salmon and Puget Sound Steelhead

DRAFT Biological Report

Note – This document was updated on 1/23/13 to correct the following:

(1) Legends in Figures A2 & B2 had Low & Medium values/colors reversed

(2) Map B17 was missing

November 2012

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EXECUTIVE SUMMARY

This report contains biological assessments supporting the National Marine Fisheries Service's (NMFS) proposed designation of critical habitat under section 4 of the Endangered Species Act for two listed distinct population segments (DPS): lower Columbia River coho salmon and Puget Sound steelhead. NMFS convened two critical habitat analytical review teams (CHART) charged with analyzing the best available data for each DPS to make findings regarding the presence of essential habitat features in each watershed, potential management actions that may affect those features, and the conservation value of each watershed within each DPS's range. This report summarizes the agency's mapping efforts, methods and information used, and final CHART assessments for these two DPSs. This information will be used in conjunction with other agency analyses (e.g., economic analyses) to determine which areas to propose as critical habitat for lower Columbia River coho salmon and Puget Sound steelhead.

BACKGROUND

In previous rulemaking, we, the National Marine Fisheries Service (NMFS) determined that lower Columbia River coho (*Oncorhynchus kisutch*) and Puget Sound steelhead (*O. mykiss*) are each a distinct population segment (DPS)[1] that warrant protection as threatened species under the Endangered Species Act (ESA)(70 FR 37160, June 28, 2005; 72 FR 26722, May 11, 2007). The agency also determined that critical habitat was not determinable at the time of those final listing decisions and announced that it would propose critical habitat designations in separate rulemaking. Since the time of listing the recovery planning process has progressed for these two species and additional new information is now available to better inform the designation process. In view of these developments, we issued an advance notice of proposed rulemaking on January 10, 2011 (76 FR 1392) to solicit comments and information that may be useful in making proposed critical habitat designations for lower Columbia River coho salmon and Puget Sound steelhead. This report describes the process and results of conducting the biological assessments supporting our proposed designation of critical habitat for these two listed DPSs.

[1] Each of the species addressed in this report isare considered a DPS under the Endangered Species Act. Although NMFS typically refers to Pacific salmon DPSs as "evolutionarily significant units" or "ESUs" (56 FR 58612; November 20, 1991), this report uses the DPS term to reduce confusion.

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.

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 NMFS 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."

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 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 (McElhaney *et al.* 2000). With respect to the habitat requirements of a healthy salmonid DPS, a DPS 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 DPS population structure (Ruckelshaus *et al.* 2001, Puget Sound Technical Recovery Team 2011).

DPSs 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. DPSs with limited geographic range are similarly at increased extinction risk due to environmental variability and catastrophic events. DPSs 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. DPSs 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 DPS 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 DPS, and the significance to the DPS of the population occupying that area.

GEOGRAPHICAL AREA OCCUPIED BY THE SPECIES

Agency regulations at 50 CFR 223.102 define the two DPSs under consideration as follows:

(1) Lower Columbia River coho—"…including all naturally spawned populations of coho salmon in the Columbia River and its tributaries in Washington and Oregon, from the mouth of the Columbia up to and including the Big White Salmon and Hood

Rivers, and includes the Willamette River to Willamette Falls, Oregon, as well as twenty-five artificial propagation programs…" and

(2) Puget Sound steelhead—"…including all naturally spawned anadromous O. mykiss (steelhead) populations, from streams in the river basins of the Strait of Juan de Fuca, Puget Sound, and Hood Canal, Washington, bounded to the west by the Elwha River (inclusive) and to the north by the Nooksack River and Dakota Creek (inclusive), as well as the Green River natural and Hamma Hamma winter-run steelhead hatchery stocks."

Both descriptions emphasize the freshwater range of each DPS because we delineated salmon and steelhead DPSs based on spawning (or natal) areas .

Given these considerations, the freshwater geographical area occupied by the species includes:

(1) Lower Columbia River coho—in the lower Columbia River basin, the Columbia River mainstem from the Pacific Ocean upstream to the confluence of the Washougal and Sandy Rivers, East Fork Hood River, West Fork Hood River, Hood River, White Salmon River, Little White Salmon River, Wind River, Middle Columbia/Grays Creek, Middle Columbia/Eagle Creek, Salmon River, Zigzag River, Upper Sandy River, Middle Sandy River, Bull Run River, Washougal River, Columbia Gorge Tributaries, Lower Sandy River, Salmon Creek, Upper Lewis River, Muddy River, Swift Reservoir, Yale Reservoir, East Fork Lewis River, Lower Lewis River, Kalama River, Beaver Creek/Columbia River, Clatskanie River, Germany/Abernathy, Skamokawa/Elochoman, Plympton Creek, Headwaters Cowlitz River, Upper Cowlitz River, Cowlitz Valley Frontal, Upper Cispus River, Lower Cispus River, Tilton River, Riffe Reservoir, Jackson Prairie, North Fork Toutle River, Green River, South Fork Toutle River, East Willapa, Coweeman, Youngs River, Big Creek, Grays Bay, Abernethy Creek, Collawash River, Upper Clackamas River, Oak Grove Fork Clackamas River, Middle Clackamas River, Eagle Creek, Lower Clackamas River, Johnson Creek, Scappoose Creek, and Columbia Slough/Willamette River.

(2) Puget Sound steelhead—in Puget Sound and the Strait of Juan de Fuca, Bellingham Bay, Samish River, Birch Bay, Upper North Fork Nooksack River, Middle Fork Nooksack River, South Fork Nooksack River, Lower North Fork Nooksack River, Nooksack River, Skagit River/Gorge Lake, Skagit River/Diobsud Creek, Cascade River, Skagit River/Illabot Creek, Baker River, Upper Sauk River, Upper Suiattle River, Lower Suiattle River, Lower Sauk River, Middle Skagit River/Finney Creek, Lower Skagit River/Nookachamps Creek, North Fork Stillaguamish River, South Fork Stillaguamish River, Lower Stillaguamish River, Tye And Beckler Rivers, Skykomish River Forks,

Skykomish River/Wallace River, Sultan River, Skykomish River/Woods Creek, Middle Fork Snoqualmie River, Lower Snoqualmie River, Pilchuck River, Snohomish River, Cedar River, Lake Sammamish, Lake Washington, Sammamish River, Upper Green River, Middle Green River, Lower Green River, Upper White River, Lower White River, Carbon River, Upper Puyallup River, Lower Puyallup River, Mashel/Ohop, Lowland, Prairie1, Prairie2, Skokomish River, Lower West Hood Canal Frontal, Hamma Hamma River, Duckabush River, Dosewallips River, Big Quilcene River, Upper West Hood Canal Frontal, West Kitsap, Kennedy/Goldsborough, Puget, Prairie3, Puget Sound/East Passage, Chambers Creek, Port Ludlow/Chimacum Creek, Discovery Bay, Sequim Bay, Dungeness River, Port Angeles Harbor, and Elwha River.

This report contains maps and tables depicting the location, extent, and other attributes of these stream reaches and watersheds.

Both DPSs also occupy vast areas of the Pacific Ocean where they forage during their juvenile and subadult life phases before returning to spawn in their natal streams. The PS steelhead DPS also occupies marine waters in Puget Sound. As described further in the Section 4(b)(2) report (NMFS 2012a), we could not identify "specific areas" within the ocean range that meet the definition of critical habitat. We did ask the CHARTs to consider the marine areas in Puget Sound for PS steelhead, but did not ask them to consider habitat in the Pacific Ocean.

"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."

For the 2005 critical habitat designations (70 FR 52630, September 2, 2005), NMFS 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. For the present rulemaking, we use the same features, which we identified in the advance notice of proposed rulemaking (76 FR 1392, January 10, 2011). These features include sites essential to support one or more life stages of the DPS (sites for spawning, rearing, migration and foraging). These sites in turn contain physical or biological features essential to the conservation of the DPS (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.

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.

"SPECIFIC AREAS" WITHIN THE OCCUPIED GEOGRAPHICAL AREA OCCUPIED BY THE SPECIES

Freshwater Areas

After determining the geographical area occupied by each DPS, and the physical and biological features essential to their conservation, we next identified the specific areas within the geographical area occupied by the species that contain the essential features. We based our delineation of "specific areas" where these features are found on the biology and population structure of the species, and the characteristics of the habitat it occupies. To delineate specific areas, we used standard watershed units, as mapped by the U.S. Geological Survey (USGS), designated by fifth field hydrologic unit codes, or

HUC5s (this report refers to these HUC5s as "watersheds"). The USGS maps watersheds as polygons, bounding a drainage area from ridge-top to ridge-top, encompassing streams, riparian areas and uplands. Within the boundaries of any watershed, there are stream reaches not occupied by the species. Land areas within the watershed boundaries are also generally not "occupied" by the species (though certain areas such as flood plains or side channels may be occupied at some times of some years). We used the watershed boundaries as a basis for aggregating stream reaches, for purposes of delineating "specific" areas where the physical or biological features are found.

Within these HUC5 watersheds, we developed extensive information regarding the stream reaches occupied by lower Columbia River coho and Puget Sound steelhead using data compiled by state and tribal fisheries agencies in Oregon and Washington, as the best available information. We collected and verified these data and produced distribution maps at a scale of 1:24,000 using standard Geographic Information System (GIS) software. We accessed these GIS data beginning in 2010, modified them based on input from state and tribal fishery biologists, and believe that they represent the best available information about areas occupied by each species at the time of listing. We also developed latitude-longitude identifiers for the end-points of each occupied stream reach.

Teams of federal biologists then examined each habitat area within a watershed to determine whether the stream reaches occupied by the species contained the physical or biological features previously identified as essential to conservation. The Teams also determined 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 Teams drew upon their first-hand knowledge of the areas and the physical or biological features as well as their experience in section 7 consultations. We asked them to determine whether there were actions occurring in those areas that may threaten the features, such that there would be any methods or procedures useful in protecting the features. The Teams identified and documented such activities for each area in tables contained in their report (NMFS 20012a).

Marine Areas

As in the 2005 designations, we identified estuary features essential to conservation. For streams and rivers that empty into marine areas, we include the associated estuary as part of the HUC5 "specific area." Also as in the 2005 designations, we identified certain prey species in nearshore and offshore marine waters (such as Pacific herring) as essential features, and concluded that some may require special management considerations or protection because they are commercially harvested.

However, prey species move or drift great distances throughout marine waters, often in association with oceanographic features that also move (such as eddies and thermoclines). Thus, although we sought new information to better inform this question, we continue to conclude that we cannot identify specific offshore marine areas where the essential habitat features may be found (see NMFS, 2012b).

We also considered marine areas in Puget Sound for steelhead but concluded that at this time the best available information suggests there are no areas that meet the definition of critical habitat in the statute. In our 2005 rule, we designated critical habitat in nearshore areas for Puget Sound Chinook and Hood Canal summer-run chum salmon. However, steelhead move rapidly out of freshwater and into offshore marine areas, unlike Puget Sound Chinook and Hood Canal summer chum, making it difficult to identify specific foraging areas where the essential features are found. (Appendix B contains a more detailed discussion of the Puget Sound CHART's consideration of nearshore areas.) We therefore determined that for Puget Sound steelhead it is not possible to identify specific areas in the nearshore zone in Puget Sound.

SPECIAL MANAGEMENT CONSIDERATIONS OR PROTECTION

Our 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 NMFS biologists in the Habitat Conservation Division and the report "An Ecosystem Approach to Salmonid Conservation" by Spence *et al.* (1996), the agency 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 NMFS 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 (Pacific Fishery Management Council 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, Pacific Fishery

Management Council 1999). The CHARTs identified and documented such activities for each area in tables contained in this report.

UNOCCUPIED AREAS

Section 3(5)(A)(ii) of the ESA authorizes the designation of "specific areas outside the geographical area occupied at the time [the species] is listed" if these areas are essential for the conservation of the species. 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." We focused our 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 distinct population segments. As with occupied areas, we considered the stream segments within a HUC5 watershed 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 always 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.

We asked the CHARTs whether there were any unoccupied areas within the historical range of the two DPSs that may be essential for conservation. The Puget Sound CHART indicated there were unoccupied stream reaches in the upper Elwha River basin that were essential for the conservation of Puget Sound steelhead. The decommissioning of two longstanding dams in this basin began in the fall of 2011 and will allow steelhead and other salmonids access to approximately 45 miles (72 km) of habitat in the basin upstream (Washington Department of Fish and Wildlife 2011, Olympic National Park 2012). The Team noted the significant amount of spawning habitat that would be available in the Elwha following dam removal relative to other much smaller streams in the Strait of Juan de Fuca, as well as the high likelihood that these habitats will be able to support both summer- and winter-run life forms of steelhead. Because the Strait represents a major HUC4 subbasin, and the Elwha provides adequate suitable habitat to support viable populations of both life history types, the CHART considered the Elwha essential for conservation of the DPS. .

In other cases, the CHARTs did not have information available that would allow them to make a determination that unoccupied areas are essential for conservation. The CHARTs nevertheless identified areas they believe may be determined essential through future recovery planning efforts (e.g., habitat for coho above Condit Dam on the White Salmon River, Washington). We anticipate that ongoing recovery planning processes will develop additional information about the species' need for these or other areas unoccupied at the time of listing.

CRITICAL HABITAT ANALYTICAL REVIEW TEAMS

OVERVIEW

To assist in the designation of critical habitat, the agency convened two CHARTs; one for lower Columbia River coho salmon and one for Puget Sound steelhead. The CHARTs consisted of federal salmonid biologists and habitat specialists tasked with assessing biological information pertaining to areas under consideration for designation. The CHARTs explored a variety of data sources and used their best professional judgment 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, riverine corridors, and estuarine and nearshore marine areas and determine if any unoccupied areas may be essential to conservation.

The CHARTS have completed three phases of work associated with critical habitat designations. In the first phase, each CHART met to discuss the assignment and to identify the best scientific information available regarding the habitats supporting the DPSs in their domain. This phase also involved reviewing a CHART scoring system for systematic discussion and evaluation of PCEs and for contributing to the determination of the overall conservation value of particular watersheds and areas. After collecting and synthesizing the available data for n DPS, the CHARTs met during Phase 2 to review and discuss the information. In this phase the CHARTs verified the presence of the PCEs in each occupied watershed/area, identified management activities that may affect those PCEs, and collectively scored each occupied watershed/area using the system developed in the first phase. In Phase 3, the CHARTs reviewed the scores derived in Phase 2 and then considered additional information about the relationship of each watershed/area to others in the range of the DPS and information about the population occupying each watershed/area and that population's relationship to other populations in the DPS. Based on the scores and the additional considerations, the CHARTs assigned conservation value ratings of high, medium, or low to each watershed/area. Details and key considerations involved in each phase are discussed below.

CHART PHASE 1

In Phase 1, CHARTs convened for a one-day orientation to the statutory and regulatory aspects of ESA critical habitat and discussed ways to identify the best available scientific data relevant to assessing critical habitat for each DPS. CHART biologists also helped develop and test a multi-factor scoring system that provided a consistent framework within which they could process information that would ultimately inform their conservation value rating of each watershed or area. The basis for using this factor-based scoring system was twofold. First it allowed CHART members with varied levels of

experience in a particular geographic area to share and discuss their knowledge of specific places and biological/physical features using a consistent set of relevant factors for each watershed in the range of a DPS. Second it generated quantitative results (i.e., sums of factor scores) that displayed numerical variation between watersheds/areas that greatly facilitated the ultimate CHART rating of each watershed/area's conservation value. Third, it provided a uniform and systematic way to assess the overall conservation value of component watersheds and areas for each DPS under agency consideration. The scoring system used by the CHARTs is shown in Table 1.

CHART PHASE 2

In Phase 2, each CHART met to discuss the information identified in Phase 1 and to (1) verify the presence of PCEs in each HUC5, (2) identify current or potential activites that may affect the PCEs, and (3) apply the scoring system. 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 tribal fishery agency. The CHARTs 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, DPS population boundaries, stream hydrography, land use, land cover, and land ownership. The CHARTs were 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 CHARTs were 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 CHARTs identified and documented such activities for each area; see Appendix A (lower Columbia River coho) and Appendix B (Puget Sound steelhead).

CHART PHASE 3

In Phase 3, the CHARTs met to discuss the watershed scores generated in Phase 2, along with additional considerations, to assign a High, Medium, or Low conservation value[2] to

[2] In the Advance Notice of Proposed Rulemaking (76 FR 1392, January 10, 2011) we describe the conservation value of a site as depending on "(1) the importance of the populations associated with a site to the DPS conservation, and (2) the contribution of that site to the conservation of the population either through demonstrated or potential productivity of the area."

each watershed/area (the conservation value of a given HUC5 is the relative importance of the HUC5 to conservation of the DPS). The additional considerations included the relationship of each HUC5 to others in the DPS and the significance to the DPS of the population occupying each HUC5. As an example of the first additional consideration, a HUC5 with a particular raw score might receive a medium rating if it is in close proximity to several other high-scoring HUC5s that support the DPS, while another HUC5 with that same raw score might receive a high rating if it is one of only a few HUC5s supporting a DPS, or if the other HUC5s have low scores.

The second consideration involves population characteristics and is relevant because some populations have a higher conservation value to the DPS than others. Thus a HUC5 that received a medium score might nevertheless be rated high if it supports a unique or significant population within the DPS. 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. Thus 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. The migration corridor was given the same rating as the highest-rated HUC5 for which it serves as a migration corridor.[3]

In other words, the scores provided a judgment about the value of each HUC5 in isolation, while the additional considerations allowed the CHARTs to evaluate the relative contribution of each HUC5 and come up with an overall rating.

Based on the raw scores and the additional considerations, high-value watersheds/areas were those deemed to have a high likelihood of promoting DPS conservation, while low-value watersheds/areas were expected to contribute relatively less to conservation. The watershed scoring system proved to be a useful tool for informing the rating of conservation value; in general, those watersheds and areas that received the highest scores in Phase 2 also were deemed to have a high conservation value for the DPS, while the opposite was true for low-scoring watersheds and areas.

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[3] The CHARTs 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 some DPSs 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 could still contain a rearing/migration corridor with a higher conservation value.

During this phase the CHARTs were 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 CHARTs' 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 Appendix C). 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 CHARTs to confirm whether they would conclude that the watersheds matching this profile did in fact have low leverage. To make this determination the CHARTs relied on the agency's recent consultation history (e.g., using data from the NMFS 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" then we would diminish the watershed's benefit of designation[4] for the purposes of conducting the ESA 4(b)(2) analysis. The CHART conclusions are contained in Appendix C of this report.

The next step in Phase 3 involved asking the CHARTs to identify any unoccupied areas that may be essential for the conservation of a DPS. Section 3(5)(C) of the ESA defines critical habitat as including unoccupied areas, but only upon making a finding that "such areas are essential for the conservation of the species." Regulations at 50 CFR 424.12(e) state 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 CHARTs were asked to provide their professional judgment as to whether limiting the designation to the entire occupied range would be adequate to ensure the conservation of the DPS. In one case (areas in the upper Elwha River previously blocked by dams) the CHART was able to determine that particular unoccupied areas "are" essential for the conservation of Puget Sound steelhead (see Appendix B). In making this assessment, the CHARTs used information regarding the DPS's historic and potential distribution, as well as pertinent

[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.

information from Section 7 consultations and ongoing recovery and re-introduction efforts.

The final step in Phase 3 involved asking the CHARTs to consider whether excluding from critical habitat designation particular areas with certain economic impacts would significantly impede conservation. The CHARTs considered these areas both alone or in combination with other eligible areas. In making this determination, the CHARTs 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 conclusions are contained in Appendix D of this report.

NEXT STEPS

This and other related reports will be distributed for public comment and peer review during the agency's rulemaking process. The CHARTs will be reconvened to review the comments and any new information that might bear on their initial assessments before the agency publishes final critical habitat designations for lower Columbia River coho salmon and Puget Sound steelhead.

Table 1. Factors and Associated Criteria Considered by CHARTs to Determine the Conservation Value of Occupied HUC5s

Factors	**Criteria**
Factor 1. PCE Quantity Considers the total stream area or number of reaches in the HUC5 where PCEs are found and compares them relative to other HUC5s and their probable historical quantity in the HUC5.	3 = High number of stream reaches with PCEs in the HUC5. 2 = Moderate number of stream reaches with PCEs in the HUC5, near or reduced from historic levels. 1 = Low number of stream reaches with PCEs are in the HUC5, likely reduced from historic potential. 0 = Low number of stream reaches with PCEs are in the HUC5, likely near historic potential.
Factor 2. PCE Quality – Current Condition Considers the existing condition of the quality of PCEs in the HUC5.	3 = PCEs in the HUC5 are in good to excellent condition. 2 = PCEs in the HUC5 are in fair to good condition. 1 = PCEs in the HUC5 are in fair to poor condition. 0 = PCEs in the HUC5 are in poor condition.
Factor 3. PCE Quality – Potential Condition Considers the likelihood of achieving PCE potential in the HUC5, either naturally or through active conservation/restoration, given known limiting factors, likely biophysical responses, and feasibility.	3 = PCEs in the HUC5 are highly functioning and are at their historic potential. 2 = PCEs in the HUC5 are reduced, but have high improvement potential. 1 = PCEs in the HUC5 may have some improvement potential. 0 = PCEs in the HUC5 have little or no improvement potential.
Factor 4. PCE Quality – Support of Rarity/Importance Considers the PCE support of rare genetic or life history characteristics or rare/important habitat types in the HUC5	3 = Highly likely that PCEs in the HUC5 support a rare genetic or life history type or include a rare/important habitat type (e.g., seeps, coldwater refuges, side channels, lakes). 2 = Possible that PCEs in the HUC5 support a rare genetic or life history type or include a rare/important habitat type. 1 = Unknown whether PCEs in the HUC5 support a rare genetic or life history type or include a rare/important habitat type. 0 = Unlikely that PCEs in the HUC5 probablysupport a rare genetic or life history type or include a rare/important type.
Factor 5. PCE Quality – Support of Abundant Populations Considers the PCE support of variable-sized populations relative to other HUC5s and the probable historical levels in the HUC5	3 = PCEs in the HUC5 currently support a large population. 2 = PCEs in the HUC5 historically supported a large population that is currently small. 1 = PCEs in the HUC5 currently and/or historically supported a small population. 0 = PCEs in the HUC5 support a population whose abundance is unknown or it is unlikely that it is or was significant.
Factor 6. PCE Quality – Support of Spawning/Rearing Considers the PCE support of spawning or rearing of varying numbers of populations.	3 = PCEs in the HUC5 support (currently or historically) spawning or rearing of multiple populations or life history types, or support the only extant spawning habitat for a single population. 2 = PCEs in the HUC5 related to spawning or rearing are found in two or more HUC5s that support a single population. 1 = Uncertain but possible that the PCEs in the HUC5 support spawning or rearing for at least one population. 0 = Unlikely that there are PCEs in the HUC5 that support spawning/rearing for at least one population.

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APPENDIX A
CHART ASSESSMENT FOR THE LOWER COLUMBIA RIVER COHO SALMON DPS

CHART Participants

The CHART for this DPS consisted of the following NMFS biologists: Mischa Connine, Michelle Day, Patty Dornbusch, Gayle Kreitman, Ben Meyer, Tim Rymer, and Rich Turner.

DPS Description

The lower Columbia River coho salmon DPS includes all naturally spawned populations of coho in the Columbia River and its tributaries in Washington and Oregon, from the mouth of the Columbia River upstream to and including the Big White Salmon and Hood Rivers, and including the lower Willamette River up to Willamette Falls, Oregon, as well as coho from twenty-five artificial propagation programs located in numerous watersheds throughout the range of the DPS (70 FR 37160, June 28, 2005). We recently conducted a review of the DPS's status and concluded that it should remain listed as a threatened species under the ESA (76 FR 50448, August 15, 2011).

Coho salmon populations in this DPS display one of two major life history types based on when and where adults migrate from the Pacific Ocean to spawn in fresh water. Early returning coho (Type S) typically forage in marine waters south of the Columbia River and return beginning in mid-August, while late returning coho (Type N) generally forage to the north and return to the Columbia River from late September through December (Oregon Department of Fish and Wildlife (ODFW), 2010a). It is thought that early returning coho migrate to headwater areas and late returning fish migrate to the lower reaches of larger rivers or into smaller streams and creeks along the Columbia River. Although there is some level of reproductive isolation and ecological specialization between early and late types, there is some uncertainty regarding the importance of these differences (Myers et al., 2006). Some tributaries historically supported spawning by both run types.

Mature coho of both types typically enter fresh water to spawn from late summer to late autumn. Spawning typically occurs between November and January. Migration and spawning timing of specific local populations may be mediated by factors such as latitude, migration distance, flows, water temperature, maturity, or migration obstacles. Coho generally occupy intermediate positions in tributaries, typically further upstream than chum salmon or fall-run Chinook salmon, but often downstream of steelhead or spring-run Chinook salmon (ODFW, 2010b). Typical coho spawning habitat includes pea to orange-size spawning gravel in small, relatively low-gradient tributaries (ODFW, 2010b). Egg incubation can take from 45 to 140 days, depending on water temperature, with longer incubation in colder water. Fry may thus emerge from early spring to early summer. Juveniles prefer complex instream structure

(primarily large and small woody debris) and shaded streams with tree-lined banks for rearing; they often overwinter in off-channel alcoves and beaver ponds (where available) (ODFW, 2010b). Freshwater rearing lasts until the following spring when the juveniles undergo physiological changes (smoltification) and migrate to salt water. Juvenile coho are present in the Columbia River estuary from March to August (Washington Lower Columbia Salmon Recovery and Fish and Wildlife Subbasin Plan, 2010). Coho grow relatively quickly in the ocean, reaching up to six kilograms after about 16 months of ocean rearing. Most coho are sexually mature at age three, except for a small percentage of males (jacks) who return to natal waters after only a few months of ocean residency. All coho die after spawning.

The lower Columbia River coho salmon DPS is comprised of 24 populations distributed among three ecological zones or ‘‘strata’’—the Coast, Cascade, and Gorge strata (Myers *et al.*, 2006 – see Figure A1). McElhany *et al.* (2007) assessed the viability of lower Columbia River coho populations and determined that only one —the Clackamas River—is approaching viability. They also observed that, with the exception of the Clackamas and Sandy populations, it is likely that most of the wild lower Columbia River coho populations were effectively extirpated in the 1990s and that no viable populations appear to exist in either the Coast or Gorge stratum. Although recently there is evidence of some natural production in this DPS, the majority of populations remain dominated by hatchery origin spawners, and there is little data to indicate they would naturally persist in the long term (NMFS, 2003). Approximately 40 percent of historical habitat is currently inaccessible, which restricts the number of areas that might support natural production, and further increases the DPS’s vulnerability to environmental variability and catastrophic events (NMFS, 2003). The extreme loss of naturally spawning populations, the low abundance of extant populations, diminished diversity, and fragmentation and isolation of the remaining naturally produced fish confer considerable risks to lower Columbia River coho.

Major habitat factors limiting recovery in fresh water include floodplain connectivity and function, channel structure and complexity, riparian areas and large woody debris recruitment, stream substrate, stream flow, and water quality (Pacific Coast Salmon Restoration Funds, 2007). In addition to impacts of the Federal Columbia River Hydropower System (especially Bonneville Dam on the mainstem Columbia River), numerous other populations are affected by upstream and tributary dams in the White Salmon, Hood, Lewis, Cowlitz, Sandy, and Clackamas basins although many of those effects are being addressed as a result of recent Federal Energy Regulatory Commission re-licensing and associated ESA consultations. For example, the removal of Marmot and Little Sandy dams in the Sandy River basin has improved passage for the coho population into the upper watershed, and the removal of Condit Dam is expected to support restoration of the White Salmon River portion of the Washington Upper Gorge coho population.

The ocean survival of juvenile lower Columbia River coho can be affected by estuary factors such as changes in food availability and the presence of contaminants. Characteristics of the

Columbia River plume are also thought to be significant to lower Columbia River coho migrants during transition to the ocean phase of their lifecycle, because yearling migrants appear to use the plume as habitat, in contrast to other species whose sub-yearling juveniles stay closer to shore (Fresh *et al.*, 2005). Predation and growth during the first marine summer appear to be important components determining coho broodyear strength (Beamish *et al.*, 2001).

Existing Salmon/Steelhead Critical Habitat Designations

Critical habitat is currently designated for three DPSs of salmon and steelhead that use lower Columbia tributary watersheds for spawning and rearing: lower Columbia River Chinook salmon and steelhead, and Columbia River chum salmon (70 FR 52630, September 2, 2005). In addition, several listed DPSs that spawn outside this range (e.g., Snake River fall Chinook salmon) have rearing and migration areas designated as critical habitat in areas occupied by lower Columbia River coho in the Columbia River mainstem and estuary. These existing designations have extensive overlap with areas under consideration as critical habitat for coho. While the essential physical and biological features are identical for the various DPSs, watershed conservation values for coho may differ due to species-specific differences in population structure and habitat utilization.

Recovery Planning Status

Recovery planning for coho and other ESA-listed salmon and steelhead in the lower Columbia River is underway, and a proposed recovery plan was made available for public comment in May 2012 (NMFS 2012). The proposed recovery plan includes three "management unit" plans, or plans addressing geographic areas smaller than the entire range of the DPS: (1) a Washington Lower Columbia management unit plan overseen and coordinated by the Lower Columbia Fish Recovery Board (LCFRB); (2) a White Salmon management unit plan overseen by NMFS and addressing the White Salmon River basin in Washington; and (3) an Oregon Lower Columbia management unit plan led by the ODFW with participation by the Oregon Governor's Natural Resources Office, NMFS, and the Oregon Lower Columbia River Stakeholder Team. Two other documents – an estuary module and a hydropower module – are key components of this recovery plan. These documents, which address regional-scale issues affecting lower Columbia River salmon and steelhead and other listed Columbia River DPSs, provide a consistent set of assumptions and recovery actions that were incorporated into each management unit plan. The plans also are all consistent with work by the Willamette/Lower Columbia Technical\Recovery Team, which was formed by NMFS to assess the population structure and develop viability criteria for listed lower Columbia River salmon and steelhead (see McElhany *et al.*, 2003; McElhany *et al.*, 2006; Myers *et al.*, 2006; and McElhany *et al.*, 2007). Because the ESA requires that recovery plans address the entire listed entity/DPS, we synthesized these management unit

plans and modules into a single recovery plan that also underscores interdependencies and issues of regional scope, and ensures that the entire salmon life cycle is addressed.

The CHART took advantage of the recent and significant progress made in recovery planning for lower Columbia River coho (NMFS 2012) and, as much as possible, incorporated that planning guidance in assessing the conservation value of occupied watersheds. Of particular value were the target statuses and recovery scenarios that served as the basis by which recovery planners could calculate numerical abundance and productivity goals for each coho population. Under this recovery scenario not all populations are targeted for a high degree of improvement, but all of them will need recovery actions—even so-called "stabilizing" populations. These are populations that are expected to remain at or near their current status (usually low or very low) because the feasibility of restoration is low and the uncertainty of success is high. "Primary" populations, on the other hand, are targeted for viability, meaning high or very high persistence probability. "Contributing" populations fall in the middle; they are targeted for some improvement in status. The actual definitions for these are:

- **Primary population**: A population that is targeted for restoration to high or very high persistence probability.
- **Contributing population**: A population for which some restoration will be needed to achieve the stratum-wide average viability recommended by the Washington-Lower Columbia Technical Recovery Team.
- **Stabilizing population**: A population that is targeted for maintenance at its baseline persistence probability, which is likely to be low or very low.

Another related parameter that was useful during the CHART's review was the recovery plan's population status index. This index allowed each population to be assigned a viability rating as portrayed in Table 1 which in turn informed the conservation value assessment for each watershed.

Table 1. Population-level Probability* of Persistence, Extinction Risk, and Status (from NMFS 2012)

Probability of Persistence	Probability of Extinction	Extinction Risk	Population Status
0 – 40%	60 – 100%	Extinct or at very high risk of extinction (VH)	Very low (VL)
40 – 75%	25 – 60%	Relatively high risk of extinction (H)	Low (L)
75 – 95%	5 – 25%	Moderate risk of extinction (M)	Medium (M)
95 – 99%	1 – 5%	Low/negligible risk of extinction (L)	High (H)
> 99%	< 1%	Very low risk of extinction (VL)	Very high (VH)

+ Probability over a 100-year time frame.
Shading indicates levels at which a population is considered viable.

CHART Area Assessments

The CHART assessment for this DPS addressed 10 subbasins containing 55 occupied watersheds, as well as the lower Columbia River and estuary rearing/migration corridor. As part of its assessment the CHART considered the conservation value of each watershed in the context of the populations within the strata identified by the TRT (Myers *et al.*, 2006). Information is presented below by USGS subbasin because they present a convenient and systematic way to organize the CHART's watershed assessments for this DPS and their names are generally more recognizable because they typically identify major river systems.

Middle Columbia/Hood Subbasin (HUC4# 17070105)

The Middle Columbia/Hood subbasin is located in the eastern portion of the Columbia River gorge of Oregon and Washington. Occupied watersheds in this subbasin are contained in Hood River, Multnomah, and Wasco counties in Oregon, and Klickitat and Skamania counties in Washington. The subbasin contains 13 watersheds, 8 of which are occupied by this DPS. Occupied watersheds encompass approximately 1,370 mi^2 (3,548 km^2). Fish distribution and habitat use data from the Oregon Department of Fish and Wildlife (ODFW) and the Washington Department of Fish and Wildlife (WDFW) identify approximately 212 miles (341 km) of occupied riverine habitat in the watersheds, including a 23-mile (37-km) segment of the Columbia River (ODFW 2010; WDFW 2010). Myers *et al.* (2006) identified a single ecological zone (Columbia Gorge) containing three populations: Upper Gorge Tributaries, Big White Salmon River, and Hood River. The recent recovery plan (NMFS 2012) identifies just two populations: Upper Gorge/Hood and Upper Gorge/White Salmon.

After reviewing the best available scientific data for this subbasin, the CHART concluded that all of the occupied areas in this subbasin contain one or more PCEs for this DPS. Table A1 summarizes the total number of occupied reaches identified for each HUC5 watershed as containing spawning, rearing, or migration PCEs, as well as management activities that may affect the PCEs in the watersheds. Map A1 depicts the specific areas in this subbasin occupied by the DPS and under consideration for critical habitat designation. The CHART also determined that the occupied HUC5 watersheds in this subbasin were of either high or medium conservation value to the DPS. Of the eight HUC5s reviewed, five were rated as having high and three were rated as having medium conservation value. The CHART noted that two HUC5s (Middle Columbia/Eagle Creek and Middle Columbia/Grays Creek) contain a high value rearing and migration corridor in the Columbia River connecting high value upstream watersheds with downstream reaches and the ocean. Table A2 summarizes the CHART's PCE/watershed scores and conservation value ratings, and Figure A2 shows the overall distribution of ratings by HUC5 watershed.

The CHART also considered whether blocked historical habitat above Condit Dam (on the White Salmon River) may be essential for conservation of the DPS. The decommissioning of this 100-year-old dam occurred in the summer of 2011 and will allow coho and other salmonids access to at least 26 miles of habitat in the 380 mi^2 basin upstream (PacifiCorp 2011a,b). The Team determined that accessing this habitat would likely provide a benefit to the DPS. However, the CHART concluded that it was unclear whether the areas above Condit Dam are essential for conservation of the entire DPS, especially in comparison to other, more extensive, historical habitats where coho are actively being reintroduced and that may be of greater potential benefit to the DPS (e.g., areas in the Upper Lewis River).

Lower Columbia/Sandy Subbasin (HUC4# 17080001)

The Lower Columbia/Sandy subbasin is located in the western portion of the Columbia River gorge of Oregon and Washington. Occupied watersheds in this subbasin are contained in Clackamas, Columbia, and Multnomah counties in Oregon, and Clark and Skamania counties in Washington. The subbasin contains nine watersheds, all of which are occupied by this DPS. Occupied watersheds encompass approximately 1,076 mi^2 (2,787 km^2). Fish distribution and habitat use data from the ODFW and WDFW identify approximately 453 miles (729 km) of occupied riverine habitat in the watersheds, including a 26-mile (42-km) segment of the Columbia River (ODFW 2010; WDFW 2010). Myers *et al.* (2003) identified two ecological zones associated with this subbasin (Western Cascade Range aka "Cascade Stratum" and Columbia Gorge aka "Gorge Stratum") containing four populations (Lower Gorge tributaries, Sandy River, Washougal River, and Salmon Creek). The recent recovery plan (NMFS 2012) identifies the same populations.

After reviewing the best available scientific data for this subbasin, the CHART concluded that all of the occupied areas in this subbasin contain one or more PCEs for this DPS. Table A1 summarizes the total number of occupied reaches identified for each HUC5 watershed as containing spawning, rearing, or migration PCEs, as well as management activities that may affect the PCEs in the watersheds. Map A2 depicts the specific areas in this subbasin occupied by the DPS and under consideration for critical habitat designation. The CHART also determined that the occupied HUC5 watersheds in this subbasin were of high or medium conservation value to the DPS. Of the nine HUC5s reviewed, four were rated as having high and five were rated as having medium conservation value. The CHART also noted that one HUC5 (Columbia Gorge Tributaries) contains a high value rearing and migration corridor in the Columbia River connecting high value upstream watersheds with downstream reaches and the ocean. Table A2 summarizes the CHART's PCE/watershed scores and conservation value ratings, and Figure A2 shows the overall distribution of ratings by HUC5 watershed.

Lewis Subbasin (HUC4# 17080002)

The Lewis subbasin is located in southwest Washington and contained in Clark, Cowlitz, and Skamania counties (a very small and unoccupied portion in the uppermost watershed is

contained in Yakima County). The subbasin contains six watersheds, all of which are currently occupied by this DPS (including four watersheds above Merwin Dam now accessible to coho via trap and haul operations in the Upper Lewis River (PacifiCorp *et al.* 2004) Occupied watersheds encompass approximately 456 mi^2 (1,181 km^2) Fish distribution and habitat use data from the WDFW identify approximately 299 miles (481 km) of occupied riverine habitat in the watersheds (WDFW 2010). Myers *et al.* (2003) identified one ecological zone associated with this subbasin (Western Cascade Range aka "Cascade Stratum") containing two populations – one in the East Fork Lewis River and another in the North Fork Lewis River. The recent recovery plan (NMFS 2012) identifies the same populations.

After reviewing the best available scientific data for this subbasin, the CHART concluded that all of the occupied areas in this subbasin contain one or more PCEs for this DPS. Table A1 summarizes the total number of occupied reaches identified for each HUC5 watershed as containing spawning, rearing, or migration PCEs, as well as management activities that may affect the PCEs in the watersheds. Map A3 depicts the specific areas in this subbasin occupied by the DPS and under consideration for critical habitat designation. The CHART also determined that the occupied HUC5 watersheds in this subbasin ranged from high to low conservation value to the DPS. Of the six HUC5s reviewed, three were rated as having high, two were rated as having medium conservation value, and one was rated as having low conservation value to the DPS. Table A2 summarizes the CHART's PCE/watershed scores and conservation value ratings, and Figure A2 shows the overall distribution of ratings by HUC5 watershed.

Lower Columbia/Clatskanie Subbasin (HUC4# 17080003)

The Lower Columbia/Clatskanie subbasin is located in southwest Washington and northwest Oregon. Occupied watersheds in this subbasin are contained in Clatsop and Columbia counties in Oregon, and Cowlitz, Lewis, Skamania, and Wahkiakum counties in Washington. The subbasin contains six watersheds, all of which are occupied by this DPS. Occupied watersheds encompass approximately 841 mi^2 (2,178 km^2) Fish distribution and habitat use data from ODFW and WDFW identify approximately 387 miles (623 km) of occupied riverine habitat in the watersheds (ODFW 2010; WDFW 2010). Myers *et al.* (2003) identified two ecological zones (Coast Range aka "Coast Stratum" and Western Cascade Range aka "Cascade Stratum") containing four populations (Kalama River, Clatskanie River, Elochoman River, and Scappoose Creek) in this subbasin. The recent recovery plan (NMFS 2012) identifies the same populations.

After reviewing the best available scientific data for this subbasin, the CHART concluded that all of the occupied areas in this subbasin contain one or more PCEs for this DPS. Table A1 summarizes the total number of occupied reaches identified for each HUC5 watershed as containing spawning, rearing, or migration PCEs, as well as management activities that may affect the PCEs in the watersheds. Map A4 depicts the specific areas in this subbasin

occupied by the DPS and under consideration for critical habitat designation. The CHART also determined that the occupied HUC5 watersheds in this subbasin were of high or medium conservation value to the DPS. Of the six HUC5s reviewed, three were rated as having high and three were rated as having medium conservation value to the DPS. Table A2 summarizes the CHART's PCE/watershed scores and conservation value ratings, and Figure A2 shows the overall distribution of ratings by HUC5 watershed.

Upper Cowlitz Subbasin (HUC4# 17080004)

The Upper Cowlitz subbasin is located in southwest Washington and contained in Lewis, Pierce, Skamania, and Yakima counties. The subbasin contains five watersheds, all of which are occupied by this DPS. Occupied watersheds encompass approximately 1,030 mi^2 (2,668 km^2) Fish distribution and habitat use data from WDFW identify approximately 181 miles (291 km) of occupied riverine habitat in the watersheds (WDFW 2010). All of this habitat is located upstream of impassable dams (Mayfield and Mossyrock) and only accessible to anadromous fish via trap and haul operations. Myers *et al.* (2003) identified one ecological zone (Western Cascade Range aka "Cascade Stratum") containing two populations (Upper Cowlitz River and Cispus River) in this subbasin. The recent recovery plan (NMFS 2012) identifies the same populations.

After reviewing the best available scientific data for this subbasin, the CHART concluded that all of the occupied areas in this subbasin contain one or more PCEs for this DPS. Table A1 summarizes the total number of occupied reaches identified for each HUC5 watershed as containing spawning, rearing, or migration PCEs, as well as management activities that may affect the PCEs in the watersheds. Map A5 depicts the specific areas in this subbasin occupied by the DPS and under consideration for critical habitat designation. The CHART also determined that four of the occupied HUC5 watersheds in this subbasin were of high conservation value and one was of medium conservation value to the DPS. Table A2 summarizes the CHART's PCE/watershed scores and conservation value ratings, and Figure A2 shows the overall distribution of ratings by HUC5 watershed.

Lower Cowlitz Subbasin (HUC4# 17080005)

The Lower Cowlitz subbasin is located in southwest Washington and contained in Cowlitz, Lewis, and Skamania counties. The subbasin contains eight watersheds, all of which are occupied by this DPS. Occupied watersheds encompass approximately 1,460 mi^2 (3,781 km^2). Fish distribution and habitat use data from WDFW identify approximately 791 miles (1,273 km) of occupied riverine habitat in the (WDFW 2010). Habitat in two HUC5 watersheds – Tilton River and Riffe Reservoir – is located upstream of impassable dams (Mayfield Dam and Mossyrock Dam) and only accessible to anadromous fish via trap and haul operations. Myers *et al.* (2003) identified one ecological zone (Western Cascade Range aka "Cascade Stratum") containing six populations (Upper Cowlitz River, Lower Cowlitz River, Tilton River, Coweeman River, North Fork Toutle River, and South Fork Toutle

River) in this subbasin. The recent recovery plan (NMFS 2012) identifies the same populations.

After reviewing the best available scientific data for this subbasin, the CHART concluded that all of the occupied areas in this subbasin contain one or more PCEs for this DPS. Table A1 summarizes the total number of occupied reaches identified for each HUC5 watershed as containing spawning, rearing, or migration PCEs, as well as management activities that may affect the PCEs in the watersheds. Map A6 depicts the specific areas in this subbasin occupied by the DPS and under consideration for critical habitat designation. The CHART determined that the occupied HUC5 watersheds in this subbasin ranged from high to low conservation value to the DPS. Of the eight HUC5s reviewed, six were rated as having high, one was rated as having medium conservation value, and one was rated as having low conservation value to the DPS. The CHART also noted that four HUC5s (Riffe Reservoir, Jackson Prairie, East Willapa, and Coweeman River) contained high value rearing and migration corridors connecting high value upstream watersheds with downstream reaches and the ocean. Table A2 summarizes the CHART's PCE/watershed scores and conservation value ratings, and Figure A2 shows the overall distribution of ratings by HUC5 watershed.

Lower Columbia Subbasin (HUC4# 17080006)

The Lower Columbia subbasin is located at the mouth of the Columbia River in southwest Washington and Northwest Oregon. Occupied watersheds in this subbasin are contained in Clatsop County, Oregon, and Lewis, Pacific, and Wahkiakum counties in Washington. The subbasin contains three watersheds, all of which are occupied by this DPS. Occupied watersheds encompass approximately 515 mi^2 (1,334 km^2). Fish distribution and habitat use data from the ODFW and WDFW identify approximately 370 miles (595 km) of occupied riverine habitat in the watersheds (ODFW 2010; WDFW 2010). Myers *et al.* (2003) identified one ecological zone (Coast Range aka "Coast Stratum") containing three populations (Grays/Chinook Rivers, Big Creek, and Youngs Bay) in this subbasin. The recent recovery plan (NMFS 2012) identifies the same populations.

After reviewing the best available scientific data for this subbasin, the CHART concluded that all of the occupied areas in this subbasin contain one or more PCEs for this DPS. Table A1 summarizes the total number of occupied reaches identified for each HUC5 watershed as containing spawning, rearing, or migration PCEs, as well as management activities that may affect the PCEs in the watersheds. Map A7 depicts the specific areas in this subbasin occupied by the DPS and under consideration for critical habitat designation. The CHART also determined that the occupied HUC5 watersheds in this subbasin were of either high (Grays Bay) or medium (Big Creek and Youngs River) conservation value to the DPS. Table A2 summarizes the CHART's PCE/watershed scores and conservation value ratings, and Figure A2 shows the overall distribution of ratings by HUC5 watershed.

Middle Willamette Subbasin (HUC4# 17090007)

The portion of the Middle Willamette River subbasin occupied by this DPS is downstream of Willamette Falls and includes a single HUC5 watershed (Abernethy Creek) as well as a short segment (approximately 1 mile (1.6 km)) of the Willamette River downstream of Willamette Falls. Occupied portions of this subbasin within the DPS's range are contained in Clackamas County, Oregon. The Abernethy Creek watershed encompasses approximately 134 mi^2 (347 km^2). Fish distribution and habitat use data from the ODFW identify approximately 27 miles (43 km) of occupied riverine habitat in the subbasin (ODFW 2010). Myers *et al.* (2003) identified one ecological zone (Western Cascade Range aka "Cascade Stratum") containing one population (Clackamas River) in this subbasin. The recent recovery plan (NMFS 2012) identifies the same population.

After reviewing the best available scientific data for this subbasin, the CHART concluded that all of the occupied areas in the Abernethy Creek watershed contain one or more PCEs for this DPS. Table A1 summarizes the total number of occupied reaches identified for each HUC5 watershed as containing spawning, rearing, or migration PCEs, as well as management activities that may affect the PCEs in the watersheds. Map A8 depicts the specific areas in this subbasin occupied by the DPS and under consideration for critical habitat designation. The CHART also determined that the Abernethy Creek HUC5 watershed was of low conservation value to the DPS. Table A2 summarizes the CHART's PCE/watershed scores and conservation value ratings, and Figure A2 shows the overall distribution of ratings by HUC5 watershed.

Clackamas Subbasin (HUC4# 17090011)

The Clackamas subbasin is a Cascade Range drainage of the lower Willamette River and is contained in Clackamas and Marion counties, Oregon. The subbasin contains six watersheds, all of which are occupied by this DPS. Occupied watersheds encompass approximately 270 mi^2 (699 km^2). Fish distribution and habitat use data from ODFW identify approximately 253 miles (407 km) of occupied riverine habitat in the watersheds (ODFW 2010). Myers *et al.* (2003) identified one ecological zone (Western Cascade Range aka "Cascade Stratum") containing one population (Clackamas River) in this subbasin. The recent recovery plan (NMFS 2012) identifies the same population.

After reviewing the best available scientific data for this subbasin, the CHART concluded that all of the occupied areas in this subbasin contain one or more PCEs for this DPS. Table A1 summarizes the total number of occupied reaches identified for each HUC5 watershed as containing spawning, rearing, or migration PCEs, as well as management activities that may affect the PCEs in the watersheds. Map A9 depicts the specific areas in this subbasin occupied by the DPS and under consideration for critical habitat designation. The CHART also determined that all of the occupied HUC5 watersheds in this subbasin were of high conservation value to the DPS. Table A2 summarizes the CHART's PCE/watershed scores

and conservation value ratings, and Figure A2 shows the overall distribution of ratings by HUC5 watershed.

Lower Willamette Subbasin (HUC4# 17090012)

The Lower Willamette subbasin is located at the confluence of the Willamette and Columbia rivers in Northwest Oregon. Occupied watersheds in this subbasin are contained in Clackamas, Multnomah, and Washington counties, Oregon. The subbasin contains three watersheds, all of which are occupied by this DPS. Occupied watersheds encompass approximately 407 mi^2 (1,054 km^2). Fish distribution and habitat use data from the ODFW identify approximately 163 miles (262 km) of occupied riverine habitat in the watersheds (ODFW 2010). Myers *et al.* (2003) identified two ecological zones (Coast Range aka "Coast Stratum") and Western Cascade Range aka "Cascade Stratum") containing two populations (Clackamas River and Scappoose Creek) in this subbasin. The recent recovery plan (NMFS 2012) identifies the same populations.

After reviewing the best available scientific data for this subbasin, the CHART concluded that all of the occupied areas in this subbasin contain one or more PCEs for this DPS. Table A1 summarizes the total number of occupied reaches identified for each HUC5 watershed as containing spawning, rearing, or migration PCEs, as well as management activities that may affect the PCEs in the watersheds. Map A10 depicts the specific areas in this subbasin occupied by the DPS and under consideration for critical habitat designation. The CHART also determined that the occupied HUC5 watersheds in this subbasin were of either high (Scappoose Creek and Johnson Creek) or medium (Columbia Slough/Willamette) conservation value to the DPS. The CHART also noted that Columbia Slough and Smith and Bybee Lakes may provide important rearing habitat for juvenile coho salmon. Table A2 summarizes the CHART's PCE/watershed scores and conservation value ratings, and Figure A2 shows the overall distribution of ratings by HUC5 watershed.

Lower Columbia River Corridor

The lower Columbia River rearing and migration corridor consists of that segment of the Columbia River from the confluences of the Sandy River (Oregon) and Washougal River (Washington) to the Pacific Ocean. This corridor overlaps with the following counties: Clatsop, Columbia, and Multnomah counties in Oregon, and Clark, Cowlitz, Pacific, and Wahkiakum counties in Washington. Fish distribution and habitat use data from ODFW and WDFW identify approximately 118 miles (190 km) of occupied riverine and estuarine habitat in this corridor (ODFW 2010; WDFW 2010). Table A1 summarizes the total number of occupied reaches in this corridor containing rearing or migration PCEs, as well as management activities that may affect the PCEs.

After reviewing the best available scientific data for this subbasin, the CHART concluded that the lower Columbia River corridor was of high conservation value to the DPS. Other upstream reaches of the Columbia River corridor (within the Middle Columbia/Hood and

Lower Columbia/Sandy Subbasin subbasins above) are also high value for rearing/migration. The CHART noted that the lower Columbia River corridor connects every watershed and population in this DPS with the ocean and is used by rearing/migrating juveniles and migrating adults. The Columbia River estuary is a particularly important area for this DPS as both juveniles and adult salmon make the critical physiological transition between life in freshwater and marine habitats (ISAB 2000, Marriott *et al.* 2002).

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Table A1. Summary of Occupied Areas, PCEs, and Management Activities Affecting PCEs for the Lower Columbia River Coho Salmon DPS

Subbasin	Watershed	Area/ Watershed (HUC5) Code	Primary Constituent Elements (PCEs)			Management Activities**
			Spawning/ Rearing PCEs (mi)	Rearing/ Migration PCEs (mi)	Migration/ Presence PCEs (mi)*	
Middle Columbia/ Hood	East Fork Hood River	1707010506	47.9			A, C, F, I, R
Middle Columbia/ Hood	West Fork Hood River	1707010507	18.3			A, F, R
Middle Columbia/ Hood	Hood River	1707010508	20.7		0.7	A, C, D, F, R, I, U
Middle Columbia/ Hood	White Salmon River	1707010509			3.7	A, C, D, F, R, U
Middle Columbia/ Hood	Little White Salmon River	1707010510			1.7	D, F, R
Middle Columbia/ Hood	Wind River	1707010511	0.8		75.3	F, R, U
Middle Columbia/ Hood	Middle Columbia/ Grays Creek	1707010512	0.7		21.3	R, U
Middle Columbia/ Hood	Middle Columbia/ Eagle Creek	1707010513	5.6	1.9	12.9	D, R, U
Lower Columbia/ Sandy	Salmon River	1708000101	22.1	0.5		F, C, R
Lower Columbia/ Sandy	Zigzag River	1708000102	22.9	0.5		F, C, R
Lower Columbia/ Sandy	Upper Sandy River	1708000103	21.9	0.2		F, R
Lower Columbia/ Sandy	Middle Sandy River	1708000104	32.6	0.4		D, R, U

Subbasin	Watershed	Area/ Watershed (HUC5) Code	Primary Constituent Elements (PCEs)			Management Activities**
			Spawning/ Rearing PCEs (mi)	Rearing/ Migration PCEs (mi)	Migration/ Presence PCEs (mi)*	
Lower Columbia/ Sandy	Bull Run River	1708000105	12.1			D, F, R
Lower Columbia/ Sandy	Washougal River	1708000106	1.8		81.9	C, F, R, S, U, W
Lower Columbia/ Sandy	Columbia Gorge Tributaries	1708000107	9.1	7.1	81.7	C, D, F, R, U, W
Lower Columbia/ Sandy	Lower Sandy River	1708000108	27.1	6.7	1.3	A, C, F, R, U
Lower Columbia/ Sandy	Salmon Creek	1708000109	7.8		111.9	A, C, F, R, U, W
Lewis	Upper Lewis River	1708000201			18.5	D, F, R, W
Lewis	Muddy River	1708000202			28.1	D, F, R, W
Lewis	Swift Reservoir	1708000203			37.0	D, F, R, W
Lewis	Yale Reservoir	1708000204			32.6	D, F, R, W
Lewis	East Fork Lewis River	1708000205	7.3		76.0	A, C, F, R, S, U, W
Lewis	Lower Lewis River	1708000206	16.1		83.3	A, C, D, F, R, U, W
Lower Columbia/ Clatskanie	Kalama River	1708000301	8.8		18.1	C, F, R, U, W
Lower Columbia/ Clatskanie	Beaver Creek/ Columbia River	1708000302	36.2	19.4		A, C, F, R, U, W

Subbasin	Watershed	Area/ Watershed (HUC5) Code	Primary Constituent Elements (PCEs)			Management Activities**
			Spawning/ Rearing PCEs (mi)	Rearing/ Migration PCEs (mi)	Migration/ Presence PCEs (mi)*	
Lower Columbia/ Clatskanie	Clatskanie River	1708000303	54.0	6.5		A, C, F, R, U, W
Lower Columbia/ Clatskanie	Germany/ Abernathy	1708000304	9.7		81.5	A, C, F, R, U, W
Lower Columbia/ Clatskanie	Skamokawa/ Elochoman	1708000305	11.7		107.3	A, C, F, R, W
Lower Columbia/ Clatskanie	Plympton Creek	1708000306	8.2	23.0		A, C, F, R, W
Upper Cowlitz	Headwaters Cowlitz River	1708000401			8.3	C, F, R
Upper Cowlitz	Upper Cowlitz River	1708000402			38.0	C, F, R
Upper Cowlitz	Cowlitz Valley Frontal	1708000403			67.5	A, F, R, U
Upper Cowlitz	Upper Cispus River	1708000404			21.1	C, F, R
Upper Cowlitz	Lower Cispus River	1708000405			46.1	C, F, R
Lower Cowlitz	Tilton River	1708000501			65.6	C, D, F, R, U
Lower Cowlitz	Riffe Reservoir	1708000502			43.8	A, C, D, F, R
Lower Cowlitz	Jackson Prairie	1708000503	16.8		130.4	A, C, D, F, R

Subbasin	Watershed	Area/ Watershed (HUC5) Code	Primary Constituent Elements (PCEs)			Management Activities**
			Spawning/ Rearing PCEs (mi)	Rearing/ Migration PCEs (mi)	Migration/ Presence PCEs (mi)*	
Lower Cowlitz	North Fork Toutle River	1708000504	2.4	0.4	26.8	F, R
Lower Cowlitz	Green River	1708000505	19.3	21.1	28.8	F, R
Lower Cowlitz	South Fork Toutle River	1708000506	7.8	49.0	33.8	F, R
Lower Cowlitz	East Willapa	1708000507	46.6	47.3	120.9	A, C, F, R, U, W
Lower Cowlitz	Coweeman	1708000508	8.7		121.6	A, C, F, R, U, W
Lower Columbia	Youngs River	1708000601	64.1	66.3		A, C, F, I, R, U, W
Lower Columbia	Big Creek	1708000602	50.1	28.3		A, C, F, I, R, W
Lower Columbia	Grays Bay	1708000603	4.5	0.3	159.7	C, F, R, W
Middle Willamette	Abernethy Creek	1709000704	20.1	5.2	1.8	A, C, D, R, U
Clackamas	Collawash River	1709001101	16.8			F, R
Clackamas	Upper Clackamas River	1709001102	49.1			F, R
Clackamas	Oak Grove Fork Clackamas River	1709001103	4.3			D, F, G, R
Clackamas	Middle Clackamas River	1709001104	41.0	3.9		D, F, R

Subbasin	Watershed	Area/ Watershed (HUC5) Code	Primary Constituent Elements (PCEs)			Management Activities**
			Spawning/ Rearing PCEs (mi)	Rearing/ Migration PCEs (mi)	Migration/ Presence PCEs (mi)*	
Clackamas	Eagle Creek	1709001105	39.6			A, F, R
Clackamas	Lower Clackamas River	1709001106	74.4	6.4	17.4	A, C, D, I, R, U, W
Lower Willamette	Johnson Creek	1709001201	31.5	9.3		A, C, I, R, U, W
Lower Willamette	Scappoose Creek	1709001202	47.9	49.3		A, C, F, I, R, U, W
Lower Willamette	Columbia Slough/ Willamette River	1709001203		25.0		A, C, R, U, W
Multiple	Lower Columbia Corridor (Sandy/ Washougal to Ocean)	NA			131.5***	C, D, I, R, T, U, W

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

** 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 = 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 by LCFRB (2003), Subbasin Summary Reports of the NWPPC, and land use/land cover GIS layers from the U.S. Geological Survey.

*** The Lower Columbia River from the ocean upstream approximately 46.5 miles is considered to contain estuarine PCEs, in addition to migration and rearing (ISAB 2000).

Table A2. Summary of CHART Scores and Ratings of Conservation Value for Habitat Areas Occupied by the Lower Columbia River Coho Salmon DPS

Subbasin	Watershed	Area/ Watershed (HUC5) Code	Scoring System (factors)						Total HUC5 Score (0-18)	Comments/Other Considerations	CHART Rating of HUC5 Conservation Value	Rating of Connect-ivity Corridor
			1	2	3	4	5	6				
Middle Columbia/ Hood	East Fork Hood River	1707010506	2	2	1	1	1	2	9	Moderate HUC5 score. PCEs support a population that is expected to play a primary role in recovery with a high level of viability. One of three HUC5s supporting Hood River coho, each with a substantial amount of available habitat relative to other watersheds in the Gorge Stratum.	High	
Middle Columbia/ Hood	West Fork Hood River	1707010507	2	2	1	1	1	2	9	Moderate HUC5 score. PCEs support a population that is expected to play a primary role in recovery with a high level of viability. One of three HUC5s supporting Hood River coho, each with a substantial amount of available habitat relative to other watersheds in the Gorge Stratum.	High	
Middle Columbia/ Hood	Hood River	1707010508	2	1	2	1	1	2	9	Moderate HUC5 score. PCEs support a population that is expected to play a primary role in recovery with a high level of viability. One of three HUC5s supporting Hood River coho, each with a substantial amount of available habitat relative to other watersheds in the Gorge Stratum.	High	High

Subbasin	Watershed	Area/ Watershed (HUC5) Code	Scoring System (factors)						Total HUC5 Score (0-18)	Comments/Other Considerations	CHART Rating of HUC5 Conservation Value	Rating of Connect-ivity Corridor
			1	2	3	4	5	6				
Middle Columbia/ Hood	White Salmon River	1707010509	1	2	2	1	1	1	8	Moderate HUC5 score. PCEs support a population that is expected to play a primary role in recovery with a high level of viability. The CHART noted that reaches above the recently-removed Condit Dam may be essential for conservation, especially given the limited number of watersheds in the Gorge Stratum and the good potential for additional coho production at the boundary of this DPS.	High	
Middle Columbia/ Hood	Little White Salmon River	1707010510	1	2	0	1	1	2	7	Moderate HUC5 score. PCEs support a population that is expected to play a primary role in recovery with a high level of viability. Although PCEs are limited in this HUC5, it may be important as coldwater refugia for coho from the White Salmon and Hood River basins.	High	
Middle Columbia/ Hood	Wind River	1707010511	3	2	2	1	1	2	11	Moderate HUC5 score. PCEs support a population that is expected to play a primary role in recovery with a high level of viability. However, steeper terrain in this watershed likely makes it of lower conservation value to coho than other HUC5s in the Gorge Stratum. The CHART did not identify any low-value watersheds in the Gorge Stratum due to the limited number of HUC5s supporting coho here.	Medium	

Subbasin	Watershed	Area/ Watershed (HUC5) Code	Scoring System (factors)						Total HUC5 Score (0-18)	Comments/Other Considerations	CHART Rating of HUC5 Conservation Value	Rating of Connect-ivity Corridor
			1	2	3	4	5	6				
Middle Columbia/ Hood	Middle Columbia/ Grays Creek	1707010512	1	2	2	1	1	3	10	Moderate HUC5 score. PCEs support a population that is expected to play a primary role in recovery with a high level of viability. However, the limited amount of tributary habitat in this watershed likely makes it of lower conservation value to coho than other HUC5s in the Gorge Stratum. The CHART did not identify any low-value watersheds in the Gorge Stratum due to the limited number of HUC5s supporting coho here.	Medium	High
Middle Columbia/ Hood	Middle Columbia/ Eagle Creek	1707010513	1	2	2	1	1	3	10	Moderate HUC5 score. PCEs support a population that is expected to play a primary role in recovery with a high level of viability. However, the limited amount of tributary habitat in this watershed likely makes it of lower conservation value to coho than other HUC5s in the Gorge Stratum. The CHART did not identify any low-value watersheds in the Gorge Stratum due to the limited number of HUC5s supporting coho here.	Medium	High
Lower Columbia/ Sandy	Salmon River	1708000101	2	2	2	3	2	2	13	High HUC5 score. PCEs support a population that is expected to play a primary role in recovery with a high level of viability. The Sandy River population is second only to the Clackamas in recent wild spawner abundance, and the Salmon River formerly supported the largest coho run in the Sandy River system.	High	

Subbasin	Watershed	Area/ Watershed (HUC5) Code	Scoring System (factors)						Total HUC5 Score (0-18)	Comments/Other Considerations	CHART Rating of HUC5 Conservation Value	Rating of Connect-ivity Corridor
			1	2	3	4	5	6				
Lower Columbia/ Sandy	Zigzag River	1708000102	3	2	2	3	2	2	14	High HUC5 score. PCEs support a population that is expected to play a primary role in recovery with a high level of viability. The Sandy River population is second only to the Clackamas in recent wild spawner abundance. Tributary spawning PCEs are still extensive in this HUC5.	High	
Lower Columbia/ Sandy	Upper Sandy River	1708000103	3	2	2	3	2	2	14	High HUC5 score. PCEs support a population that is expected to play a primary role in recovery with a high level of viability. The Sandy River population is second only to the Clackamas in recent wild spawner abundance. Tributary spawning PCEs are still extensive in this HUC5.	High	
Lower Columbia/ Sandy	Middle Sandy River	1708000104	1	1	2	3	2	2	11	Moderate HUC5 score. PCEs support a population that is expected to play a primary role in recovery with a high level of viability. Tributary PCEs are more limited in this HUC5 relative to upstream/headwater HUC5s that the CHART determined had a higher conservation value.	Medium	High
Lower Columbia/ Sandy	Bull Run River	1708000105	1	1	2	3	2	2	11	Moderate HUC5 score. PCEs support a population that is expected to play a primary role in recovery with a high level of viability. Tributary PCEs are more limited in this HUC5 relative to other headwater HUC5s that the CHART determined had a higher conservation value.	Medium	

Subbasin	Watershed	Area/ Watershed (HUC5) Code	Scoring System (factors)						Total HUC5 Score (0-18)	Comments/Other Considerations	CHART Rating of HUC5 Conservation Value	Rating of Connect-ivity Corridor
			1	2	3	4	5	6				
Lower Columbia/ Sandy	Washougal River	1708000106	2	1	2	1	2	2	10	Moderate HUC5 score. PCEs support a population that is expected to play a lesser, contributing role in recovery with only a moderate level of viability. The CHART noted that although PCEs are still fairly extensive in this HUC5, historical coho production was some of the lowest in the DPS.	Medium	
Lower Columbia/ Sandy	Columbia Gorge Tributaries	1708000107	2	2	2	2	1	3	12	Moderate HUC5 score. PCEs support a population that is expected to play a primary role in recovery with a high level of viability. A substantial amount of tributary habitat in this watershed relative to the two other Columbia corridor HUC5s upstream. This is the only HUC5 with spawning habitat supporting the Lower Gorge Tributaries population. Also, there are significant restoration efforts underway here, and regular high concentrations of spawners.	High	High
Lower Columbia/ Sandy	Lower Sandy River	1708000108	1	1	2	3	2	2	11	Moderate HUC5 score. PCEs support a population that is expected to play a primary role in recovery with a high level of viability. Tributary PCEs are more limited in this HUC5 relative to upstream/headwater HUC5s that the CHART determined had a higher conservation value.	Medium	High
Lower Columbia/ Sandy	Salmon Creek	1708000109	2	1	2	1	2	3	11	Moderate HUC5 score. PCEs support a population that is expected to play a lesser stabilizing role in recovery with only a very low level of viability. Although this watershed is highly urbanized, the CHART noted that there is still a significant amount of habitat available in this HUC5, especially in the upper reaches of Salmon Creek.	Medium	

Subbasin	Watershed	Area/ Watershed (HUC5) Code	Scoring System (factors)						Total HUC5 Score (0-18)	Comments/Other Considerations	CHART Rating of HUC5 Conservation Value	Rating of Connect-ivity Corridor
			1	2	3	4	5	6				
Lewis	Upper Lewis River	1708000201	2	3	3	2	2	2	14	High HUC5 score. PCEs support a population that is expected to play a lesser, contributing role in recovery with only a low level of viability. This HUC5 contains important mid- to high-elevation forested habitats for spawning. Coho access this watershed via a trap and haul program , and the CHART noted important re-introduction programs underway for this area. The CHART also noted that PCEs are still fairly extensive in this HUC5 and the historical production from this population was considerable.	High	
Lewis	Muddy River	1708000202	2	3	3	2	2	2	14	High HUC5 score. PCEs support a population that is expected to play a lesser, contributing role in recovery with only a low level of viability. This HUC5 contains important mid- to high-elevation forested habitats for spawning. Coho access this watershed via a trap and haul program , and the CHART noted important re-introduction programs underway for this area. The CHART also noted that PCEs are still fairly extensive in this HUC5 and the historical production from this population was considerable.	High	
Lewis	Swift Reservoir	1708000203	1	1	1	2	2	2	9	Moderate HUC5 score. PCEs support a population that is expected to play a lesser, contributing role in recovery with only a low level of viability. Coho access this watershed via a trap and haul program. Tributary PCEs are significantly degraded due to inundation by Swift reservoir. This HUC5 is important primarily as a rearing/migration corridor for juveniles from upstream spawning areas.	Medium	High

Subbasin	Watershed	Area/ Watershed (HUC5) Code	Scoring System (factors)						Total HUC5 Score (0-18)	Comments/Other Considerations	CHART Rating of HUC5 Conservation Value	Rating of Connect-ivity Corridor
			1	2	3	4	5	6				
Lewis	Yale Reservoir	1708000204	1	1	1	2	2	2	9	Moderate HUC5 score. PCEs support a population that is expected to play a lesser, contributing role in recovery with only a low level of viability. Coho access this watershed via a trap and haul program. Tributary PCEs are significantly limited and degraded due to inundation by Yale reservoir. This HUC5 is important primarily as a rearing/migration corridor for juveniles from upstream spawning areas.	Low	High
Lewis	East Fork Lewis River	1708000205	2	1	2	2	2	3	12	Moderate HUC5 score. PCEs support a population that is expected to play a primary role in recovery with a high level of viability. The CHART noted that, in addition to the recovery planning emphasis in this HUC5, the East Fork Lewis River is the only major undammed stream within the Washington side of the Columbia River basin.	High	
Lewis	Lower Lewis River	1708000206	2	1	2	2	2	2	11	Moderate HUC5 score. Most PCEs in this HUC5 support a population that is expected to play a lesser, contributing role in recovery with only a low level of viability. The lowermost section of the Lewis River also supports the East Fork Lewis population (see above). Coho access the upper portion of this watershed via a trap and haul program. Tributary PCEs are significantly limited and degraded due to inundation by Merwin reservoir. This HUC5 is important primarily as a rearing/migration corridor for juveniles from upstream spawning areas but does contain substantial tributary habitat as well.	Medium	High

Subbasin	Watershed	Area/ Watershed (HUC5) Code	Scoring System (factors)						Total HUC5 Score (0-18)	Comments/Other Considerations	CHART Rating of HUC5 Conservation Value	Rating of Connect-ivity Corridor
			1	2	3	4	5	6				
Lower Columbia/ Clatskanie	Kalama River	1708000301	1	2	2	1	1	3	10	Moderate HUC5 score. PCEs support a population that is expected to play a lesser, contributing role in recovery with only a moderate level of viability. The CHART noted that PCEs are not extensive here and historical coho production was some of the lowest in the DPS.	Medium	
Lower Columbia/ Clatskanie	Beaver Creek/ Columbia River	1708000302	1	1	1	1	0	3	7	Moderate HUC5 score. PCEs support portions of two populations that are expected to play a primary role in recovery with a very high level of viability. However, the PCEs are much more limited in this HUC5 relative to the adjacent watersheds supporting these populations. The CHART did not identify any low-value watersheds in the Coast Stratum due to the limited number of HUC5s supporting coho here.	Medium	
Lower Columbia/ Clatskanie	Clatskanie River	1708000303	3	1	2	1	1	2	10	Moderate HUC5 score. PCEs support a population that is expected to play a primary role in recovery with very a high level of viability. PCEs are extensive in this HUC5 and the majority of habitat supporting this population is located here and in the adjacent Plympton Creek HUC5.	High	
Lower Columbia/ Clatskanie	Germany/ Abernathy	1708000304	3	1	2	1	2	3	12	Moderate HUC5 score. PCEs support a population that is expected to play a lesser, contributing role in recovery with a medium level of viability. Therefore the CHART determined that the conservation value of this HUC5 was lower than others in the Coast Stratum. The CHART did not identify any low-value watersheds in the Coast Stratum due to the limited number of HUC5s supporting coho here.	Medium	

Subbasin	Watershed	Area/ Watershed (HUC5) Code	Scoring System (factors)						Total HUC5 Score (0-18)	Comments/Other Considerations	CHART Rating of HUC5 Conservation Value	Rating of Connect-ivity Corridor
			1	2	3	4	5	6				
Lower Columbia/ Clatskanie	Skamokawa/ Elochoman	1708000305	3	2	2	1	2	3	13	High HUC5 score. PCEs support a population that is expected to play a primary role in recovery with a high level of viability. PCEs are extensive in this HUC5, which is the only watershed supporting this population.	High	
Lower Columbia/ Clatskanie	Plympton Creek	1708000306	2	2	2	1	1	2	10	Moderate HUC5 score. PCEs support a population that is expected to play a primary role in recovery with a very high level of viability. PCEs are extensive in this HUC5 and the majority of habitat supporting this population is located here and in the adjacent Clatskanie River HUC5.	High	
Upper Cowlitz	Headwaters Cowlitz River	1708000401	1	2	1	1	1	2	8	Moderate HUC5 score. PCEs support a population that is expected to play a primary role in recovery with a high level of viability. PCEs are very limited in this HUC5 compared to other watersheds downstream.	Medium	
Upper Cowlitz	Upper Cowlitz River	1708000402	2	1	2	1	2	2	10	Moderate HUC5 score. PCEs support a population that is expected to play a primary role in recovery with a high level of viability. Coho access this watershed via a trap and haul program. The CHART noted that PCEs are still fairly extensive in this HUC5 and the historical production from this population was some of the highest in the DPS.	High	High

Subbasin	Watershed	Area/ Watershed (HUC5) Code	Scoring System (factors)						Total HUC5 Score (0-18)	Comments/Other Considerations	CHART Rating of HUC5 Conservation Value	Rating of Connect-ivity Corridor
			1	2	3	4	5	6				
Upper Cowlitz	Cowlitz Valley Frontal	1708000403	2	1	2	1	2	2	10	Moderate HUC5 score. PCEs support a population that is expected to play a primary role in recovery with a high level of viability. Coho access this watershed via a trap and haul program. The CHART noted that PCEs are still fairly extensive in this HUC5 and the historical production from this population was some of the highest in the DPS.	High	High
Upper Cowlitz	Upper Cispus River	1708000404	2	2	2	1	2	2	11	Moderate HUC5 score. PCEs support a population that is expected to play a primary role in recovery with a high level of viability. Coho access this watershed via a trap and haul program. The CHART noted that PCEs are still fairly extensive in this HUC5 and the historical production from this population was considerable.	High	
Upper Cowlitz	Lower Cispus River	1708000405	2	2	2	1	2	2	11	Moderate HUC5 score. PCEs support a population that is expected to play a primary role in recovery with a high level of viability. Coho access this watershed via a trap and haul program. The CHART noted that PCEs are still fairly extensive in this HUC5 and the historical production from this population was considerable.	High	High
Lower Cowlitz	Tilton River	1708000501	2	1	2	1	1	2	9	Moderate HUC5 score. PCEs support a population that is expected to play a lesser, stabilizing role in recovery with a only a very low level of viability. Coho access this watershed via a trap and haul program. PCEs are more degraded here than in other adjacent watersheds in the upper Cowlitz River basin.	Medium	

Subbasin	Watershed	Area/ Watershed (HUC5) Code	Scoring System (factors)						Total HUC5 Score (0-18)	Comments/Other Considerations	CHART Rating of HUC5 Conservation Value	Rating of Connect-ivity Corridor
			1	2	3	4	5	6				
Lower Cowlitz	Riffe Reservoir	1708000502	1	1	1	1	1	2	7	Moderate HUC5 score. PCEs support a population that is expected to play a primary role in recovery with a high level of viability. Coho access this watershed via a trap and haul program. Tributary PCEs are significantly degraded due to inundation by the reservoir. This HUC5 is important primarily as a rearing/migration corridor for juveniles from upstream spawning areas for the Cispus River and Upper Cowlitz River populations.	Low	High
Lower Cowlitz	Jackson Prairie	1708000503	3	1	2	3	2	2	13	High HUC5 score. PCEs support a population that is expected to play a primary role in recovery with a high level of viability. Tributary PCEs, although degraded, are still very extensive in this HUC5. The CHART noted that this population could be considered an archetype for the late-run (Type N) coho stock.	High	High
Lower Cowlitz	North Fork Toutle River	1708000504	1	1	2	3	2	2	11	Moderate HUC5 score. PCEs support a population that is expected to play a primary role in recovery with a high level of viability. The CHART noted that this population (North Fork Toutle) could be considered an archetype for the early-run (Type S) coho stock, and may show some resilience to catastrophic/volcanic sediment loads. The CHART also noted that historical production from this population was considerable.	High	

Subbasin	Watershed	Area/ Watershed (HUC5) Code	Scoring System (factors)						Total HUC5 Score (0-18)	Comments/Other Considerations	CHART Rating of HUC5 Conservation Value	Rating of Connect-ivity Corridor
			1	2	3	4	5	6				
Lower Cowlitz	Green River	1708000505	2	1	2	3	2	2	12	Moderate HUC5 score. PCEs support a population that is expected to play a primary role in recovery with a high level of viability. The CHART noted that this population (North Fork Toutle) could be considered an archetype for the early-run (Type S) coho stock, and may show some resilience to catastrophic/volcanic sediment loads. The CHART also noted that PCEs are still fairly extensive in this HUC5 and the historical production from this population was considerable.	High	
Lower Cowlitz	South Fork Toutle River	1708000506	2	1	2	3	2	3	13	Moderate HUC5 score. PCEs support a population that is expected to play a primary role in recovery with a high level of viability. The CHART noted that this population (South Fork Toutle) could be considered an archetype for the early-run (Type S) coho stock, and may show some resilience to catastrophic/volcanic sediment loads. The CHART also noted that PCEs are still fairly extensive in this HUC5 and the historical production from this population was considerable.	High	
Lower Cowlitz	East Willapa	1708000507	3	1	2	3	3	3	15	High HUC5 score. PCEs support a population that is expected to play a primary role in recovery with a high level of viability. Tributary PCEs, although degraded, are still very extensive in this HUC5. The CHART noted that this population (Lower Cowlitz River) could be considered an archetype for the late-run (Type N) coho stock.	High	High

Subbasin	Watershed	Area/ Watershed (HUC5) Code	Scoring System (factors)						Total HUC5 Score (0-18)	Comments/Other Considerations	CHART Rating of HUC5 Conservation Value	Rating of Connect-ivity Corridor
			1	2	3	4	5	6				
Lower Cowlitz	Coweeman	1708000508	3	1	2	2	2	3	13	Moderate HUC5 score. PCEs support a population that is expected to play a primary role in recovery with a high level of viability. Tributary PCEs are still extensive in this HUC5 and the CHART noted that there has been relatively little hatchery fish influence on this population (Coweeman).	High	High
Lower Columbia	Youngs River	1708000601	3	1	2	1	2	3	12	Moderate HUC5 score. PCEs support a population that is expected to play a lesser, stabilizing role in recovery with only a very low level of viability. The CHART did not identify any low-value watersheds in the Coast Stratum due to the limited number of HUC5s supporting coho here.	Medium	
Lower Columbia	Big Creek	1708000602	3	2	2	2	2	3	14	Moderate HUC5 score. PCEs support a population that is expected to play a lesser, stabilizing role in recovery with only a very low level of viability. The CHART did not identify any low-value watersheds in the Coast Stratum due to the limited number of HUC5s supporting coho here.	Medium	
Lower Columbia	Grays Bay	1708000603	3	1	2	1	2	3	12	High HUC5 score. PCEs support a population that is expected to play a primary role in recovery with a high level of viability. PCEs are extensive in this HUC5, which is the only watershed supporting this population.	High	
Middle Willamette	Abernethy Creek	1709000704	1	1	2	3	0	2	9	Moderate HUC5 score. PCEs support a population that is expected to play a primary role in recovery with a very high level of viability. However, the PCEs are much more limited in this HUC5 relative to the adjacent Clackamas River watersheds supporting this population.	Low	

Subbasin	Watershed	Area/ Watershed (HUC5) Code	Scoring System (factors)						Total HUC5 Score (0-18)	Comments/Other Considerations	CHART Rating of HUC5 Conservation Value	Rating of Connect-ivity Corridor
			1	2	3	4	5	6				
Clackamas	Collawash River	1709001101	1	3	3	3	2	2	14	High HUC5 score. PCEs support a population that is expected to play a primary role in recovery with a very high level of viability. This is one of only two populations in the entire DPS that is not at high risk or possibly extinct.	High	
Clackamas	Upper Clackamas River	1709001102	3	3	3	3	2	2	16	High HUC5 score. PCEs support a population that is expected to play a primary role in recovery with a very high level of viability. This is one of only two populations in the entire DPS that is not at high risk or possibly extinct.	High	
Clackamas	Oak Grove Fork Clackamas River	1709001103	1	2	2	3	2	2	12	High HUC5 score. PCEs support a population that is expected to play a primary role in recovery with a very high level of viability. This is one of only two populations in the entire DPS that is not at high risk or possibly extinct.	High	
Clackamas	Middle Clackamas River	1709001104	2	2	1	3	3	2	13	High HUC5 score. PCEs support a population that is expected to play a primary role in recovery with a very high level of viability. This is one of only two populations in the entire DPS that is not at high risk or possibly extinct.	High	High
Clackamas	Eagle Creek	1709001105	2	2	2	3	1	2	12	High HUC5 score. PCEs support a population that is expected to play a primary role in recovery with a very high level of viability. This is one of only two populations in the entire DPS that is not at high risk or possibly extinct.	High	
Clackamas	Lower Clackamas River	1709001106	3	1	2	3	3	2	14	High HUC5 score. PCEs support a population that is expected to play a primary role in recovery with a very high level of viability. This is one of only two populations in the entire DPS that is not at high risk or possibly extinct.	High	High

Subbasin	Watershed	Area/ Watershed (HUC5) Code	Scoring System (factors)						Total HUC5 Score (0-18)	Comments/Other Considerations	CHART Rating of HUC5 Conservation Value	Rating of Connect-ivity Corridor
			1	2	3	4	5	6				
Lower Willamette	Johnson Creek	1709001201	2	1	2	3	1	2	11	Moderate HUC5 score. PCEs support a population that is expected to play a primary role in recovery with a very high level of viability. This is one of only two populations in the entire DPS that is not at high risk or possibly extinct. Other HUC5s in the Clackamas River basin contain the majority of spawning habitat for this population. However, the CHART noted that this HUC5 may provide important refuge habitat for Clackamas River coho and it's more urbanized setting may promote unique adaptations.	High	High
Lower Willamette	Scappoose Creek	1709001202	3	1	2	1	2	2	11	Moderate HUC5 score. PCEs support a population that is expected to play a primary role in recovery with a very high level of viability. This is one of only two populations in the entire DPS that is not at high risk or possibly extinct. Relative to the other HUC5 supporting the Scappoose population (Clatskanie River HUC5), PCEs are more extensive in this watershed and it contains the majority of spawning habitat for this population.	High	High
Lower Willamette	Columbia Slough/ Willamette River	1709001203	1	0	2	3	2	2	10	Moderate HUC5 score. PCEs support a population that is expected to play a primary role in recovery with a very high level of viability. This is one of only two populations in the entire DPS that is not at high risk or possibly extinct. There is likely little or no spawning in the tributaries of this HUC5, however the off-channel habitat is particularly important for rearing and migrating juvenile coho.	Medium	High

Subbasin	Watershed	Area/ Watershed (HUC5) Code	Scoring System (factors)						Total HUC5 Score (0-18)	Comments/Other Considerations	CHART Rating of HUC5 Conservation Value	Rating of Connect-ivity Corridor
			1	2	3	4	5	6				
Multiple	Lower Columbia Corridor (Sandy/ Washougal to Ocean)	NA	-	-	-	-	-	-	Not scored	Area not scored since many reaches are outside HUC5 boundaries. However, the CHART concluded that rearing and migration PCEs throughout this corridor are highly essential to ESU conservation.		High

Figure A1. Populations and Strata Identified for Lower Columbia River Coho Salmon (see NMFS 2012)

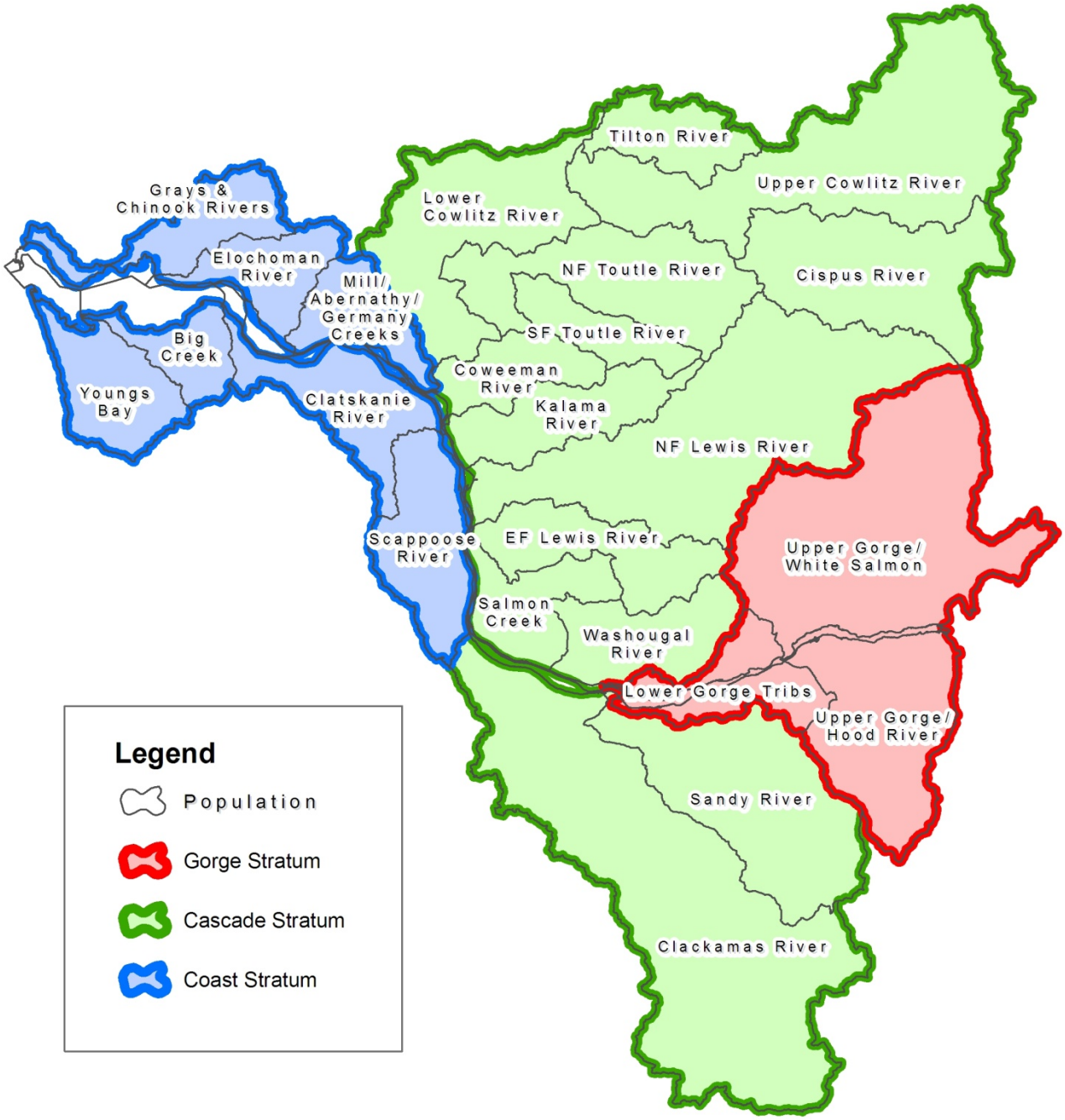
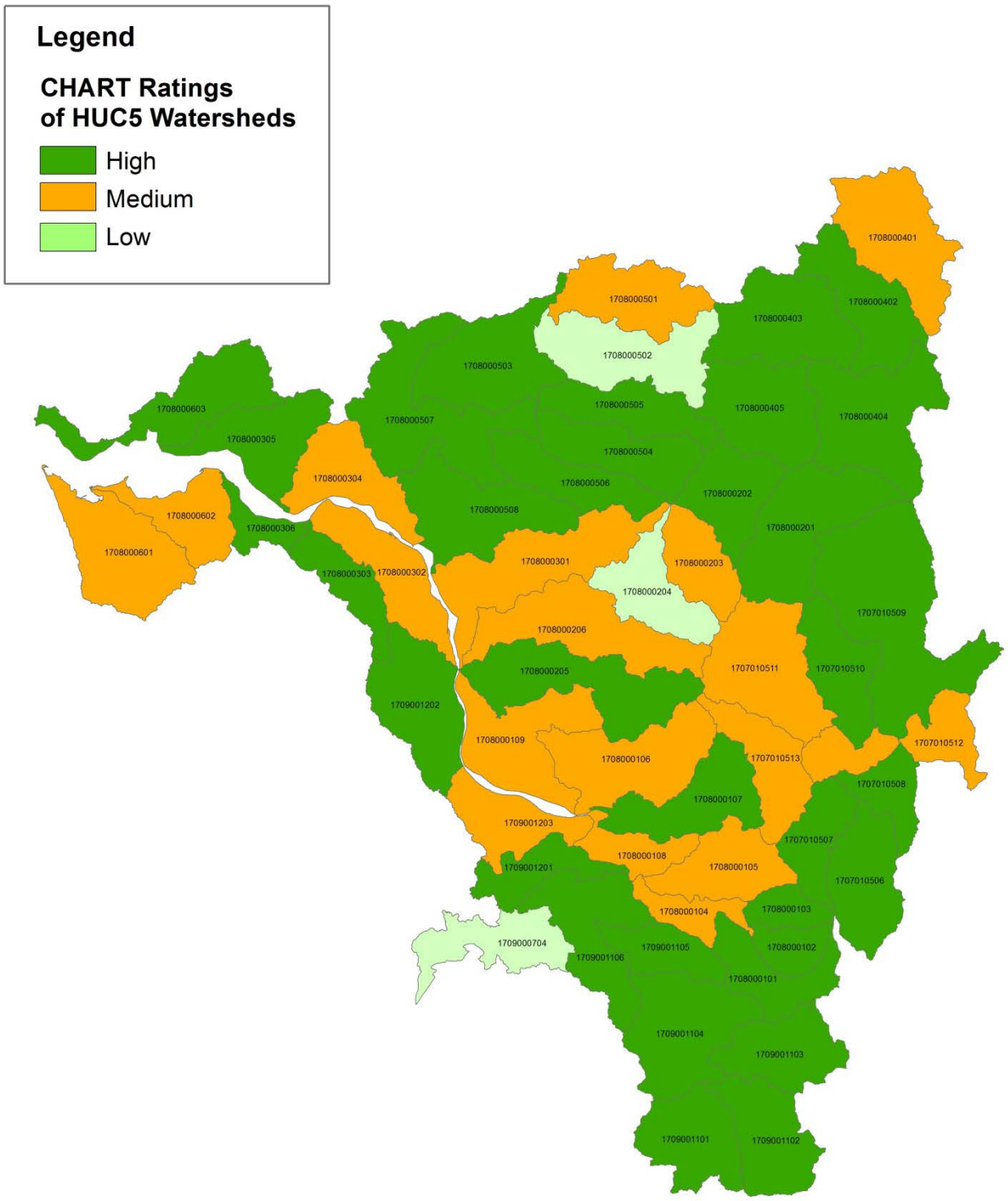
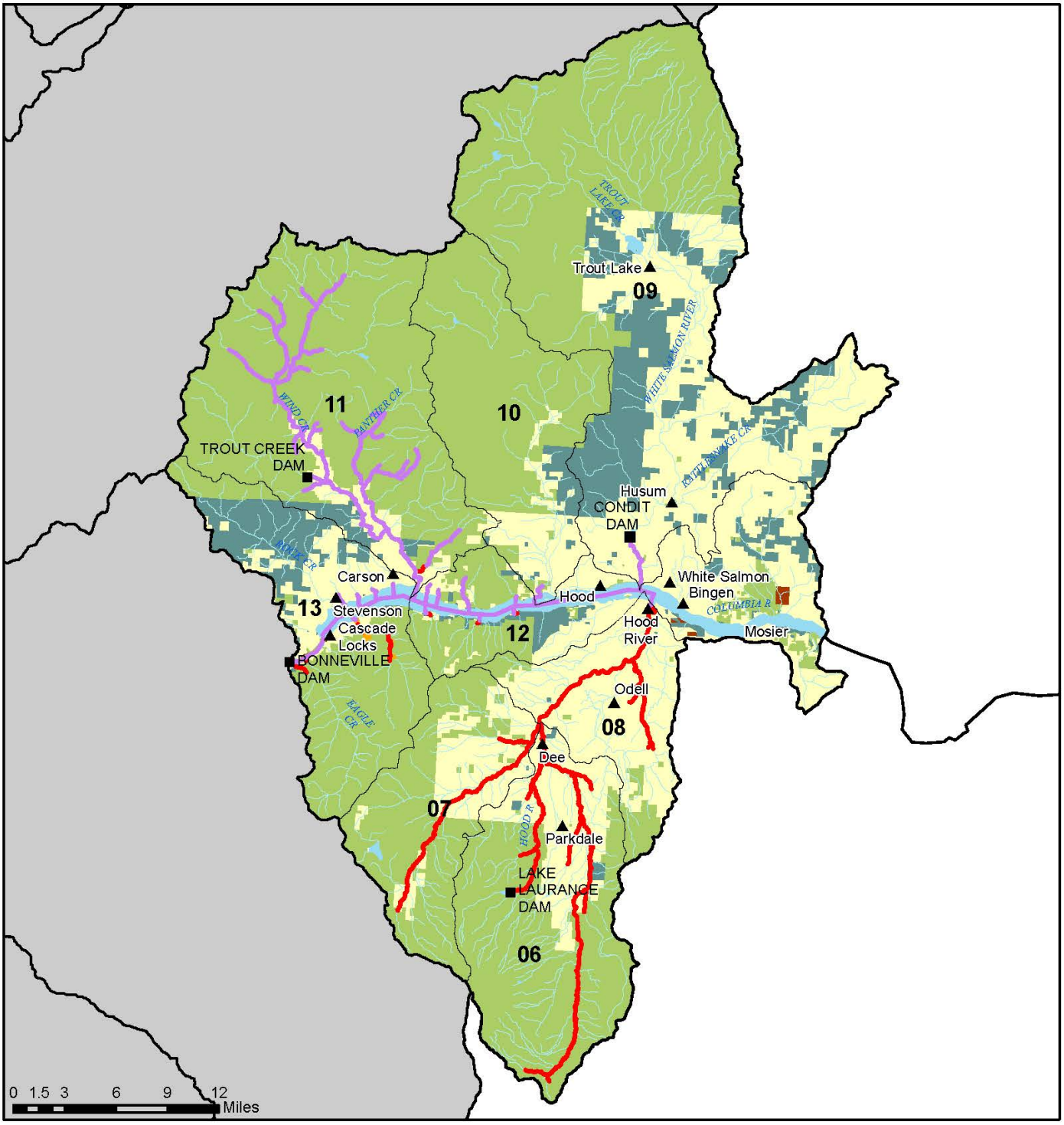


Figure A2. CHART Ratings of Conservation Value for Habitat Areas in HUC5 Watersheds Occupied by the Lower Columbia River Coho Salmon DPS [Legend corrected on 1/23/13]



Maps A1 through A10. Lower Columbia River Coho Salmon DPS – Habitat Areas Under Consideration for Critical Habitat Designation (note: the lower Columbia River corridor is not shown as a separate map but is under consideration as described in the text of Appendix A)



Lower Columbia River Coho Distribution

Middle Columbia-Hood Subbasin 17070105

Map A1

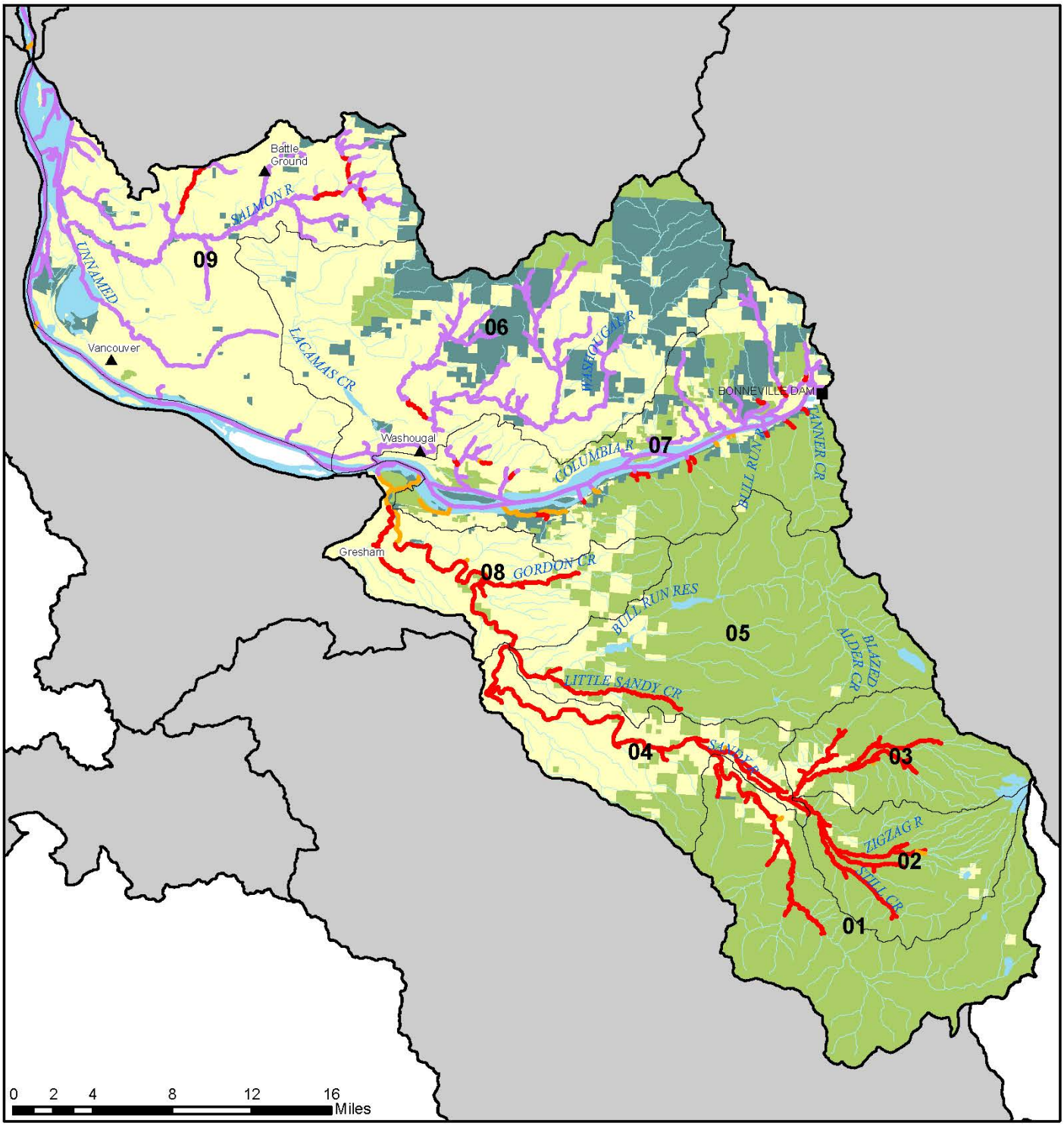
N

The watershed code is the subbasin number with the two digit watershed code appended to the end (i.e., Subbasin = 1711007, watershed = 171100701)

Note: This map is for general reference only

Legend

- Cities
- Dams/Barriers
- Streams (1:100,000)
- Migration/Presence
- Spawning/Rearing
- Rearing/Migration
- Watersheds
- Private
- Federal
- State/Local
- Tribal



Lower Columbia River Coho Distribution

Lower Columbia-Sandy Subbasin 17080001

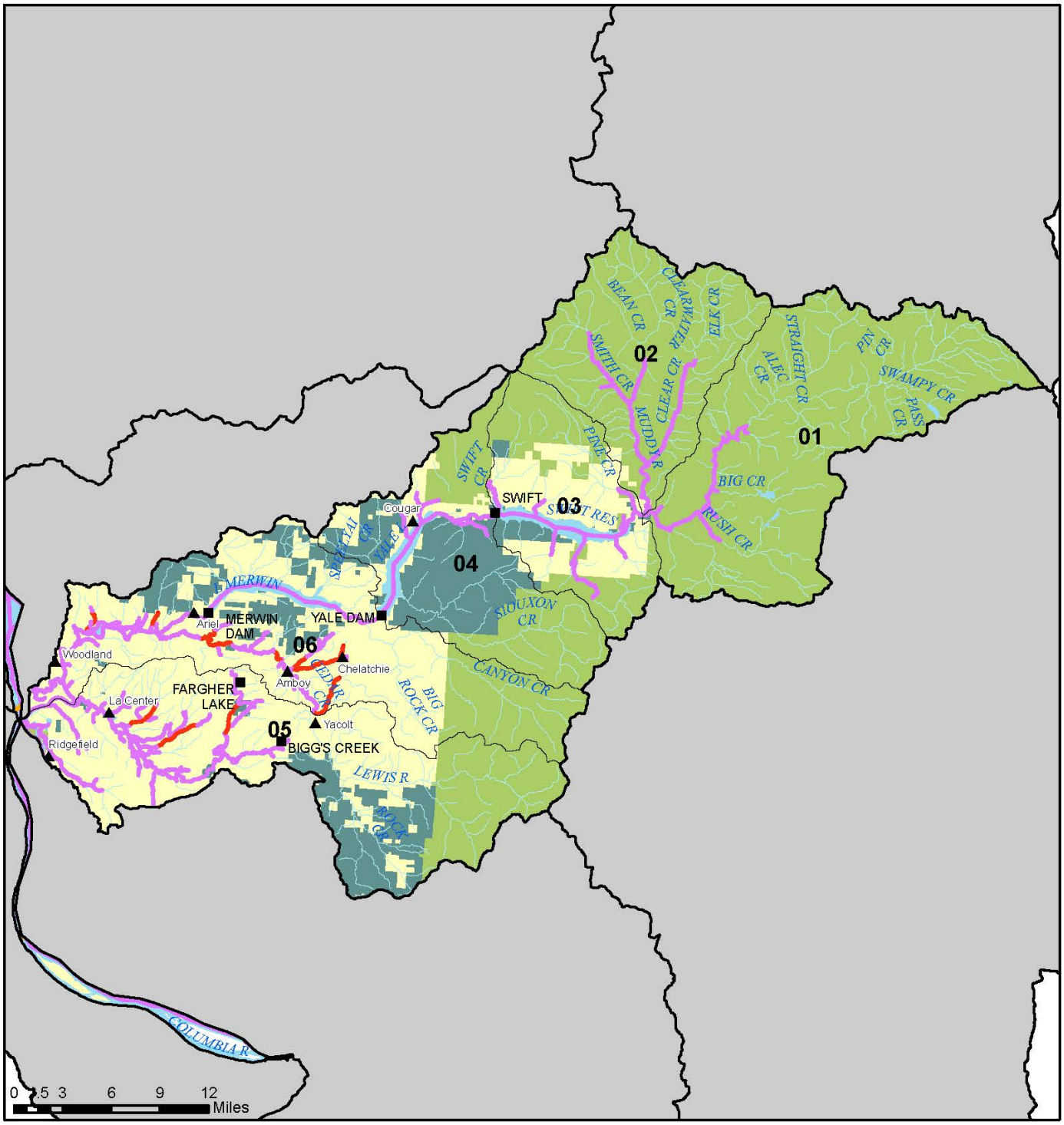
Map A2

The watershed code is the subbasin number with the two digit watershed code appended to the end (i.e., Subbasin = 1711007, watershed = 171100701)

Note: This map is for general reference only

Legend

- Cities
- Dams/Barriers
- Streams (1:100,000)
- Migration/Presence
- Spawning/Rearing
- Rearing/Migration
- Watersheds
- Private
- Federal
- State/Local
- Tribal



Lower Columbia River Coho Distribution

Lewis Subbasin17080002

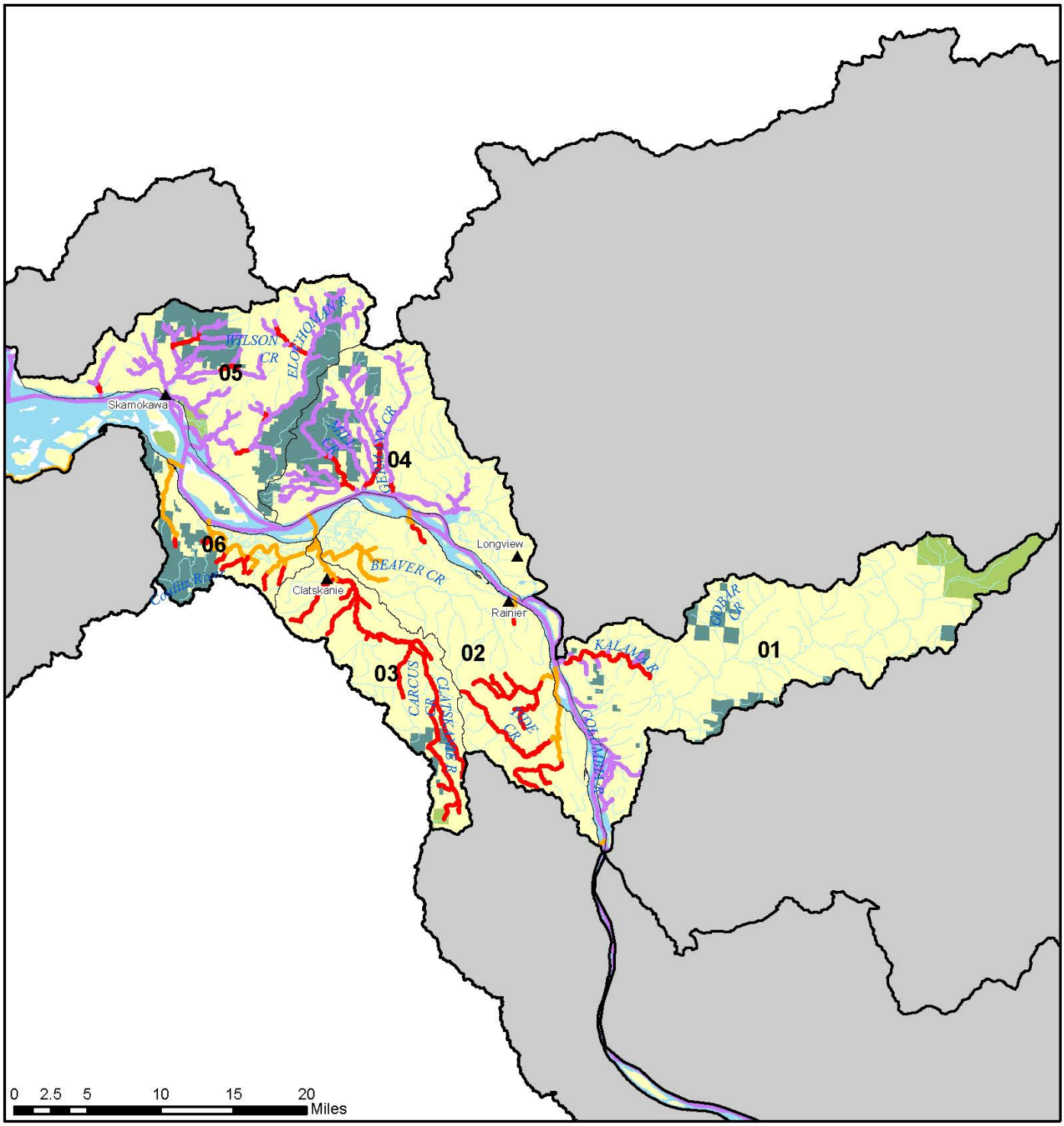
Map A3

The watershed code is the subbasin number with the two digit watershed code appended to the end (i.e., Subbasin = 1711007, watershed = 171100701)

Note: This map is for general reference only

Legend

- Cities
- Streams (1:100,000)
- Migration/Presence
- Spawning/Rearing
- Rearing/Migration
- Watersheds
- Private
- Federal
- State/Local
- Tribal



N

Lower Columbia River Coho Distribution

Lower Columbia-Clatskanie Subbasin 17080003

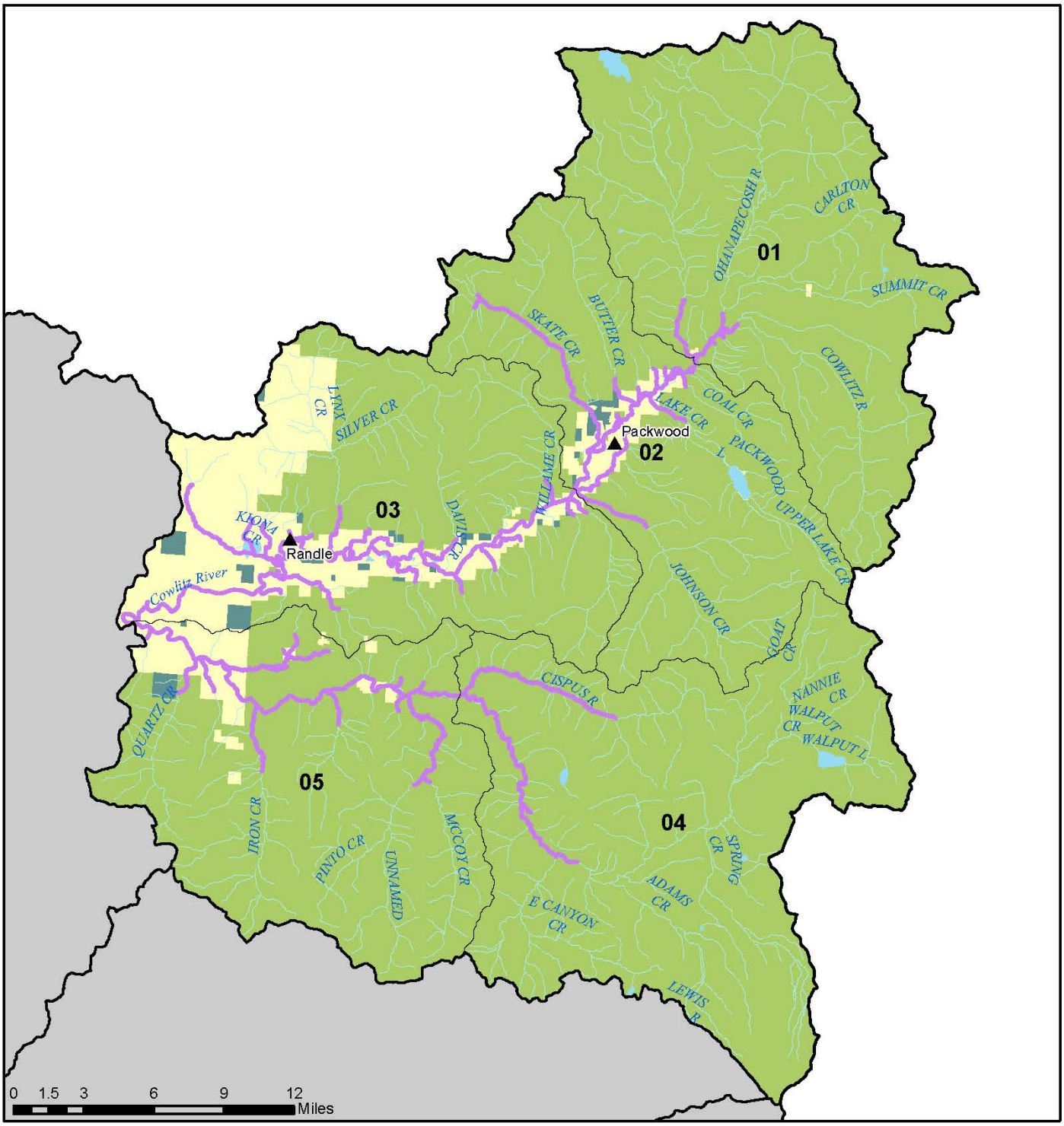
Map A4

The watershed code is the subbasin number with the two digit watershed code appended to the end (i.e., Subbasin = 1711007, watershed = 171100701)

Note: This map is for general reference only

Legend

- Cities
- Dams/Barriers
- Streams (1:100,000)
- Migration/Presence
- Spawning/Rearing
- Rearing/Migration
- Watersheds
- Private
- Federal
- State/Local
- Tribal



Lower Columbia River Coho Distribution

Upper Cowlitz Subbasin 17080004

Map A5

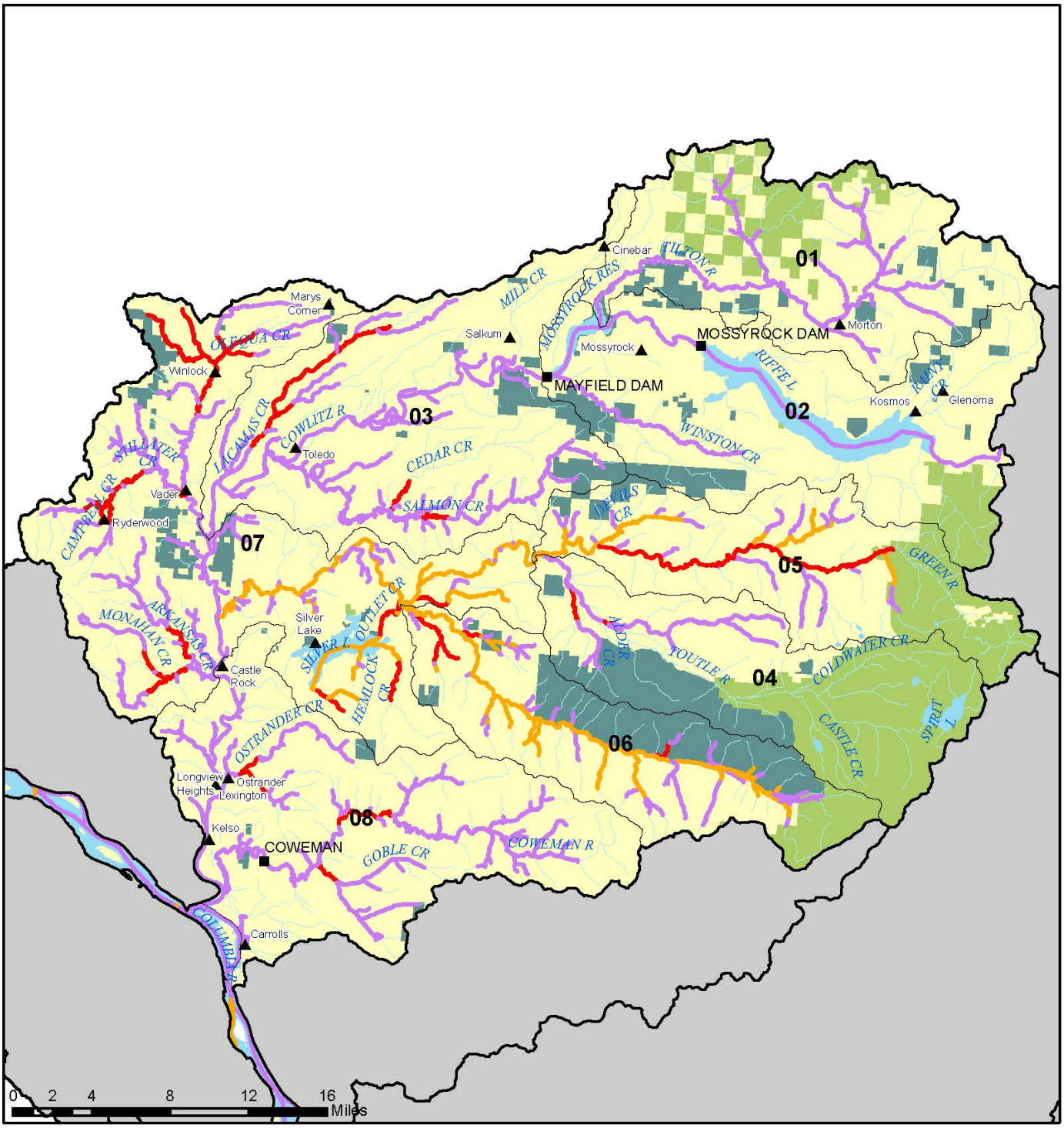
N

The watershed code is the subbasin number with the two digit watershed code appended to the end (i.e., Subbasin = 1711007, watershed = 171100701)

Note: This map is for general reference only

Legend

- Cities
- Dams/Barriers
- Streams (1:100,000)
- Migration/Presence
- Spawning/Rearing
- Rearing/Migration
- Watersheds
- Private
- Federal
- State/Local
- Tribal



Lower Columbia River Coho Distribution

Cowlitz Subbasin 17080005

Map A6

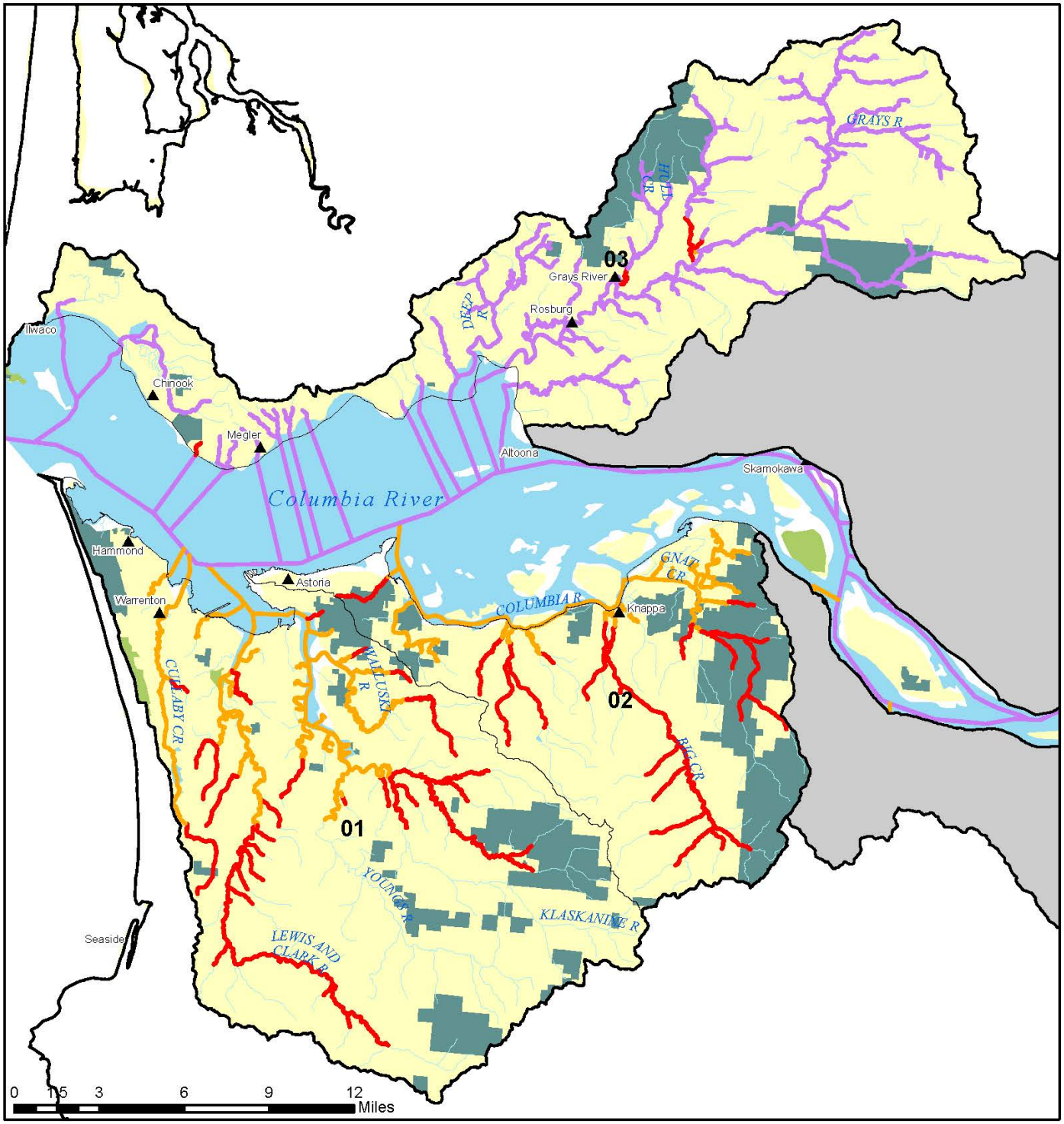
N

The watershed code is the subbasin number with the two digit watershed code appended to the end (i.e., Subbasin = 1711007, watershed = 171100701)

Note: This map is for general reference only

Legend

- Cities
- Streams (1:100,000)
- Migration/Presence
- Spawning/Rearing
- Rearing/Migration
- Watersheds
- Private
- Federal
- State/Local
- Tribal



Lower Columbia River Coho Distribution

Lower Columbia Subbasin 17080006

Map A7

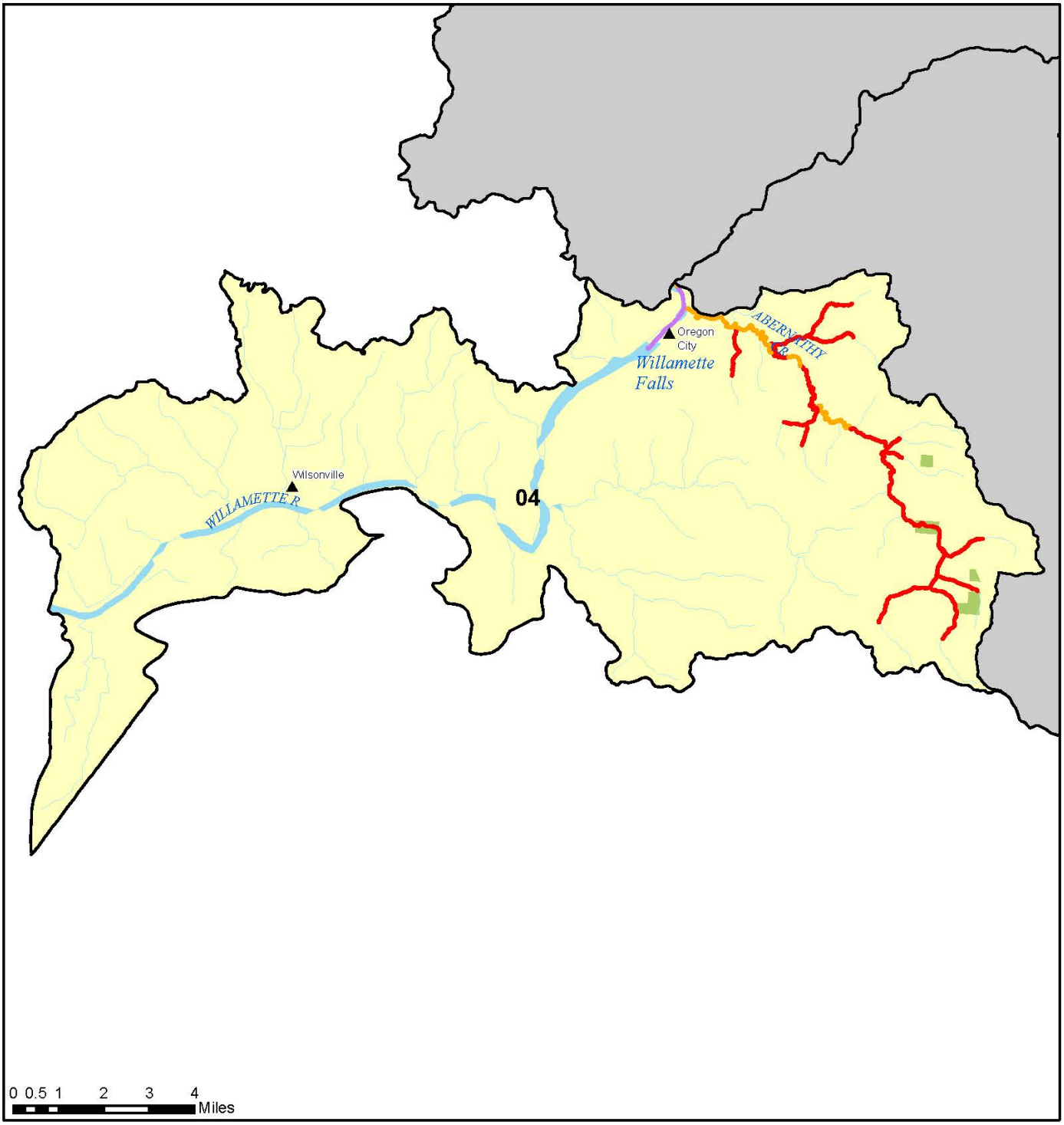
N

The watershed code is the subbasin number with the two digit watershed code appended to the end (i.e., Subbasin = 1711007, watershed = 171100701)

Note: This map is for general reference only

Legend

- Cities
- Dams/Barriers
- Streams (1:100,000)
- Migration/Presence
- Spawning/Rearing
- Rearing/Migration
- Watersheds
- Private
- Federal
- State/Local
- Tribal



Lower Columbia River Coho Distribution

Middle Willamette Subbasin 17090007

Map A8

The watershed code is the subbasin number with the two digit watershed code appended to the end (i.e., Subbasin = 1711007, watershed = 171100701)

Note: This map is for general reference only

Legend

- Cities
- Dams/Barriers
- Streams (1:100,000)
- Migration/Presence
- Spawning/Rearing
- Rearing/Migration
- Watersheds
- Private
- Federal
- State/Local
- Tribal

Lower Columbia River Coho Distribution

Clackamas Subbasin 17090011

Map A9

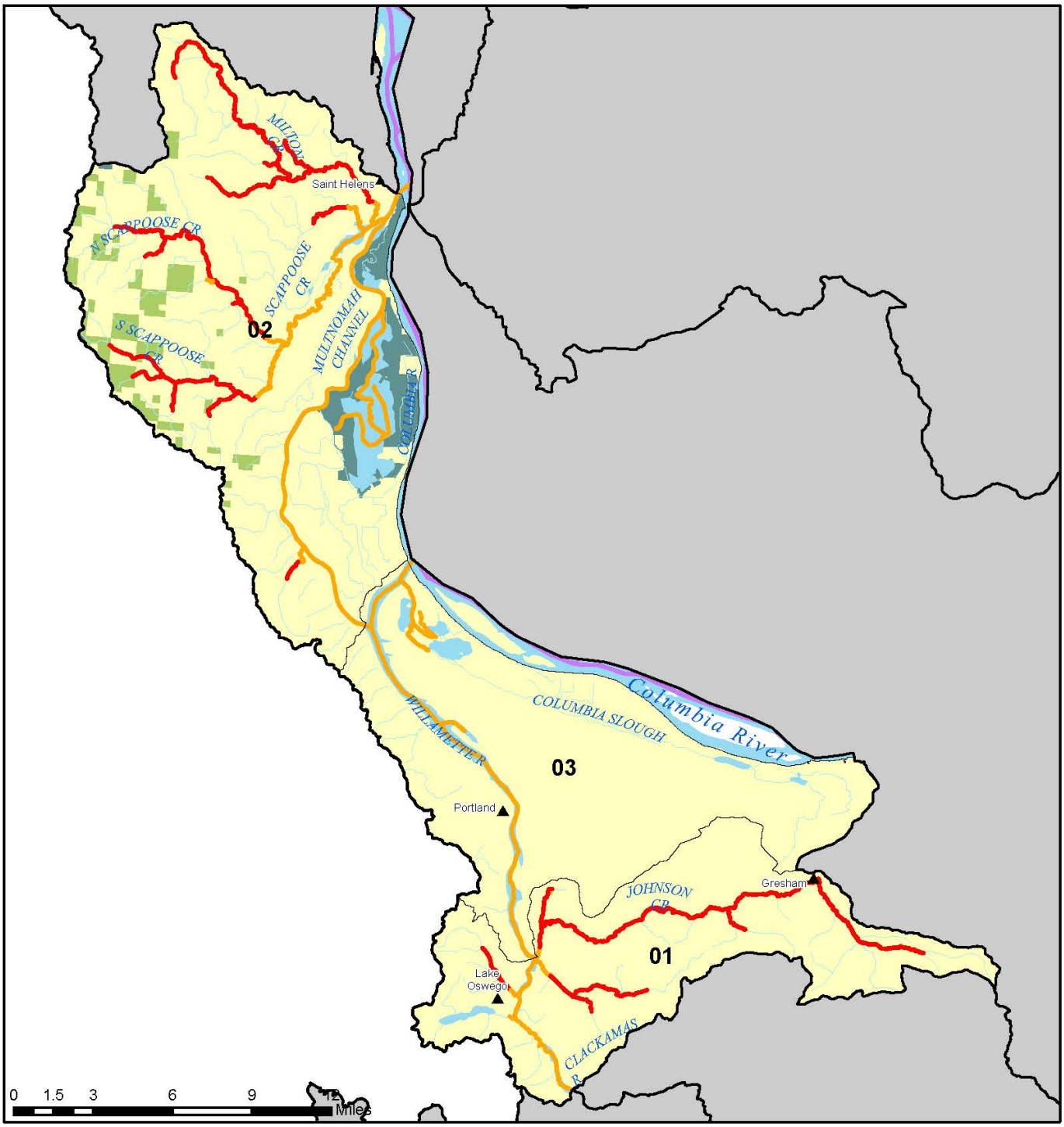
N

The watershed code is the subbasin number with the two digit watershed code appended to the end (i.e., Subbasin = 1711007, watershed = 171100701)

Note: This map is for general reference only

Legend

- Cities
- Dams/Barriers
- Streams (1:100,000)
- Migration/Presence
- Spawning/Rearing
- Rearing/Migration
- Watersheds
- Private
- Federal
- State/Local
- Tribal



N

Lower Columbia River Coho Distribution

Lower Willamette Subbasin 17090012

Map A10

The watershed code is the subbasin number with the two digit watershed code appended to the end (i.e., Subbasin = 1711007, watershed = 171100701)

Note: This map is for general reference only

Legend

- Cities
- Dams/Barriers
- Streams (1:100,000)
- Migration/Presence
- Spawning/Rearing
- Rearing/Migration
- Watersheds
- Private
- Federal
- State/Local
- Tribal

APPENDIX B
CHART ASSESSMENT FOR THE PUGET SOUND STEELHEAD DPS

CHART Participants

The CHART for this DPS consisted of the following NMFS biologists: Jeff Hard, Steve Leider, Randy McIntosh, Joel Moribe, Jim Myers, George Pess, Tom Sibley, Tim Tynan, and Amilee Wilson.

DPS Description

Steelhead populations can be divided into two basic reproductive ecotypes, based on the state of sexual maturity at the time of river entry (summer or winter) and duration of spawning migration (Burgner *et al.*, 1992). The Puget Sound DPS includes all naturally spawned anadromous winter-run and summer-run steelhead populations in streams in the river basins of the Strait of Juan de Fuca, Puget Sound, and Hood Canal, Washington, bounded to the west by the Elwha River (inclusive) and to the north by the Nooksack River and Dakota Creek (inclusive), as well as the Green River natural and Hamma Hamma winter-run steelhead hatchery stocks. Non-anadromous "resident" *O. mykiss* occur within the range of Puget Sound steelhead but are not part of the DPS due to marked differences in physical, physiological, ecological, and behavioral characteristics (71 FR 15666, March 29, 2006).

Stream-maturing steelhead, also called summer-run steelhead, enter fresh water at an early stage of maturation, usually from May to October. These summer-run fish migrate to headwater areas and hold for several months before spawning in the spring. Ocean-maturing steelhead, also called winter-run steelhead, enter fresh water from December to April at an advanced stage of maturation and spawn from March through June (Hard *et al.*, 2007). While there is some temporal overlap in spawn timing between these forms, in basins where both winter- and summer-run steelhead are present, summer-run steelhead spawn farther upstream, often above a partially impassable barrier. In many cases it appears that the summer migration timing evolved to access areas above falls or cascades that present velocity barriers to migration during high winter flow months, but are passable during low summer flows. Winter-run steelhead are predominant in Puget Sound, in part because there are relatively few basins in the Puget Sound DPS with the geomorphological and hydrological characteristics necessary to establish the summer-run life history. Summer-run steelhead stocks within this DPS are all small and occupy limited habitat.

Steelhead eggs incubate from one to four months (depending on water temperature) before hatching, generally between February and June. After emerging from the gravel, fry commonly occupy the margins of streams and side channels, seeking cover to make them less vulnerable to predation (WDFW, 2008). Juvenile steelhead forage for one to four years before emigrating to sea as smolts. Smoltification and seaward migration occur principally from April to mid-May. The nearshore migration pattern of Puget Sound steelhead is not well understood, but it is generally thought that

smolts move quickly offshore, bypassing the extended estuary transition stage which many other salmonids need (Hartt and Dell, 1986).

Steelhead oceanic migration patterns are also poorly understood. Evidence from tagging and genetic studies indicates that Puget Sound steelhead travel to the central North Pacific Ocean (Hartt and Dell 1986; Burgner *et al.*, 1992). Puget Sound steelhead feed in the ocean for one to three years before returning to their natal stream to spawn. They typically spend two years in the ocean, although, notably, Deer Creek summer-run steelhead spend only a single year in the ocean before spawning. In contrast with other species of Pacific salmonids, steelhead are iteroparous, capable of repeat spawning. While winter steelhead spawn shortly after returning to fresh water, adult summer steelhead rely on "holding habitat" – typically cool, deep pools – for up to 10 months prior to spawning (WDFW, 2008). Adults tend to spawn in moderate to high-gradient sections of streams. In contrast to semelparous Pacific salmon, steelhead females do not guard their redds, or nests, but return to the ocean following spawning (Burgner *et al.*, 1992). Spawned-out fish that return to the sea are referred to as "kelts."

The Puget Sound steelhead DPS includes more than 50 stocks of summer- and winter-run fish (WDFW, 2002). Hatchery steelhead production in Puget Sound is widespread and focused primarily on the propagation of winter-run fish derived from a stock of domesticated, mixed-origin steelhead (the Chambers Creek Hatchery stock) originally native to a small Puget Sound stream that is now extirpated from the wild. Hatchery summer-run steelhead are also produced in Puget Sound; these fish are derived from the Skamania River in the Columbia River Basin.

Habitat utilization by steelhead in the Puget Sound area has been dramatically affected by large dams and other manmade barriers in a number of drainages, including the Nooksack, Skagit, White, Nisqually, Skokomish, and Elwha[5] river basins. In addition to limiting habitat accessibility, dams affect habitat quality through changes in river hydrology, altered temperature profile, reduced downstream gravel recruitment, and the reduced recruitment of large woody debris. Such changes can have significant negative impacts on salmonids (e.g., increased water temperatures resulting in decreased disease resistance) (Spence *et al.*, 1996; McCullough, 1999).

Many upper tributaries in the Puget Sound region have been affected by poor forestry practices, while many of the lower reaches of rivers and their tributaries have been altered by agriculture and urban development. Urbanization has caused direct loss of riparian vegetation and soils, significantly altered hydrologic and erosional rates and processes (e.g., by creating impermeable surfaces such as roads, buildings, parking lots, sidewalks etc.), and polluted waterways with stormwater and point-source discharges. The loss of wetland and riparian habitat has dramatically changed the hydrology of many streams, with increases in flood frequency and peak low during storm events and decreases in groundwater driven summer flows (Moscrip and Montgomery, 1997; Booth *et al.*, 2002; May *et al.*,

[5] The Elwha dams are in the process of being removed, which will significantly change the Elwha River's hydrology and allow steelhead and salmon access dozens of miles of historical habitat upstream.

2003). River braiding and sinuosity have been reduced through the construction of dikes, hardening of banks with riprap, and channelization of the mainstem. Constriction of river flows, particularly during high flow events, increases the likelihood of gravel scour and the dislocation of rearing juveniles. The loss of side-channel habitats has also reduced important areas for spawning, juvenile rearing, and overwintering habitats. Estuarine areas have been dredged and filled, resulting in the loss of important juvenile rearing areas. In addition to being a factor that contributed to the present decline of Puget Sound steelhead populations, the continued destruction and modification of steelhead habitat is the principal factor limiting the viability of the Puget Sound steelhead DPS into the foreseeable future. Because of their limited distribution in upper tributaries, summer-run steelhead may be at higher risk than winter-run steelhead from habitat degradation in larger, more complex watersheds.

Existing Salmon Critical Habitat Designations

Critical habitat is currently designated for two DPSs of salmon that inhabit Puget Sound watersheds: Puget Sound Chinook salmon and Hood Canal summer-run chum salmon (70 FR 52630, September 2, 2005). These existing designations have extensive overlap with areas under consideration as critical habitat for Puget Sound steelhead. While the essential physical and biological features are similar for the three DPSs, watershed conservation values for steelhead may differ due to species-specific differences in population structure and habitat utilization.

Recovery Planning Status

Recovery planning in Puget Sound is proceeding as a collaborative effort between NMFS and numerous tribal, state, and local governments and interested stakeholders. The Puget Sound Partnership is the entity responsible for working with NMFS to recover the listed Puget Sound Chinook salmon DPS, and the Hood Canal Coordinating Council is the regional board implementing the recovery plan for the Hood Canal summer chum salmon DPS. There is a good deal of overlap between the geographical area occupied by Puget Sound steelhead and these two salmon DPSs, both of which had critical habitat designated on September 2, 2005 (70 FR 52630). A technical recovery team (TRT) was convened in 2008 to identify the historically independent spawning populations of steelhead within, and viability criteria for, the Puget Sound steelhead DPS. In 2011 the TRT completed an initial draft assessment "Identifying Historical Populations of Steelhead Within the Puget Sound Distinct Population Segment" (Puget Sound Steelhead Technical Recovery Team, 2011 – see Figure B1) and has begun work on viability criteria for this DPS. Upon completion of the technical work from the TRT, we will develop a recovery plan for Puget Sound steelhead and will work directly with the two regional boards to augment implementation plans to include measures to recover Puget Sound steelhead. In preparing the critical habitat designation for Puget Sound steelhead we will review and incorporate as appropriate the information from these regional recovery plans as well as the ongoing population work by the TRT.

CHART Area Assessments

The CHART assessment for this DPS addressed 18 subbasins containing 66 occupied watersheds. As part of its assessment the CHART considered the conservation value of each watershed in the context of the demographically independent populations (DIPs) within the three ecological zones/major population groups or "MPGs" (Northern Cascades, Central and South Puget Sound, and Olympic Peninsula) in Puget Sound identified by the Puget Sound TRT (2011). Information is presented below by USGS subbasin because they present a convenient and systematic way to organize the CHART's watershed assessments for this DPS and their names are generally more recognizable because they typically identify major river systems.

Strait of Georgia Subbasin (HUC4# 17110002)

The Strait of Georgia subbasin is located in northern Puget Sound (near the U.S. Canada border) and contained in Skagit and Whatcom counties, Washington. The subbasin contains three watersheds occupied by this DPS and these watersheds encompass approximately 428 mi^2 (1,109 km^2). Fish distribution and habitat use data identify approximately 118 miles (190 km) of occupied riverine/estuarine habitat in the watersheds (WDFW, 2010; Northwest Indian Fisheries Commission (NWIFC), 2011). Preliminary analyses by the Puget Sound TRT (2011) have identified one ecological zone/MPG (Northern Cascades) containing two winter-run populations (Drayton Harbor Tributaries and Samish River) in this subbasin. After reviewing the best available scientific data for this subbasin, the CHART concluded that all of the occupied areas in this subbasin contain one or more PCEs for this DPS. Table B1 summarizes the total number of occupied reaches identified for each HUC5 watershed as containing spawning, rearing, or migration PCEs, as well as management activities that may affect the PCEs in the watersheds. Map B1 depicts the specific areas in this subbasin occupied by the DPS and under consideration for critical habitat designation. The CHART also determined that all of the occupied HUC5 watersheds in this subbasin were of medium conservation value to the DPS. Table B2 summarizes the CHART's PCE/watershed scores and conservation value ratings, and Figure B2 shows the overall distribution of ratings by HUC5 watershed.

Nooksack Subbasin (HUC4# 17110004)

The Nooksack subbasin is located in northern Puget Sound and contained in Skagit and Whatcom counties, Washington. The subbasin contains five watersheds occupied by this DPS these watersheds encompass approximately 795 mi^2 (2,059 km^2). Fish distribution and habitat use data identify approximately 324 miles (521 km) of occupied riverine/estuarine habitat in the watersheds (WDFW, 2010; NWIFC, 2011). Preliminary analyses by the Puget Sound TRT (2011) have identified one ecological zone/MPG (Northern Cascades) containing one winter-run population (Nooksack River) and one summer-run population (South Fork Nooksack River) in this subbasin. After reviewing the best available scientific data for this subbasin, the CHART concluded that all of the occupied areas in this subbasin contain one or more PCEs for this DPS. Table B1 summarizes the total number of occupied reaches identified for each HUC5 watershed as containing spawning, rearing, or migration PCEs, as well as management activities that may affect the PCEs in the watersheds. Map B2 depicts the specific areas in this subbasin occupied by the DPS and under consideration for critical habitat designation. The CHART also determined that the occupied HUC5 watersheds in this subbasin were of either high

or medium conservation value to the DPS. Of the five HUC5s reviewed, three were rated as having high and two were rated as having medium conservation value. Table B2 summarizes the CHART's PCE/watershed scores and conservation value ratings, and Figure B2 shows the overall distribution of ratings by HUC5 watershed.

Upper Skagit Subbasin (HUC4# 17110005)

The Upper Skagit subbasin is located in northern Puget Sound and contained in Skagit and Whatcom counties, Washington. The subbasin contains five watersheds occupied by this DPS and these watersheds encompass approximately 999 mi^2 (2,587 km^2). Fish distribution and habitat use data identify approximately 167 miles (269 km) of occupied riverine habitat in the watersheds (WDFW, 2010; NWIFC, 2011). Preliminary analyses by the Puget Sound TRT (2011) have identified one ecological zone/MPG (Northern Cascades) containing two winter-run populations (Baker River and Skagit River) in this subbasin. After reviewing the best available scientific data for this subbasin, the CHART concluded that all of the occupied areas in this subbasin contain one or more PCEs for this DPS. Table B1 summarizes the total number of occupied reaches identified for each HUC5 watershed as containing spawning, rearing, or migration PCEs, as well as management activities that may affect the PCEs in the watersheds. Map B3 depicts the specific areas in this subbasin occupied by the DPS and under consideration for critical habitat designation. The CHART also determined that the occupied HUC5 watersheds in this subbasin were of either high or medium conservation value to the DPS. Of the five HUC5s reviewed, four were rated as having high and one was rated as having medium conservation value. Table B2 summarizes the CHART's PCE/watershed scores and conservation value ratings, and Figure B2 shows the overall distribution of ratings by HUC5 watershed.

Sauk Subbasin (HUC4# 17110006)

The Sauk subbasin is located in northern Puget Sound and contained in Skagit and Snohomish counties, Washington. The subbasin contains four watersheds occupied by this DPS and these watersheds encompass approximately 741 mi^2 (1,919 km^2). Fish distribution and habitat use data from identify approximately 156 miles (251 km) of occupied riverine habitat in the watersheds (WDFW, 2010; NWIFC, 2011). Preliminary analyses by the Puget Sound TRT (2011) have identified one ecological zone/MPG (Northern Cascades) containing one winter-run population (Sauk River) in this subbasin. After reviewing the best available scientific data for this subbasin, the CHART concluded that all of the occupied areas in this subbasin contain one or more PCEs for this DPS. Table B1 summarizes the total number of occupied reaches identified for each HUC5 watershed as containing spawning, rearing, or migration PCEs, as well as management activities that may affect the PCEs in the watersheds. Map B4 depicts the specific areas in this subbasin occupied by the DPS and under consideration for critical habitat designation. The CHART also determined that the occupied HUC5 watersheds in this subbasin were of either high or medium conservation value to the DPS. Of the four HUC5s reviewed, three were rated as having high and one was rated as having medium conservation value. Table B2 summarizes the CHART's PCE/watershed scores and conservation value ratings, and Figure B2 shows the overall distribution of ratings by HUC5 watershed.

Lower Skagit Subbasin (HUC4# 17110007)

The Lower Skagit subbasin is located in northern Puget Sound and contained in Skagit and Snohomish counties, Washington. The subbasin contains two watersheds occupied by this DPS and these watersheds encompass approximately 447 mi^2 (1,158 km^2). Fish distribution and habitat use data identify approximately 210 miles (338 km) of occupied riverine/estuarine habitat in the watersheds (WDFW, 2010; NWIFC, 2011). Preliminary analyses by the Puget Sound TRT (2011) have identified one ecological zone/MPG (Northern Cascades) containing four winter-run populations (Baker River, Nookachamps Creek, Sauk River, and Skagit River) in this subbasin. After reviewing the best available scientific data for this subbasin, the CHART concluded that all of the occupied areas in this subbasin contain one or more PCEs for this DPS. Table B1 summarizes the total number of occupied reaches identified for each HUC5 watershed as containing spawning, rearing, or migration PCEs, as well as management activities that may affect the PCEs in the watersheds. Map B5 depicts the specific areas in this subbasin occupied by the DPS and under consideration for critical habitat designation. The CHART also determined that both of the occupied HUC5 watersheds in this subbasin were of high conservation value to the DPS. Table B2 summarizes the CHART's PCE/watershed scores and conservation value ratings, and Figure B2 shows the overall distribution of ratings by HUC5 watershed.

Stillaguamish Subbasin (HUC4# 17110008)

The Stillaguamish subbasin is located in north-central Puget Sound and contained in Skagit and Snohomish counties, Washington. The subbasin contains three watersheds occupied by this DPS and these watersheds encompass approximately 704 mi^2 (1,823 km^2). Fish distribution and habitat use data identify approximately 351 miles (465 km) of occupied riverine/estuarine habitat in the watersheds (WDFW, 2010; NWIFC, 2011). Preliminary analyses by the Puget Sound TRT (2011) have identified one ecological zone/MPG (Northern Cascades) containing two summer-run populations (Deer Creek and Canyon Creek) and one winter-run population (Stillaguamish River) in this subbasin. After reviewing the best available scientific data for this subbasin, the CHART concluded that all of the occupied areas in this subbasin contain one or more PCEs for this DPS. Table B1 summarizes the total number of occupied reaches identified for each HUC5 watershed as containing spawning, rearing, or migration PCEs, as well as management activities that may affect the PCEs in the watersheds. Map B6 depicts the specific areas in this subbasin occupied by the DPS and under consideration for critical habitat designation. The CHART also determined that the occupied HUC5 watersheds in this subbasin were all of high conservation value to the DPS. Table B2 summarizes the CHART's PCE/watershed scores and conservation value ratings, and Figure B2 shows the overall distribution of ratings by HUC5 watershed.

Skykomish Subbasin (HUC4# 17110009)

The Skykomish subbasin is located in north-central Puget Sound and contained in King and Snohomish counties, Washington. The subbasin contains five watersheds occupied by this DPS and these watersheds encompass approximately 853 mi^2 (2,209 km^2). Fish distribution and habitat use data identify approximately 230 miles (370 km) of occupied riverine habitat in the watersheds (WDFW,

2010; NWIFC, 2011). Preliminary analyses by the Puget Sound TRT (2011) have identified one ecological zone/MPG (Northern Cascades) containing one summer-run population (North Fork Skykomish River) and one winter-run population (Snohomish/Skykomish River) in this subbasin. After reviewing the best available scientific data for this subbasin, the CHART concluded that all of the occupied areas in this subbasin contain one or more PCEs for this DPS. Table B1 summarizes the total number of occupied reaches identified for each HUC5 watershed as containing spawning, rearing, or migration PCEs, as well as management activities that may affect the PCEs in the watersheds. Map B7 depicts the specific areas in this subbasin occupied by the DPS and under consideration for critical habitat designation. The CHART also determined that the occupied HUC5 watersheds in this subbasin were of either high or medium conservation value to the DPS. Of the five HUC5s reviewed, three were rated as having high and two were rated as having medium conservation value. Table B2 summarizes the CHART's PCE/watershed scores and conservation value ratings, and Figure B2 shows the overall distribution of ratings by HUC5 watershed.

Snoqualmie Subbasin (HUC4# 17110010)

The Snoqualmie subbasin is located in north-central Puget Sound and contained in King and Snohomish counties, Washington. The subbasin contains two watersheds occupied by this DPS and these watersheds encompass approximately 504 mi^2 (1,305 km^2). Fish distribution and habitat use data identify approximately 199 miles (320 km) of occupied riverine habitat in the watersheds (WDFW, 2010; NWIFC, 2011). Preliminary analyses by the Puget Sound TRT (2011) have identified one ecological zone/MPG (Northern Cascades) containing one summer-run population (Tolt River) and one winter-run population (Snoqualmie River) in this subbasin. After reviewing the best available scientific data for this subbasin, the CHART concluded that all of the occupied areas in this subbasin contain one or more PCEs for this DPS. Table B1 summarizes the total number of occupied reaches identified for each HUC5 watershed as containing spawning, rearing, or migration PCEs, as well as management activities that may affect the PCEs in the watersheds. Map B8 depicts the specific areas in this subbasin occupied by the DPS and under consideration for critical habitat designation. The CHART also determined that both of the occupied HUC5 watersheds in this subbasin were of high conservation value to the DPS. Table B2 summarizes the CHART's PCE/watershed scores and conservation value ratings, and Figure B2 shows the overall distribution of ratings by HUC5 watershed.

Snohomish Subbasin (HUC4# 17110011)

The Snohomish subbasin is located in north-central Puget Sound and contained entirely in Snohomish County, Washington. The subbasin contains two watersheds occupied by this DPS and these watersheds encompass approximately 278 mi^2 (720 km^2). Fish distribution and habitat use data identify approximately 215 miles (557 km) of occupied riverine/estuarine habitat in the watersheds (WDFW, 2010; NWIFC, 2011). Preliminary analyses by the Puget Sound TRT (2011) have identified one ecological zone/MPG (Northern Cascades) containing two summer-run populations (North Fork Skykomish River and Tolt River) and three winter-run populations (Pilchuck River, Snohomish/Skykomish River, and Snoqualmie River) in this subbasin. After reviewing the best

available scientific data for this subbasin, the CHART concluded that all of the occupied areas in this subbasin contain one or more PCEs for this DPS. Table B1 summarizes the total number of occupied reaches identified for each HUC5 watershed as containing spawning, rearing, or migration PCEs, as well as management activities that may affect the PCEs in the watersheds. Map B9 depicts the specific areas in this subbasin occupied by the DPS and under consideration for critical habitat designation. The CHART also determined that both of the occupied HUC5 watersheds in this subbasin were of high conservation value to the DPS. Table B2 summarizes the CHART's PCE/watershed scores and conservation value ratings, and Figure B2 shows the overall distribution of ratings by HUC5 watershed.

Lake Washington Subbasin (HUC4# 17110012)

The Lake Washington subbasin is located in south Puget Sound and contained in King and Snohomish counties, Washington. Lake Washington is a dominant feature in this subbasin. The subbasin contains four watersheds occupied by this DPS and these watersheds encompass approximately 619 mi^2 (1,603 km^2). Fish distribution and habitat use data identify approximately 202 miles (325 km) of occupied riverine/estuarine habitat in the watersheds (WDFW, 2010; NWIFC, 2011). Lake Washington contains approximately 40 mi^2 of lake habitat in these watersheds. Preliminary analyses by the Puget Sound TRT (2011) have identified one ecological zone/MPG (Central and South Puget Sound) containing two winter-run populations (Cedar River and Lake Washington Tributaries) in this subbasin. After reviewing the best available scientific data for this subbasin, the CHART concluded that all of the occupied areas in this subbasin contain one or more PCEs for this DPS. Table B1 summarizes the total number of occupied reaches identified for each HUC5 watershed as containing spawning, rearing, or migration PCEs, as well as management activities that may affect the PCEs in the watersheds. Map B10 depicts the specific areas in this subbasin occupied by the DPS and under consideration for critical habitat designation. The CHART also determined that the occupied HUC5 watersheds in this subbasin were of either medium or low conservation value to the DPS. Of the four HUC5s reviewed, three were rated as having low and one was rated as having medium conservation value. Table B2 summarizes the CHART's PCE/watershed scores and conservation value ratings, and Figure B2 shows the overall distribution of ratings by HUC5 watershed.

Duwamish Subbasin (HUC4# 17110013)

The Duwamish subbasin is located in south Puget Sound and contained in King County, Washington. The subbasin contains three watersheds occupied by this DPS and these watersheds encompass approximately 487 mi^2 (1,261 km^2). Fish distribution and habitat use data identify approximately 178 miles (286 km) of occupied riverine/estuarine habitat in the watersheds (WDFW, 2010; NWIFC, 2011). Preliminary analyses by the Puget Sound TRT (2011) have identified one ecological zone/MPG (Central and South Puget Sound) containing one winter-run population (Green River) in this subbasin. After reviewing the best available scientific data for this subbasin, the CHART concluded that all of the occupied areas in this subbasin contain one or more PCEs for this DPS. Table B1 summarizes the total number of occupied reaches identified for each HUC5 watershed as containing spawning, rearing, or migration PCEs, as well as management activities that may affect the PCEs in the watersheds. Map

B11 depicts the specific areas in this subbasin occupied by the DPS and under consideration for critical habitat designation. The CHART also determined that all of the occupied HUC5 watersheds in this subbasin were of high conservation value to the DPS. Table B2 summarizes the CHART's PCE/watershed scores and conservation value ratings, and Figure B2 shows the overall distribution of ratings by HUC5 watershed.

Puyallup Subbasin (HUC4# 17110014)

The Puyallup subbasin is located in south Puget Sound and contained in King and Pierce counties, Washington. The subbasin contains five watersheds occupied by this DPS and these watersheds encompass approximately 996 mi^2 (2,580 km^2). Fish distribution and habitat use data identify approximately 272 miles (438 km) of occupied riverine/estuarine habitat in the watersheds (WDFW, 2010; NWIFC, 2011). Preliminary analyses by the Puget Sound TRT (2011) have identified one ecological zone/MPG (Central and South Puget Sound) containing two winter-run populations (Puyallup River/Carbon River and White River) in this subbasin. After reviewing the best available scientific data for this subbasin, the CHART concluded that all of the occupied areas in this subbasin contain one or more PCEs for this DPS. Table B1 summarizes the total number of occupied reaches identified for each HUC5 watershed as containing spawning, rearing, or migration PCEs, as well as management activities that may affect the PCEs in the watersheds. Map B12 depicts the specific areas in this subbasin occupied by the DPS and under consideration for critical habitat designation. The CHART also determined that all of the occupied HUC5 watersheds in this subbasin were of high conservation value to the DPS. Table B2 summarizes the CHART's PCE/watershed scores and conservation value ratings, and Figure B2 shows the overall distribution of ratings by HUC5 watershed.

Nisqually Subbasin (HUC4# 17110015)

The Nisqually subbasin is located in south Puget Sound and contained in Pierce, Thurston, and Lewis counties, Washington (although the latter is not occupied by this DPS). The subbasin contains two watersheds occupied by this DPS and these watersheds encompass approximately 472 mi^2 (1,222 km^2). Fish distribution and habitat use data identify approximately 161 miles (259 km) of occupied riverine/estuarine habitat in the watersheds (WDFW, 2010; NWIFC, 2011). Preliminary analyses by the Puget Sound TRT (2011) have identified one ecological zone/MPG (Central and South Puget Sound) containing one winter-run population (Nisqually River) in this subbasin. After reviewing the best available scientific data for this subbasin, the CHART concluded that all of the occupied areas in this subbasin contain one or more PCEs for this DPS. Table B1 summarizes the total number of occupied reaches identified for each HUC5 watershed as containing spawning, rearing, or migration PCEs, as well as management activities that may affect the PCEs in the watersheds. Map B13 depicts the specific areas in this subbasin occupied by the DPS and under consideration for critical habitat designation. The CHART also determined that both of the occupied HUC5 watersheds in this subbasin were of high conservation value to the DPS. Table B2 summarizes the CHART's PCE/watershed scores and conservation value ratings, and Figure B2 shows the overall distribution of ratings by HUC5 watershed.

Deschutes Subbasin (HUC4# 17110016)

The Deschutes subbasin is located at the southern end of Puget Sound, most of it in Thurston County, Washington. The subbasin contains two watersheds occupied by this DPS and these encompass approximately 168 mi^2 (435 km^2). Fish distribution and habitat use data identify approximately 63 miles (101 km) of occupied riverine/estuarine habitat in the watersheds (WDFW, 2010; NWIFC, 2011). Preliminary analyses by the Puget Sound TRT (2011) have identified one ecological zone/MPG (Central and South Puget Sound) in this subbasin. The Puget Sound TRT did not identify a steelhead DIP in this subbasin and noted that the Deschutes River was historically impassable to anadromous fish at Tumwater Falls. Winter steelhead were introduced into the Deschutes River when a fish ladder was installed at Tumwater Falls in 1954, but it is unclear if a naturally self-sustaining population exists (WDFW 2008). Despite these uncertainties, the Team noted that steelhead spawning in this watershed would likely be considered part of the listed DPS. After reviewing the best available scientific data for this subbasin (including the uncertainties about population status/structure in the Deschutes subbasin), the CHART concluded that all of the occupied areas in this subbasin contain one or more PCEs for this DPS. Table B1 summarizes the total number of occupied reaches identified for each HUC5 watershed as containing spawning, rearing, or migration PCEs, as well as management activities that may affect the PCEs in the watersheds. Map B14 depicts the specific areas in this subbasin occupied by the DPS and under consideration for critical habitat designation. The CHART also determined that both of the occupied HUC5 watersheds in this subbasin were of low conservation value to the DPS. Table B2 summarizes the CHART's PCE/watershed scores and conservation value ratings, and Figure B2 shows the overall distribution of ratings by HUC5 watershed.

Skokomish Subbasin (HUC4# 17110017)

The Skokomish subbasin is located at the southern end of Hood Canal, and most of it is in Mason County, Washington (although small portions of the subbasin – unoccupied by this DPS – also extend into Grays Harbor and Jefferson counties, Washington). The subbasin contains a single watershed (Skokomish River HUC5# - 1711001701) and encompasses approximately 248 mi^2 (642 km^2). Preliminary analyses by the Puget Sound TRT (2011) have identified one ecological zone/MPG (Olympic Peninsula) containing one winter-run population (Skokomish River) in this subbasin. Fish distribution and habitat use data identify approximately 86 miles (138 km) of occupied riverine/estuarine habitat in the watersheds (WDFW, 2010; NWIFC, 2011). After reviewing the best available scientific data for this subbasin, the CHART concluded that all of the occupied areas in this subbasin contain one or more PCEs for this DPS. Table B1 summarizes the total number of occupied reaches identified for each HUC5 watershed as containing spawning, rearing, or migration PCEs, as well as management activities that may affect the PCEs in the watersheds. Map B15 depicts the specific areas in this subbasin occupied by the DPS and under consideration for critical habitat designation. The CHART also determined that the occupied HUC5 watershed in this subbasin was of high conservation value to the DPS. Table B2 summarizes the CHART's PCE/watershed scores and conservation value ratings, and Figure B2 shows the overall distribution of ratings by HUC5 watershed.

Hood Canal Subbasin (HUC4# 17110018)

The Hood Canal subbasin includes most of the drainages of Hood Canal proper, including those of the western Kitsap Peninsula. The subbasin includes portions of the following Washington counties: Clallam, Jefferson, Kitsap, and Mason. The subbasin contains seven watersheds occupied by this DPS and encompasses approximately 605 mi^2 (1,567 km^2). Fish distribution and habitat use data identify approximately 153 miles (246 km) of occupied riverine/estuarine habitat in the watersheds (WDFW, 2010; NWIFC, 2011). Preliminary analyses by the Puget Sound TRT (2011) have identified one ecological zone/MPG (Olympic Peninsula) containing three winter-run populations (East, West, and South Hood Canal Tributaries) in this subbasin. After reviewing the best available scientific data for this subbasin, the CHART concluded that all of the occupied areas in this subbasin contain one or more PCEs for this DPS. Table B1 summarizes the total number of occupied reaches identified for each HUC5 watershed as containing spawning, rearing, or migration PCEs, as well as management activities that may affect the PCEs in the watersheds. Map B17 depicts the specific areas in this subbasin occupied by the DPS and under consideration for critical habitat designation. The CHART also determined that the occupied HUC5 watersheds in this subbasin were of either high or medium conservation value to the DPS. Of the seven HUC5s reviewed, four were rated as having high and three were rated as having medium conservation value. Table B2 summarizes the CHART's PCE/watershed scores and conservation value ratings, and Figure B2 shows the overall distribution of ratings by HUC5 watershed.

Kitsap Subbasin (HUC4# 17110019)

The Kitsap subbasin includes drainages of eastern Kitsap Peninsula as well as small, frontal drainages of southern and eastern Puget Sound up to Whidbey Island. The subbasin includes portions of the following Washington counties: Island, Jefferson, King, Kitsap, Mason, Pierce, Snohomish, and Thurston counties. The subbasin contains six watersheds occupied by this DPS and these encompass approximately 1,087 mi^2 (2,815 km^2). Fish distribution and habitat use data identify approximately 260 miles (418 km) of occupied riverine/estuarine habitat in the watersheds (WDFW, 2010; NWIFC, 2011). Preliminary analyses by the Puget Sound TRT (2011) have identified two ecological zones/MPGs (Olympic Peninsula and South Central Cascades) containing three winter-run populations (Strait of Juan de Fuca Lowland Tributaries, East Kitsap Peninsula Tributaries, and South Sound Tributaries) in this subbasin. After reviewing the best available scientific data for this subbasin, the CHART concluded that all of the occupied areas in this subbasin contain one or more PCEs for this DPS. Table B1 summarizes the total number of occupied reaches identified for each HUC5 watershed as containing spawning, rearing, or migration PCEs, as well as management activities that may affect the PCEs in the watersheds. Map B18 depicts the specific areas in this subbasin occupied by the DPS and under consideration for critical habitat designation. The CHART also determined that the occupied HUC5 watersheds in this subbasin were of either low or medium conservation value to the DPS. Of the six HUC5s reviewed, four were rated as having low and two were rated as having medium conservation value. Table B2 summarizes the CHART's PCE/watershed scores and conservation value ratings, and Figure B2 shows the overall distribution of ratings by HUC5 watershed.

Dungeness/Elwha Subbasin (HUC4# 17110020)

The Dungeness/Elwha subbasin includes drainages to the eastern Strait of Juan de Fuca and includes portions of Clallam and Jefferson counties, Washington. The subbasin contains five occupied watersheds and encompasses approximately 828 mi^2 (2,145 km^2). Preliminary analyses by the Puget Sound TRT (2011) have identified one ecological zone/MPG (Olympic Peninsula) containing four winter-run populations (Dungeness River, Elwha River, Strait of Juan de Fuca Lowland Tributaries, and Strait of Juan de Fuca Independent Tributaries) in this subbasin. Fish distribution and habitat use data identify approximately 144 miles (232 km) of occupied riverine/estuarine habitat in the watersheds (WDFW, 2010; NWIFC, 2011). After reviewing the best available scientific data for this subbasin, the CHART concluded that all of the occupied areas in this subbasin contain one or more PCEs for this DPS. Table B1 summarizes the total number of occupied reaches identified for each HUC5 watershed as containing spawning, rearing, or migration PCEs, as well as management activities that may affect the PCEs in the watersheds. Map B18 depicts the specific areas in this subbasin occupied by the DPS and under consideration for critical habitat designation. Of the five HUC5s reviewed in this subbasin, four were rated as having high and one (Sequim Bay) was rated as having medium conservation value. Table B2 summarizes the CHART's PCE/watershed scores and conservation value ratings, and Figure B2 shows the overall distribution of ratings by HUC5 watershed.

At the time PS steelhead were listed, the Elwha River was blocked at river mile 4.9 by the Elwha dam. The upper reaches of the river were thus not "occupied at the time of listing." In 2012 the Elwha dam was removed, providing access to the mainstem and tributaries up to Glines Canyon Dam at river mile 13.4. State and tribal biologists captured adult steelhead returning in 2012 and relocated them to tributaries in the newly open area. In addition, some wild steelhead migrated above the site of the former Elwha Dam. Because the Elwha River was not occupied at the time of listing, the CHART considered whether the blocked historical habitat above the dams (approximately 45 miles of river in the mainstem and tributaries, WDFW 2011; Olympic National Park 2012) may be essential for conservation of the DPS.

The CHART noted the significant amount of spawning habitat now available in the Elwha and its tributaries following dam removal (relative to other much smaller streams in the Strait of Juan de Fuca), the unique habitat protections afforded steelhead in Olympic National Park, and the high likelihood that these habitats will be able to support both summer- and winter-run life forms of steelhead. The summer-run form is a rare but important life history type in this DPS, but currently there is no extant summer-run population in the Olympic MPG. The Puget Sound TRT (2011) noted that a summer run may have been present historically in the Elwha River; however, it is likely that any such run was extirpated or the run residualized when the two Elwha River dams were constructed in the early 1900s. The historical distribution of summer-run steelhead in the Elwha River is not known, but it is possible that rapids and cascades in canyon areas may have provided an isolating mechanism for migrating winter and summer steelhead (especially during high spring flows). The Elwha is also the largest producer of steelhead in the Strait of Juan de Fuca (Olympic National Park 2005). Because the Strait is a major component of the Olympic MPG, and the Elwha provides extensive and unique

habitats to support viable populations of both life history types, the CHART considered the upper reaches of the Elwha River essential for conservation of the DPS.

Nearshore Marine Areas of Puget Sound

As noted in previous rulemaking (70 FR 52630, September 2, 2005) the unique ecological setting of Puget Sound allowed us to identify and designate as critical habitat specific nearshore areas for Puget Sound Chinook and Hood Canal summer-run chum salmon. 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 these two species (Washington Department of Fish and Wildlife (WDFW) and Point No Point Treaty Tribes, 2000; Puget Sound Nearshore Ecosystem Restoration Program 2003). However, unlike most other Pacific salmonids, steelhead appear to make only ephemeral use of nearshore marine waters. The species' lengthy freshwater rearing period results in large smolts that are prepared to move rapidly through estuaries[6] and nearshore waters to forage on larger prey in offshore marine areas. Although data specific to Puget Sound are limited, recent studies of steelhead migratory behavior strongly suggest that juveniles spend little time (a matter of hours in some cases) in estuarine and nearshore areas and do not favor migration along shorelines (Moore *et al.*, 2010a, Moore *et al.*, 2010b; Romer, 2010). In contrast, stream-type Puget Sound Chinook and Hood Canal summer-run chum salmon are known to make extensive use of nearshore areas in Puget Sound, spending from several days to several months in and adjacent to natal estuaries (WDFW and Point No Point Treaty Tribes, 2000; Redman *et al.*, 2005; Fresh, 2006). That well-documented behavior led us to designate specific nearshore areas as critical habitat for those two species (70 FR 52630, September 2, 2005). The data for steelhead, however, suggest the opposite conclusion.

Anecdotal reports suggest that juvenile steelhead may travel short distances in nearshore areas as they move between adjacent river mouths. There are similar reports of limited nearshore use by precocious steelhead (i.e., fish that are reproductively mature but have not reached their typical adult age and size). Although such behaviors could be important life history strategies for steelhead, it is uncertain whether and where such behaviors occur in Puget Sound. Therefore, given the best available information, the CHART members concluded they could not delineate specific foraging areas near shore in Puget Sound.

[6] Because estuaries are a necessary migration corridor for steelhead, and estuaries are readily delineated, we consider them part of the HUC5 "specific areas" that contain essential features, as discussed in this report.

References and Sources of Information

References cited above as well as key reports and data sets reviewed by the CHART include the following:

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Table B1. Summary of Occupied Areas, PCEs, and Management Activities Affecting PCEs for the Puget Sound Steelhead DPS

Subbasin	Watershed	Area/ Watershed (HUC5) Code	Primary Constituent Elements (PCEs)			Unoccupied but may be essential** (mi)	Management Activities***
			Spawning/ Rearing PCEs (mi)	Rearing/ Migration PCEs (mi)	Migration/ Presence PCEs (mi)*		
Strait of Georgia	Bellingham Bay	1711000201	13.2	0.8	5.5		C, I, U
Strait of Georgia	Samish River	1711000202	29.3	7.7	22.4		A, C, U
Strait of Georgia	Birch Bay	1711000204	11.6	2.1	23.9		F, U
Nooksack	Upper North Fork Nooksack River	1711000401	17.9	0.4	15.3		F, R
Nooksack	Middle Fork Nooksack River	1711000402	16.2		1.3		F, I, R
Nooksack	South Fork Nooksack River	1711000403	45.7		34.7		C, F, R
Nooksack	Lower North Fork Nooksack River	1711000404	64.1	1.0	15.9		A, F, G
Nooksack	Nooksack River	1711000405	48.2	11.1	53.8		A, C, F
Upper Skagit	Skagit River/ Gorge Lake	1711000504	2.1		4.0		D, F, R
Upper Skagit	Skagit River/ Diobsud Creek	1711000505	18.3		13.8		F, R
Upper Skagit	Cascade River	1711000506	20.3		18.5		F

Subbasin	Watershed	Area/ Watershed (HUC5) Code	Primary Constituent Elements (PCEs)			Unoccupied but may be essential** (mi)	Management Activities***
			Spawning/ Rearing PCEs (mi)	Rearing/ Migration PCEs (mi)	Migration/ Presence PCEs (mi)*		
Upper Skagit	Skagit River/ Illabot Creek	1711000507	37.9	1.3	11.4		F, R
Upper Skagit	Baker River	1711000508	7.4	22.4	12.2		D, F, R
Sauk	Upper Sauk River	1711000601	24.0	8.4	16.1		F, R
Sauk	Upper Suiattle River	1711000602	5.3		6.8		F, R
Sauk	Lower Suiattle River	1711000603	30.3	1.8	5.6		F, R
Sauk	Lower Sauk River	1711000604	44.1	0.3	10.9		F
Lower Skagit	Middle Skagit River/ Finney Creek	1711000701	53.9	25.8	48.1		A
Lower Skagit	Lower Skagit River/ Nookachamps Creek	1711000702	4.7	24.7	52.4		A, C, W, U
Stillaguamish	North Fork Stillaguamish River	1711000801	75.4	8.4	53.8		F, R
Stillaguamish	South Fork Stillaguamish River	1711000802	73.7	7.6	56.6		F, R
Stillaguamish	Lower Stillaguamish River	1711000803	5.1	29.1	41.6		F, U, W
Skykomish	Tye And Beckler Rivers	1711000901	26.7	1.9	4.5		F, R

Subbasin	Watershed	Area/ Watershed (HUC5) Code	Primary Constituent Elements (PCEs)			Unoccupied but may be essential** (mi)	Management Activities***
			Spawning/ Rearing PCEs (mi)	Rearing/ Migration PCEs (mi)	Migration/ Presence PCEs (mi)*		
Skykomish	Skykomish River Forks	1711000902	38.4	3.3	23.5		A, F, U
Skykomish	Skykomish River/ Wallace River	1711000903	28.1	4.5	16.6		A, F
Skykomish	Sultan River	1711000904	9.8		0.4		D, F, U
Skykomish	Skykomish River/ Woods Creek	1711000905	34.1	0.8	37.1		A, F, G
Snoqualmie	Middle Fork Snoqualmie River	1711001003	25.8	8.6	37.0		A, F
Snoqualmie	Lower Snoqualmie River	1711001004	27.4	32.0	68.2		A, F
Snohomish	Pilchuck River	1711001101	45.4	0.9	19.4		A, D, F, S
Snohomish	Snohomish River	1711001102	1.4	18.0	134.9		C, F, U
Lake Washington	Cedar River	1711001201	22.6	4.6	16.4		C, D, F, I, R, U
Lake Washington	Lake Sammamish	1711001202	12.7	5.1	23.7		F, R, U
Lake Washington	Lake Washington	1711001203			61.5		F, R, U
Lake Washington	Sammamish River	1711001204			56.3		F, R, U
Duwamish	Upper Green River	1711001301			26.2		D, F
Duwamish	Middle Green River	1711001302	11.8	0.0	29.3		A, D, U
Duwamish	Lower Green River	1711001303	46.3	12.5	53.2		C, I, U

Subbasin	Watershed	Area/ Watershed (HUC5) Code	Primary Constituent Elements (PCEs)			Unoccupied but may be essential** (mi)	Management Activities***
			Spawning/ Rearing PCEs (mi)	Rearing/ Migration PCEs (mi)	Migration/ Presence PCEs (mi)*		
Puyallup	Upper White River	1711001401	16.3	14.5	17.1		D, F, I
Puyallup	Lower White River	1711001402	29.1	19.0	27.2		A, D, I, U
Puyallup	Carbon River	1711001403	42.5		13.2		A, F
Puyallup	Upper Puyallup River	1711001404	23.5	8.8	13.2		D, F
Puyallup	Lower Puyallup River	1711001405	10.7	0.3	36.2		C, U
Nisqually	Mashel/ Ohop	1711001502	21.2	17.2	29.7		A, D, U
Nisqually	Lowland	1711001503	25.7	5.9	61.5		A, U
Deschutes	Prairie1	1711001601	19.3		16.9		A, F, G
Deschutes	Prairie2	1711001602	21.2		6.0		A, F, G
Skokomish	Skokomish River	1711001701	49.5	2.8	35.9		C, D, F, U
Hood Canal	Lower West Hood Canal Frontal	1711001802			5.4		C, F, R, U
Hood Canal	Hamma Hamma River	1711001803	4.4		0.0		C, F
Hood Canal	Duckabush River	1711001804	4.4	1.7	3.2		C, F
Hood Canal	Dosewallips River	1711001805	9.1	3.3	2.2		C, F, R
Hood Canal	Big Quilcene River	1711001806	4.5	0.9	1.6		C, F
Hood Canal	Upper West Hood Canal Frontal	1711001807	9.5	2.8	22.8		C, F, U
Hood Canal	West Kitsap	1711001808	32.9	9.0	35.6		A, F, U

Subbasin	Watershed	Area/ Watershed (HUC5) Code	Primary Constituent Elements (PCEs)			Unoccupied but may be essential** (mi)	Management Activities***
			Spawning/ Rearing PCEs (mi)	Rearing/ Migration PCEs (mi)	Migration/ Presence PCEs (mi)*		
Kitsap	Kennedy/ Goldsborough	1711001900	23.7		94.9		A, F, U
Kitsap	Puget	1711001901	13.9		67.5		A, G, U
Kitsap	Prairie3	1711001902	2.6		18.0		G, U
Kitsap	Puget Sound/ East Passage	1711001904			3.4		C, U
Kitsap	Chambers Creek	1711001906			16.8		C, U
Kitsap	Port Ludlow/ Chimacum Creek	1711001908	10.8		10.5		A, B, F, U
Dungeness/ Elwha	Discovery Bay	1711002001	13.3	0.1	1.7		A, C, F
Dungeness/ Elwha	Sequim Bay	1711002002	3.6	0.1	5.3		C, F, U
Dungeness/ Elwha	Dungeness River	1711002003	24.7		33.6		C, F, I, R, S, U
Dungeness/ Elwha	Port Angeles Harbor	1711002004	23.0	0.7	30.2		F, U
Dungeness/ Elwha	Elwha River	1711002007	4.8		2.6	90.2[§]	D, F

* Some streams classified as “Migration/Presence PCEs” may also include rearing or spawning PCEs, but the GIS data are still undergoing review to confirm additional habitat use types.

** These watersheds contain unoccupied habitat that historically supported spawning and rearing PCEs. The CHART determined that these habitat areas/watersheds may be essential for conservation of the ESU.

*** 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/bank modifications such as boat ramps, bulkheads, rip rap, diking and/or dredging, 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 by Berry et al (2001), Kerwin (1999a), Kerwin (1999b), WSCC (1999), WSCC (2000), Kerwin (2001), Beamer *et al.* (2000), Washington State Department of Natural Resources (2001), Haring (2002), Smith (2002), Kuttel (2003), and Fresh *et al.* (2004).

§ Watershed contains unoccupied habitat (classified as “Potential” habitat in GIS data from WDFW) above Elwha and Glines Canyon dams that the CHART determined was essential for conservation of this DPS.

Table B2. Summary of CHART Scores and Ratings of Conservation Value for Habitat Areas Occupied by the Puget Sound Steelhead DPS

Subbasin	Watershed	Area/ Watershed (HUC5) Code	Scoring System (factors)						Total HUC5 Score (0-18)	Comments/Other Considerations	CHART Rating of HUC5 Conservation Value	Rating of Connect-ivity Corridor
			1	2	3	4	5	6				
Strait of Georgia	Bellingham Bay	1711000201	1	1	1	1	1	2	7	Moderate HUC5 score. Limited amount of PCEs, but creeks here are lowland, rain-driven systems, that are very distinct from glacially influenced systems like the Nooksack River. Part of the Northern Cascades (South Salish Sea) Major Population Group (MPG), which is the largest and most diverse in this DPS.	Medium	
Strait of Georgia	Samish River	1711000202	2	2	2	1	2	2	11	Moderate HUC5 score. This HUC contains a large portion of the PCEs in the Samish River DIP. It is lowland, rain-driven system that is very distinct from glacially influenced systems like the Nooksack River. Also, while the adjacent Nooksack and Skagit River steelhead populations appear to be steadily declining the Samish River steelhead escapement trend has been stable or increasing at times during recent years. Part of the Northern Cascades (South Salish Sea) MPG, which is the largest and most diverse in this DPS.	Medium	

Subbasin	Watershed	Area/ Watershed (HUC5) Code	Scoring System (factors)						Total HUC5 Score (0-18)	Comments/Other Considerations	CHART Rating of HUC5 Conservation Value	Rating of Connect-ivity Corridor
			1	2	3	4	5	6				
Strait of Georgia	Birch Bay	1711000204	1	1	1	2	1	3	9	Moderate HUC5 score. Limited amount of PCEs, but creeks here are lowland, rain-driven systems, that are very distinct from glacially influenced systems like the Nooksack River. Part of the Northern Cascades (South Salish Sea) MPG, which is the largest and most diverse in this DPS.	Medium	
Nooksack	Upper North Fork Nooksack River	1711000401	2	2	2	1	2	2	11	Moderate HUC5 score. PCEs support an important (North Fork Nooksack) winter-run population that historically may have numbered in the tens of thousands of steelhead, but are not as extensive in this HUC5 as in others supporting this population. Part of the Northern Cascades (South Salish Sea) MPG, which is the largest and most diverse in this DPS.	Medium	
Nooksack	Middle Fork Nooksack River	1711000402	1	1	2	1	2	2	9	Moderate HUC5 score. PCEs support an important (North Fork Nooksack) winter-run population that historically may have numbered in the tens of thousands of steelhead, but are not as extensive in this HUC5 as in others supporting this population. Part of the Northern Cascades (South Salish Sea) MPG, which is the largest and most diverse in this DPS.	Medium	

Subbasin	Watershed	Area/ Watershed (HUC5) Code	Scoring System (factors)						Total HUC5 Score (0-18)	Comments/Other Considerations	CHART Rating of HUC5 Conservation Value	Rating of Connect-ivity Corridor
			1	2	3	4	5	6				
Nooksack	South Fork Nooksack River	1711000403	3	1	2	3	2	3	14	High HUC5 score. PCEs are extensive and support an important (North Fork Nooksack) winter-run population that historically may have numbered in the tens of thousands of steelhead. This HUC5 also supports spawning habitat for one of the few summer-run populations (South Fork Nooksack) in this DPS. Part of the Northern Cascades (South Salish Sea) MPG, which is the largest and most diverse in this DPS.	High	
Nooksack	Lower North Fork Nooksack River	1711000404	3	1	2	3	2	3	14	High HUC5 score. PCEs are extensive and support an important (North Fork Nooksack) winter-run population that historically may have numbered in the tens of thousands of steelhead. This HUC5 also supports one of the few summer-run populations (South Fork Nooksack) in this DPS. Part of the Northern Cascades (South Salish Sea) MPG, which is the largest and most diverse in this DPS.	High	High

Subbasin	Watershed	Area/ Watershed (HUC5) Code	Scoring System (factors)						Total HUC5 Score (0-18)	Comments/Other Considerations	CHART Rating of HUC5 Conservation Value	Rating of Connect-ivity Corridor
			1	2	3	4	5	6				
Nooksack	Nooksack River	1711000405	3	1	2	3	3	3	15	High HUC5 score. PCEs are extensive and support an important (North Fork Nooksack) winter-run population that historically may have numbered in the tens of thousands of steelhead. This HUC5 also supports one of the few summer-run populations (South Fork Nooksack) in this DPS. Part of the Northern Cascades (South Salish Sea) MPG, which is the largest and most diverse in this DPS.	High	High
Upper Skagit	Skagit River/ Gorge Lake	1711000504	1	3	3	1	3	2	13	High HUC5 score. High quality PCEs support an important and diverse summer- and winter-run population (Mainstem Skagit) that historically may have numbered in the tens of thousands of steelhead. Currently it remains one of the predominant steelhead populations in Puget Sound. Part of the Northern Cascades (South Salish Sea) MPG, which is the largest and most diverse in this DPS.	High	

Subbasin	Watershed	Area/ Watershed (HUC5) Code	Scoring System (factors)						Total HUC5 Score (0-18)	Comments/Other Considerations	CHART Rating of HUC5 Conservation Value	Rating of Connect-ivity Corridor
			1	2	3	4	5	6				
Upper Skagit	Skagit River/ Diobsud Creek	1711000505	2	3	3	1	3	2	14	High HUC5 score. High quality and extensive PCEs support an important and diverse summer- and winter-run population (Mainstem Skagit) that historically may have numbered in the tens of thousands of steelhead. Currently it remains one of the predominant steelhead populations in Puget Sound. Part of the Northern Cascades (South Salish Sea) MPG, which is the largest and most diverse in this DPS.	High	
Upper Skagit	Cascade River	1711000506	2	3	3	2	2	2	14	High HUC5 score. High quality and extensive PCEs support an important and diverse summer- and winter-run population (Mainstem Skagit) that historically may have numbered in the tens of thousands of steelhead. Currently it remains one of the predominant steelhead populations in Puget Sound. Part of the Northern Cascades (South Salish Sea) MPG, which is the largest and most diverse in this DPS.	High	

Subbasin	Watershed	Area/ Watershed (HUC5) Code	Scoring System (factors)						Total HUC5 Score (0-18)	Comments/Other Considerations	CHART Rating of HUC5 Conservation Value	Rating of Connect-ivity Corridor
			1	2	3	4	5	6				
Upper Skagit	Skagit River/ Illabot Creek	1711000507	3	3	3	2	3	2	16	High HUC5 score. High quality and extensive PCEs support important and diverse summer- and winter-run populations (Mainstem Skagit and Sauk River) that historically may have numbered in the tens of thousands of steelhead. The Mainstem Skagit remains one of the predominant steelhead populations in Puget Sound. Part of the Northern Cascades (South Salish Sea) MPG, which is the largest and most diverse in this DPS.	High	High
Upper Skagit	Baker River	1711000508	2	1	1	2	1	3	10	Moderate HUC5 score. PCEs likely supported historically important runs of summer- and winter-run populations. Extensive habitat still remains, but dams in the upper portion of the watershed have diminished the quality, quantity, and potential of PCEs. Part of the Northern Cascades (South Salish Sea) MPG, which is the largest and most diverse in this DPS.	Medium	

Subbasin	Watershed	Area/ Watershed (HUC5) Code	Scoring System (factors)						Total HUC5 Score (0-18)	Comments/Other Considerations	CHART Rating of HUC5 Conservation Value	Rating of Connect-ivity Corridor
			1	2	3	4	5	6				
Sauk	Upper Sauk River	1711000601	3	3	3	2	2	3	16	High HUC5 score. High quality and extensive PCEs. The Sauk River was historically considered an excellent steelhead stream and principal spawning habitat for the Skagit River system. Part of the Northern Cascades (South Salish Sea) MPG, which is the largest and most diverse in this DPS. The winter-run population occupying this HUC5 has one of the highest estimates of intrinsic potential habitat productivity for the entire DPS. PCEs also overlap a FEMAT Tier 1 key watershed for fish populations/habitat.	High	
Sauk	Upper Suiattle River	1711000602	1	3	3	1	2	2	12	Moderate HUC5 score. PCEs are more limited in this watershed relative to other adjacent watersheds in the Sauk River. The Sauk River was historically considered an excellent steelhead stream and principal spawning habitat for the Skagit River system. Part of the Northern Cascades (South Salish Sea) MPG, which is the largest and most diverse in this DPS. PCEs also overlap a FEMAT Tier 1 key watershed for fish populations/habitat.	Medium	

Subbasin	Watershed	Area/ Watershed (HUC5) Code	Scoring System (factors)						Total HUC5 Score (0-18)	Comments/Other Considerations	CHART Rating of HUC5 Conservation Value	Rating of Connect-ivity Corridor
			1	2	3	4	5	6				
Sauk	Lower Suiattle River	1711000603	3	3	3	1	2	2	14	High HUC5 score. High quality and extensive PCEs. The Sauk River was historically considered an excellent steelhead stream and principal spawning habitat for the Skagit River system. Part of the Northern Cascades (South Salish Sea) MPG, which is the largest and most diverse in this DPS. PCEs also overlap a FEMAT Tier 1 key watershed for fish populations/habitat.	High	High
Sauk	Lower Sauk River	1711000604	3	2	3	1	2	3	14	High HUC5 score. Extensive PCEs. The Sauk River was historically considered an excellent steelhead stream and principal spawning habitat for the Skagit River system. Part of the Northern Cascades (South Salish Sea) MPG, which is the largest and most diverse in this DPS. The winter-run population occupying this HUC5 has one of the highest estimates of intrinsic potential habitat productivity for the entire DPS. PCEs also overlap a FEMAT Tier 1 key watershed for fish populations/habitat.	High	High

Subbasin	Watershed	Area/ Watershed (HUC5) Code	Scoring System (factors)						Total HUC5 Score (0-18)	Comments/Other Considerations	CHART Rating of HUC5 Conservation Value	Rating of Connect-ivity Corridor
			1	2	3	4	5	6				
Lower Skagit	Middle Skagit River/ Finney Creek	1711000701	3	2	3	3	3	3	17	High HUC5 score. Extensive PCEs support important and diverse summer- and winter-run populations (Mainstem Skagit, Sauk River, and Baker River) that historically may have numbered in the tens of thousands of steelhead. Currently the Mainstem Skagit remains one of the predominant steelhead populations in Puget Sound. The winter-run population occupying this HUC5 has one of the highest estimates of intrinsic potential habitat productivity for the entire DPS. Part of the Northern Cascades (South Salish Sea) MPG, which is the largest and most diverse in this DPS.	High	High

Subbasin	Watershed	Area/ Watershed (HUC5) Code	Scoring System (factors)						Total HUC5 Score (0-18)	Comments/Other Considerations	CHART Rating of HUC5 Conservation Value	Rating of Connect-ivity Corridor
			1	2	3	4	5	6				
Lower Skagit	Lower Skagit River/ Nookachamps Creek	1711000702	3	1	2	3	3	3	15	High HUC5 score. Extensive PCEs support important and diverse summer- and winter-run populations (Mainstem Skagit, Sauk River, and Baker River) that historically may have numbered in the tens of thousands of steelhead. Currently the Mainstem Skagit remains one of the predominant steelhead populations in Puget Sound. The winter-run population occupying this HUC5 has one of the highest estimates of intrinsic potential habitat productivity for the entire DPS. Part of the Northern Cascades (South Salish Sea) MPG, which is the largest and most diverse in this DPS.	High	High

Subbasin	Watershed	Area/ Watershed (HUC5) Code	Scoring System (factors)						Total HUC5 Score (0-18)	Comments/Other Considerations	CHART Rating of HUC5 Conservation Value	Rating of Connect-ivity Corridor
			1	2	3	4	5	6				
Stillaguamish	North Fork Stillaguamish River	1711000801	3	2	2	3	2	3	15	High HUC5 score. Extensive PCEs support one of the few naturally sustained steelhead populations with likely minimal hatchery influence. This HUC5 also supports spawning habitat for one of the few summer-run populations (Deer Creek) in this DPS. Part of the Northern Cascades (South Salish Sea) MPG, which is the largest and most diverse in this DPS. PCEs also overlap a FEMAT Tier 1 key watershed for fish populations/habitat.	High	
Stillaguamish	South Fork Stillaguamish River	1711000802	3	2	2	3	2	3	15	High HUC5 score. Extensive PCEs. This HUC5 also supports spawning habitat for one of the few summer-run populations (Canyon Creek) in this DPS. Historically, Canyon Creek was identified as having a relatively good-sized run of steelhead. Part of the Northern Cascades (South Salish Sea) MPG, which is the largest and most diverse in this DPS. PCEs also overlap a FEMAT Tier 1 key watershed for fish populations/habitat.	High	

Subbasin	Watershed	Area/ Watershed (HUC5) Code	Scoring System (factors)						Total HUC5 Score (0-18)	Comments/Other Considerations	CHART Rating of HUC5 Conservation Value	Rating of Connect-ivity Corridor
			1	2	3	4	5	6				
Stillaguamish	Lower Stillaguamish River	1711000803	3	1	2	3	2	3	14	High HUC5 score. PCEs support one winter-run population and two summer-run populations. Part of the Northern Cascades (South Salish Sea) MPG, which is the largest and most diverse in this DPS.	High	High
Skykomish	Tye And Beckler Rivers	1711000901	1	3	3	0	0	1	8	Moderate HUC5 score. PCEs are more limited in this watershed relative to other adjacent watersheds in the Skykomish River system. Part of the Northern Cascades (South Salish Sea) MPG, which is the largest and most diverse in this DPS. PCEs also overlap a FEMAT Tier 1 key watershed for fish populations/habitat.	Medium	
Skykomish	Skykomish River Forks	1711000902	3	3	2	3	2	3	16	High HUC5 score. Extensive and high-quality PCEs also support spawning habitat for one of the few summer-run populations (North Fork Skykomish) in this DPS. Part of the Northern Cascades (South Salish Sea) MPG, which is the largest and most diverse in this DPS. PCEs also overlap a FEMAT Tier 1 key watershed for fish populations/habitat.	High	High

Subbasin	Watershed	Area/ Watershed (HUC5) Code	Scoring System (factors)						Total HUC5 Score (0-18)	Comments/Other Considerations	CHART Rating of HUC5 Conservation Value	Rating of Connect-ivity Corridor
			1	2	3	4	5	6				
Skykomish	Skykomish River/ Wallace River	1711000903	3	2	2	3	2	3	15	High HUC5 score. PCEs support a winter-run population and one of the few summer-run populations (North Fork Skykomish) in this DPS. Part of the Northern Cascades (South Salish Sea) MPG, which is the largest and most diverse in this DPS.	High	High
Skykomish	Sultan River	1711000904	1	1	2	1	2	2	9	Moderate HUC5 score. PCEs are much more limited in quantity and quality in this watershed than in other adjacent watersheds in the Skykomish River system. Part of the Northern Cascades (South Salish Sea) MPG, which is the largest and most diverse in this DPS.	Medium	
Skykomish	Skykomish River/ Woods Creek	1711000905	2	3	2	3	2	3	15	High HUC5 score. PCEs support a winter-run population and one of the few summer-run populations (North Fork Skykomish) in this DPS. Part of the Northern Cascades (South Salish Sea) MPG, which is the largest and most diverse in this DPS.	High	High

Subbasin	Watershed	Area/ Watershed (HUC5) Code	Scoring System (factors)						Total HUC5 Score (0-18)	Comments/Other Considerations	CHART Rating of HUC5 Conservation Value	Rating of Connect-ivity Corridor
			1	2	3	4	5	6				
Snoqualmie	Middle Fork Snoqualmie River	1711001003	3	2	2	2	2	2	13	High HUC5 score. Extensive PCEs are believed to have historically sustained large runs of steelhead. Part of the Northern Cascades (South Salish Sea) MPG, which is the largest and most diverse in this DPS.	High	
Snoqualmie	Lower Snoqualmie River	1711001004	3	2	2	3	3	3	16	High HUC5 score. Extensive PCEs are believed to have historically sustained large runs of steelhead. This HUC5 also supports spawning habitat for one of the few summer-run populations (Tolt River) in this DPS. Part of the Northern Cascades (South Salish Sea) MPG, which is the largest and most diverse in this DPS.	High	High
Snohomish	Pilchuck River	1711001101	3	2	2	2	2	3	14	High HUC5 score. Extensive PCEs and historically reported to be a good producer of winter-run steelhead. Age structure of the Pilchuck River winter-run may include a higher proportion of 3-year ocean fish. Part of the Northern Cascades (South Salish Sea) MPG, which is the largest and most diverse in this DPS.	High	

Subbasin	Watershed	Area/ Watershed (HUC5) Code	Scoring System (factors)						Total HUC5 Score (0-18)	Comments/Other Considerations	CHART Rating of HUC5 Conservation Value	Rating of Connect-ivity Corridor
			1	2	3	4	5	6				
Snohomish	Snohomish River	1711001102	3	1	2	3	3	3	15	High HUC5 score. Extensive PCEs support multiple winter-run populations as well as one of the few summer-run populations (Tolt River) in this DPS. Part of the Northern Cascades (South Salish Sea) MPG, which is the largest and most diverse in this DPS.	High	High
Lake Washington	Cedar River	1711001201	2	2	2	1	1	2	10	Moderate HUC5 score. Significant manmade hydrological changes have affected this watershed. A substantial resident *O. mykiss* population exists in the Cedar River, but the relationship between the existing resident population and the historical anadromous population remains unclear. However, this HUC5 is considered to have the best and most extensive habitat of the Lake Washington subbasin tributaries and the resident *O. mykiss* contribution to steelhead production may be determined to be important for the Central and South Puget Sound Major Population Group.	Medium	

Subbasin	Watershed	Area/ Watershed (HUC5) Code	Scoring System (factors)						Total HUC5 Score (0-18)	Comments/Other Considerations	CHART Rating of HUC5 Conservation Value	Rating of Connect-ivity Corridor
			1	2	3	4	5	6				
Lake Washington	Lake Sammamish	1711001202	1	1	1	0	0	2	5	Very low HUC5 score and very poor quality PCEs. Significant development and manmade hydrological changes have affected this watershed. Moreover, it is not clear to what degree steelhead utilized tributaries in this HUC5.	Low	
Lake Washington	Lake Washington	1711001203	1	0	1	0	1	2	5	Very low HUC5 score and very poor quality PCEs. Significant development and manmade hydrological changes have affected this watershed, as reflected in one of the lowest estimates of intrinsic potential habitat productivity in the entire DPS. Moreover, it is not clear to what degree steelhead utilized tributaries in this HUC5 (although it does provide a rearing/migration corridor for the Medium-valued Cedar River watershed/population).	Low	Medium
Lake Washington	Sammamish River	1711001204	1	1	1	0	1	2	6	Very low HUC5 score and very poor quality PCEs. Significant development and manmade hydrological changes have affected this watershed. Moreover, it is not clear to what degree steelhead utilized tributaries in this HUC5.	Low	

Subbasin	Watershed	Area/ Watershed (HUC5) Code	Scoring System (factors)						Total HUC5 Score (0-18)	Comments/Other Considerations	CHART Rating of HUC5 Conservation Value	Rating of Connect-ivity Corridor
			1	2	3	4	5	6				
Duwamish	Upper Green River	1711001301	1	1	2	2	1	2	9	Moderate HUC5 score. Winter-run steelhead were historically present in considerable numbers in the Green River and the winter-run population occupying this HUC5 has one of the highest estimates of intrinsic potential habitat productivity for the entire DPS (and the highest for this MPG). This HUC5 also may have supported a historical, native summer-run population.	High	
Duwamish	Middle Green River	1711001302	1	2	1	2	2	2	10	Moderate HUC5 score. Winter-run steelhead were historically present in considerable numbers in the Green River and the winter-run population occupying this HUC5 has one of the highest estimates of intrinsic potential habitat productivity for the entire DPS (and the highest for this MPG).	High	High

Subbasin	Watershed	Area/ Watershed (HUC5) Code	Scoring System (factors)						Total HUC5 Score (0-18)	Comments/Other Considerations	CHART Rating of HUC5 Conservation Value	Rating of Connect-ivity Corridor
			1	2	3	4	5	6				
Duwamish	Lower Green River	1711001303	3	1	1	2	2	2	11	Moderate HUC5 score. Extensive mainstem and tributary PCEs. Winter-run steelhead were historically present in considerable numbers in the Green River and the winter-run population occupying this HUC5 has one of the highest estimates of intrinsic potential habitat productivity for the entire DPS (and the highest for this MPG).	High	High
Puyallup	Upper White River	1711001401	2	2	2	1	2	2	11	Moderate HUC5 score. The winter-run population occupying this HUC5 has one of the highest estimates of intrinsic potential habitat productivity for the entire DPS. PCEs also overlap a FEMAT Tier 1 key watershed for fish populations/habitat.	High	
Puyallup	Lower White River	1711001402	3	1	2	1	2	2	11	Moderate HUC5 score and extensive PCEs. The winter-run population occupying this HUC5 has one of the highest estimates of intrinsic potential habitat productivity for the entire DPS.	High	High
Puyallup	Carbon River	1711001403	2	2	2	1	2	2	11	Moderate HUC5 score. The winter-run population occupying this HUC5 has one of the highest estimates of intrinsic potential habitat productivity for the entire DPS.	High	

Subbasin	Watershed	Area/ Watershed (HUC5) Code	Scoring System (factors)						Total HUC5 Score (0-18)	Comments/Other Considerations	CHART Rating of HUC5 Conservation Value	Rating of Connect-ivity Corridor
			1	2	3	4	5	6				
Puyallup	Upper Puyallup River	1711001404	2	1	2	1	2	2	10	Moderate HUC5 score. The winter-run population occupying this HUC5 has one of the highest estimates of intrinsic potential habitat productivity for the entire DPS.	High	
Puyallup	Lower Puyallup River	1711001405	2	0	1	1	2	2	8	Moderate HUC5 score. The two winter-run populations occupying this HUC5 have some of the highest estimates of intrinsic potential habitat productivity for the entire DPS.	High	High
Nisqually	Mashel/ Ohop	1711001502	2	2	2	1	2	2	11	Moderate HUC5 score. The winter-run population occupying this HUC5 has one of the highest estimates of intrinsic potential habitat productivity for the entire DPS.	High	
Nisqually	Lowland	1711001503	3	2	2	3	2	2	14	High HUC5 score. The winter-run population occupying this HUC5 has one of the highest estimates of intrinsic potential habitat productivity for the entire DPS. Extensive PCEs include a substantial and rare estuary (Nisqually Delta) within the range of this DPS.	High	High
Deschutes	Prairie1	1711001601	1	1	1	0	0	0	3	Very low HUC5 score. Considerable uncertainty regarding demographically independent population structure.	Low	

Subbasin	Watershed	Area/ Watershed (HUC5) Code	Scoring System (factors)						Total HUC5 Score (0-18)	Comments/Other Considerations	CHART Rating of HUC5 Conservation Value	Rating of Connect-ivity Corridor
			1	2	3	4	5	6				
Deschutes	Prairie2	1711001602	1	1	1	0	0	0	3	Very low HUC5 score. Considerable uncertainty regarding demographically independent population structure.	Low	Low
Skokomish	Skokomish River	1711001701	3	1	2	1	2	3	12	Moderate HUC5 score. This HUC5 supports the only extant spawning habitat for the Skokomish River winter-run population. Extensive PCEs include the largest intact estuary in Hood Canal and overlap a FEMAT Tier 1 key watershed for fish populations/habitat.	High	
Hood Canal	Lower West Hood Canal Frontal	1711001802	0	3	2	1	1	2	9	Moderate HUC5 score and limited amount of – but high-quality – PCEs. The CHART determined that there were no Low conservation value areas in Hood Canal's unique ecological setting.	Medium	
Hood Canal	Hamma Hamma River	1711001803	1	2	1	1	1	2	8	Moderate HUC5 score. Limited amount of PCEs. Focus of recent steelhead supplementation/rebuilding efforts.	High	
Hood Canal	Duckabush River	1711001804	1	2	2	1	1	2	9	Moderate HUC5 score. Limited amount of PCEs, yet some of the highest for the watersheds supporting the West Hood Canal Tributaries winter-run population. PCEs also overlap a FEMAT Tier 1 key watershed for fish populations/habitat.	High	

Subbasin	Watershed	Area/ Watershed (HUC5) Code	Scoring System (factors)						Total HUC5 Score (0-18)	Comments/Other Considerations	CHART Rating of HUC5 Conservation Value	Rating of Connect-ivity Corridor
			1	2	3	4	5	6				
Hood Canal	Dosewallips River	1711001805	1	2	2	1	1	2	9	Moderate HUC5 score. Limited amount of PCEs, yet some of the highest for the watersheds supporting the West Hood Canal Tributaries winter-run population. PCEs also overlap a FEMAT Tier 1 key watershed for fish populations/habitat..	High	
Hood Canal	Big Quilcene River	1711001806	1	1	1	1	1	2	7	Moderate HUC5 score. PCE quantity is limited in this HUC5. The CHART determined that there were no Low conservation value areas in Hood Canal's unique ecological setting.	Medium	
Hood Canal	Upper West Hood Canal Frontal	1711001807	1	2	2	1	1	2	9	Moderate HUC5 score. PCEs are limited but distributed among a substantial number of independent tributaries in this HUC5. The CHART determined that there were no Low conservation value areas in Hood Canal's unique ecological setting.	Medium	
Hood Canal	West Kitsap	1711001808	2	2	1	1	2	3	11	Moderate HUC5 score. Creeks here are lowland, rain-driven systems, that are very distinct from glacially influenced systems prevalent throughout much of the DPS range. The highest estimate of intrinsic potential habitat productivity in the Hood Canal portion of this MPG.	High	

Subbasin	Watershed	Area/ Watershed (HUC5) Code	Scoring System (factors)						Total HUC5 Score (0-18)	Comments/Other Considerations	CHART Rating of HUC5 Conservation Value	Rating of Connect-ivity Corridor
			1	2	3	4	5	6				
Kitsap	Kennedy/ Goldsborough	1711001900	3	2	1	1	1	2	10	Moderate HUC5 score. Extensive PCEs; creeks here are lowland, rain-driven systems, that are very distinct from glacially influenced systems prevalent throughout much of the DPS range.	Medium	
Kitsap	Puget	1711001901	2	1	1	1	1	3	9	Moderate HUC5 score. Creeks here are lowland, rain-driven systems, that are very distinct from glacially influenced systems prevalent throughout much of the DPS range.	Medium	
Kitsap	Prairie3	1711001902	1	0	1	0	0	2	4	Very low HUC5 score. Very limited PCE quantity and quality, and considerable uncertainty regarding demographically independent population structure.	Low	
Kitsap	Puget Sound/ East Passage	1711001904	0	0	0	1	0	0	1	Very low HUC5 score. Extremely limited PCE quantity and quality. Also, there is considerable uncertainty regarding population structure of steelhead occupying this HUC5.	Low	
Kitsap	Chambers Creek	1711001906	1	0	1	0	1	2	5	Low HUC5 score. Very limited PCE quantity and quality, and considerable uncertainty regarding demographically independent population structure.	Low	

Subbasin	Watershed	Area/ Watershed (HUC5) Code	Scoring System (factors)						Total HUC5 Score (0-18)	Comments/Other Considerations	CHART Rating of HUC5 Conservation Value	Rating of Connect-ivity Corridor
			1	2	3	4	5	6				
Kitsap	Port Ludlow/ Chimacum Creek	1711001908	1	1	1	0	0	2	5	Low HUC5 score. Very limited PCE quantity and quality and considered the least important of the three HUC5s supporting the Strait of Juan de Fuca Lowland Tributaries population.	Low	
Dungeness/ Elwha	Discovery Bay	1711002001	1	2	1	2	1	2	9	Moderate HUC5 score. Although PCEs are limited in this HUC5, it is considered the most important of the three HUC5s supporting the Strait of Juan de Fuca Lowland Tributaries population. Steelhead in one tributary of this HUC5 (Snow Creek) have been intensively monitored and give insights into the dynamics of small populations throughout the DPS. Resident fish here are also known to generate anadromous offspring.	High	
Dungeness/ Elwha	Sequim Bay	1711002002	0	2	1	0	0	2	5	Low HUC5 score. Of the three HUC5s supporting the Strait of Juan de Fuca Lowland Tributaries population, this HUC5 was considered of intermediate importance in part due to its close proximity to higher conservation-value HUC5s to the west (e.g., the Dungeness River).	Medium	

Subbasin	Watershed	Area/ Watershed (HUC5) Code	Scoring System (factors)						Total HUC5 Score (0-18)	Comments/Other Considerations	CHART Rating of HUC5 Conservation Value	Rating of Connect-ivity Corridor
			1	2	3	4	5	6				
Dungeness/ Elwha	Dungeness River	1711002003	3	2	2	2	1	3	13	High HUC5 score. This HUC5 supports the only extant spawning habitat for the Dungeness River winter-run population. This population has the second highest estimate of intrinsic potential habitat productivity for this MPG. Extensive PCEs also overlap a FEMAT Tier 1 key watershed for fish populations/habitat.	High	
Dungeness/ Elwha	Port Angeles Harbor	1711002004	3	2	2	1	1	3	12	Moderate HUC5 score. Extensive PCEs are distributed among a number of independent tributaries in this HUC5.	High	

Subbasin	Watershed	Area/ Watershed (HUC5) Code	Scoring System (factors)						Total HUC5 Score (0-18)	Comments/Other Considerations	CHART Rating of HUC5 Conservation Value	Rating of Connect-ivity Corridor
			1	2	3	4	5	6				
Dungeness/ Elwha	Elwha River	1711002007	1	2	2	2	2	3	12	Moderate HUC5 score. The winter-run population occupying this HUC5 has one of the highest estimates of intrinsic potential habitat productivity for the entire DPS (and the highest for this MPG). Historical areas now accessible to steelhead in Indian and Little Creeks overlap with a FEMAT Tier 1 key watershed for fish populations/habitat. The CHART determined that areas above both Elwha dams are essential for conservation of the DPS, noting the significant amount of additional spawning habitat relative to other much smaller streams in the Strait of Juan de Fuca, as well as the high likelihood that these habitats will likely be able to support both a winter-run and the rarer summer-run life forms of steelhead.	High	

Figure B1. Populations and Major Population Groups (see Puget Sound Technical Recovery Team 2011) Identified In the Range of Watersheds Occupied by Puget Sound Steelhead

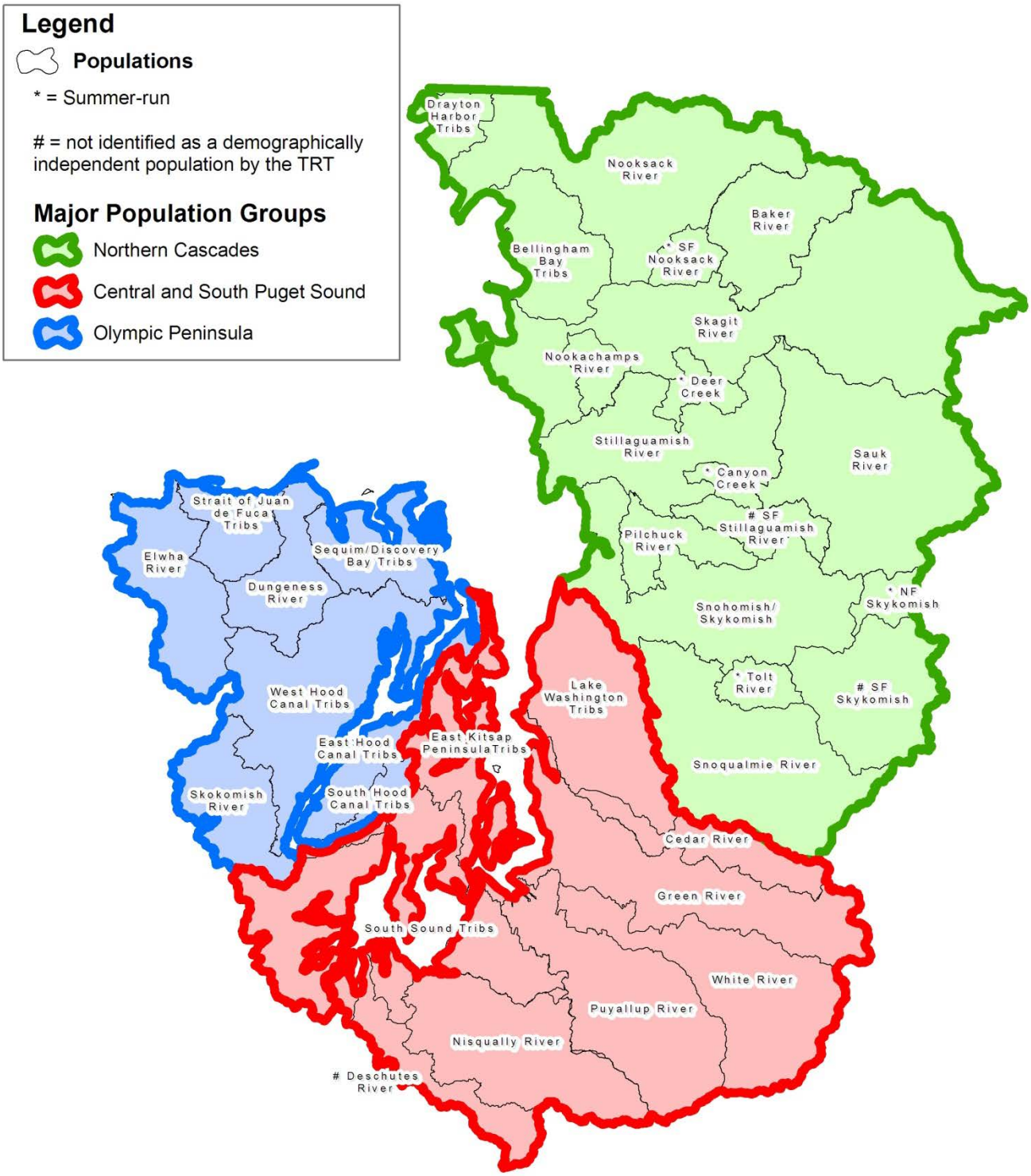
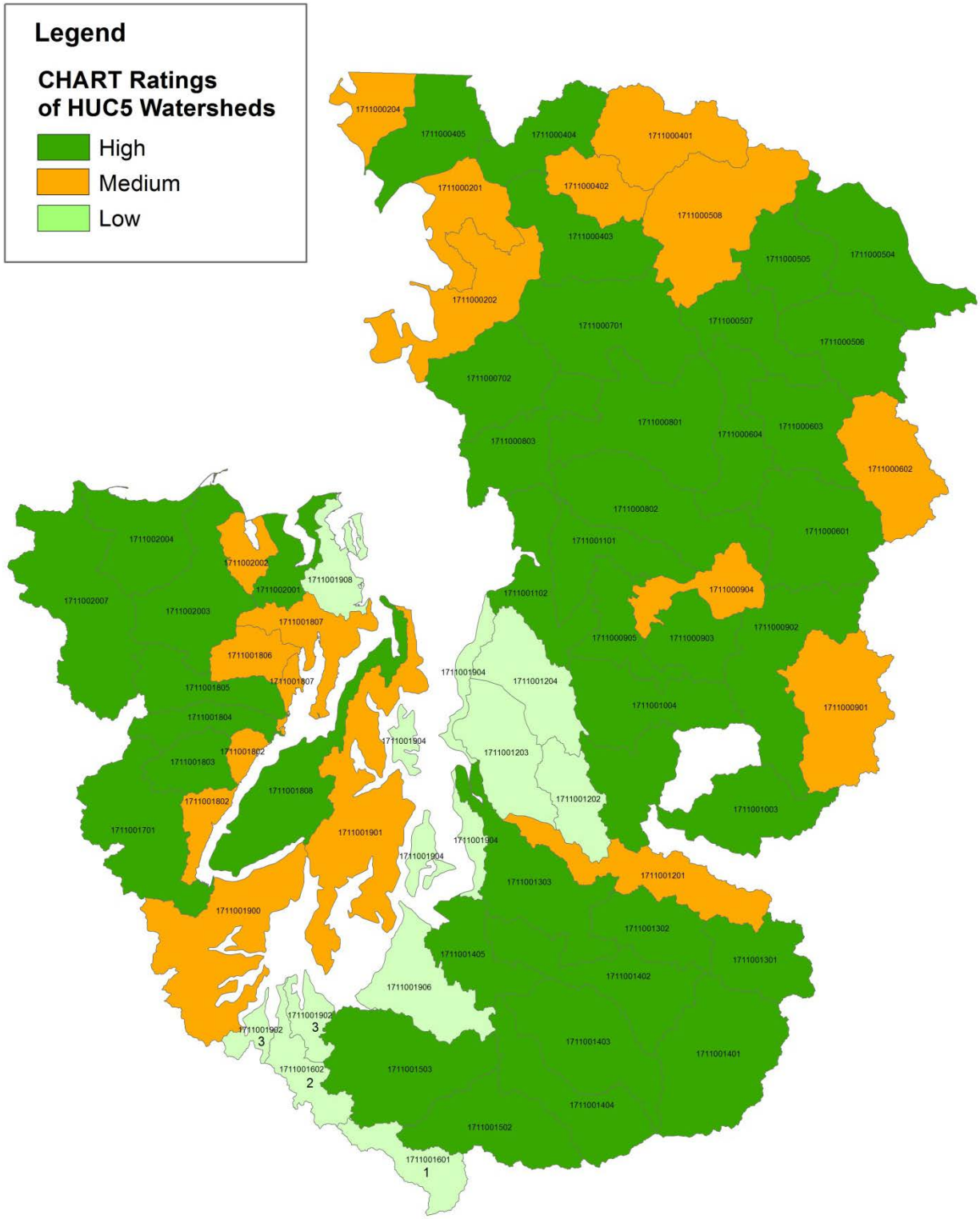
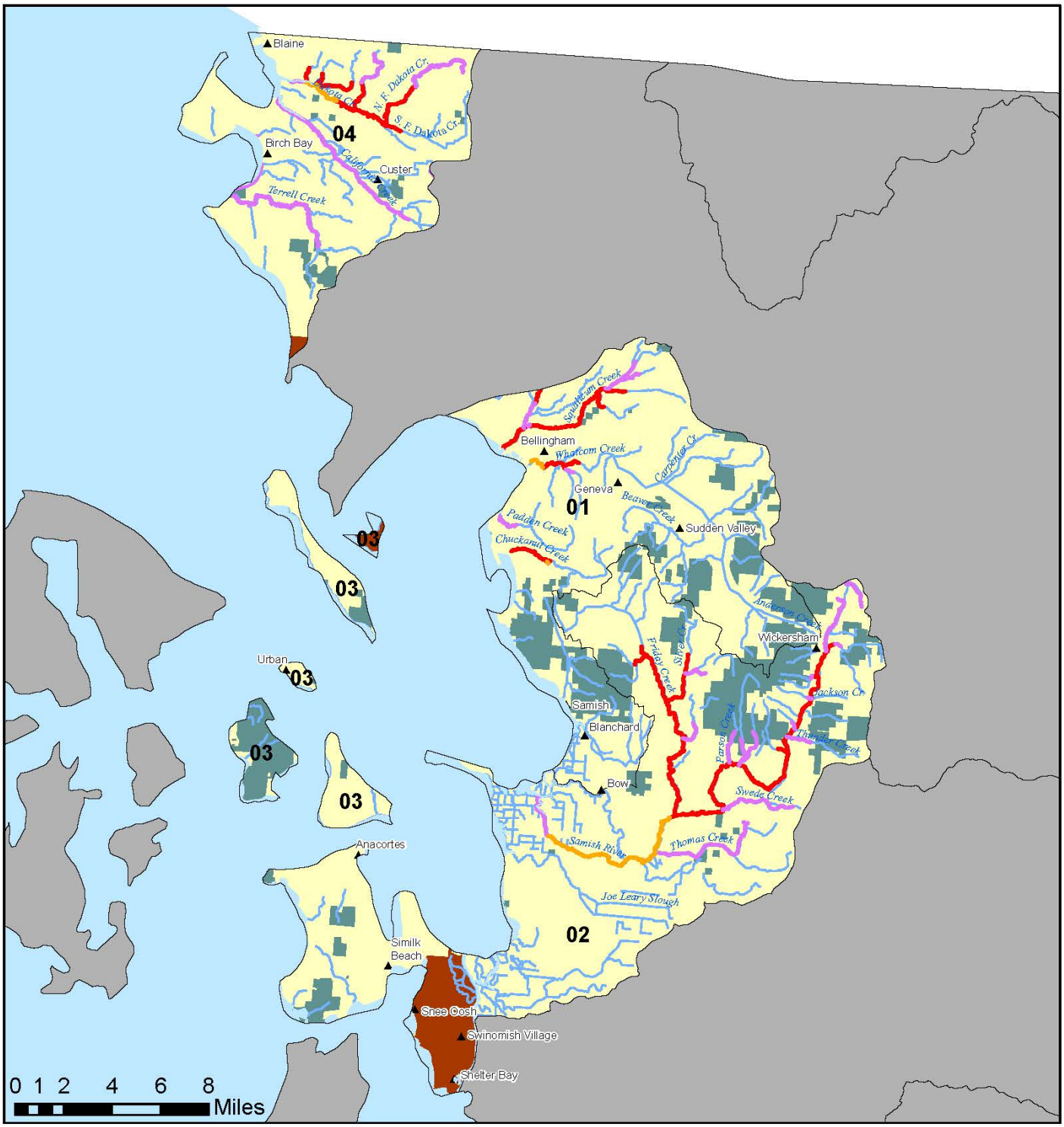


Figure B2. CHART Ratings of Conservation Value for Habitat Areas in HUC5 Watersheds Occupied by the Puget Sound Steelhead DPS [Legend corrected on 1/23/13]



Maps B1 through B18. Puget Sound Steelhead DPS – Habitat Areas Under Consideration for Critical Habitat Designation



Puget Sound Steelhead Distribution

Strait Of Georgia Subbasin 17110002

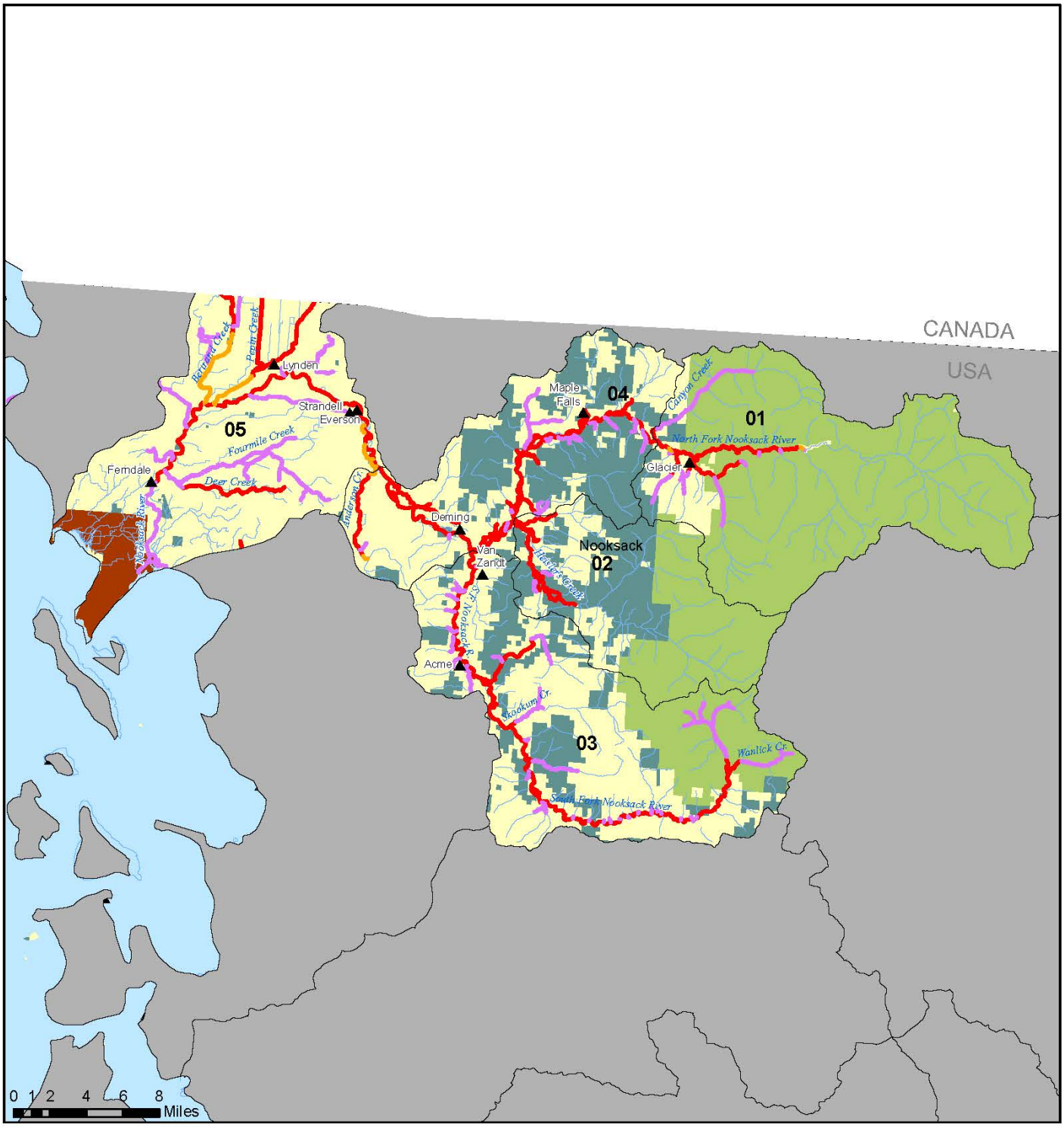
Map B1

The watershed code is the subbasin number with the two digit watershed code appended to the end (i.e., Subbasin = 1711007, watershed = 171100701)

Note: This map is for general reference only

Legend

- Cities
- Streams (1:100,000)
- Spawning/Rearing
- Rearing/Migration
- Migration/Presence
- Watersheds
- Private
- Federal
- State/Local
- Tribal

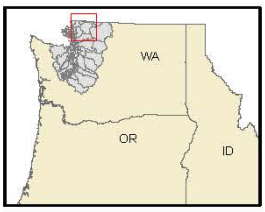


N

Puget Sound Steelhead Distribution

Nooksack Subbasin 17110004

Map B2

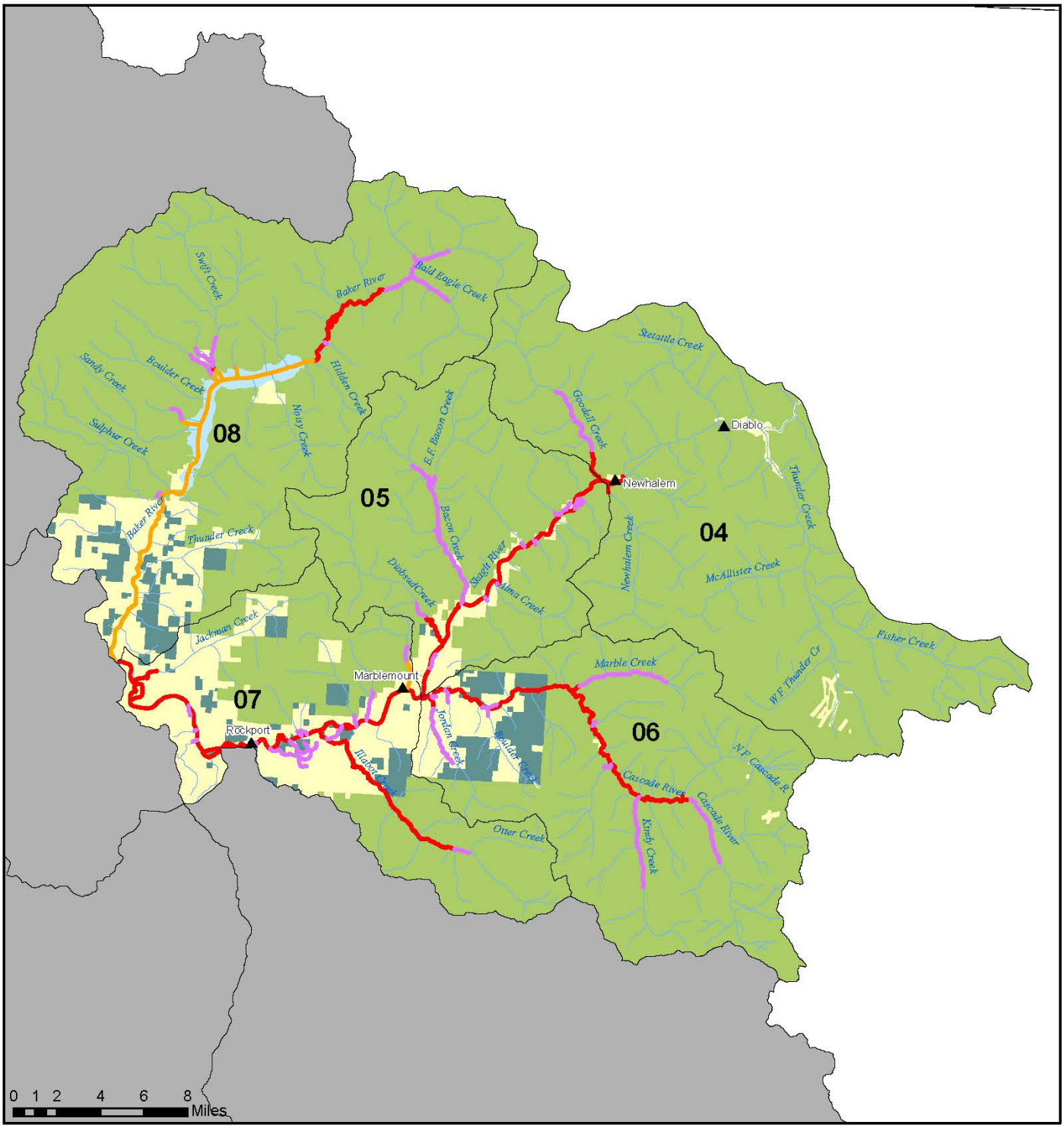


The watershed code is the subbasin number with the two digit watershed code appended to the end (i.e., Subbasin = 1711007, watershed = 171100701)

Note: This map is for general reference only

Legend

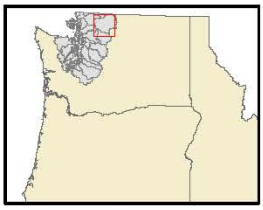
- Cities
- Streams (1:100,000)
- Spawning/Rearing
- Rearing/Migration
- Migration/Presence
- Watersheds
- Private
- Federal
- State/Local
- Tribal



Puget Sound Steelhead Distribution

Upper Skagit Subbasin 17110005

Map B3

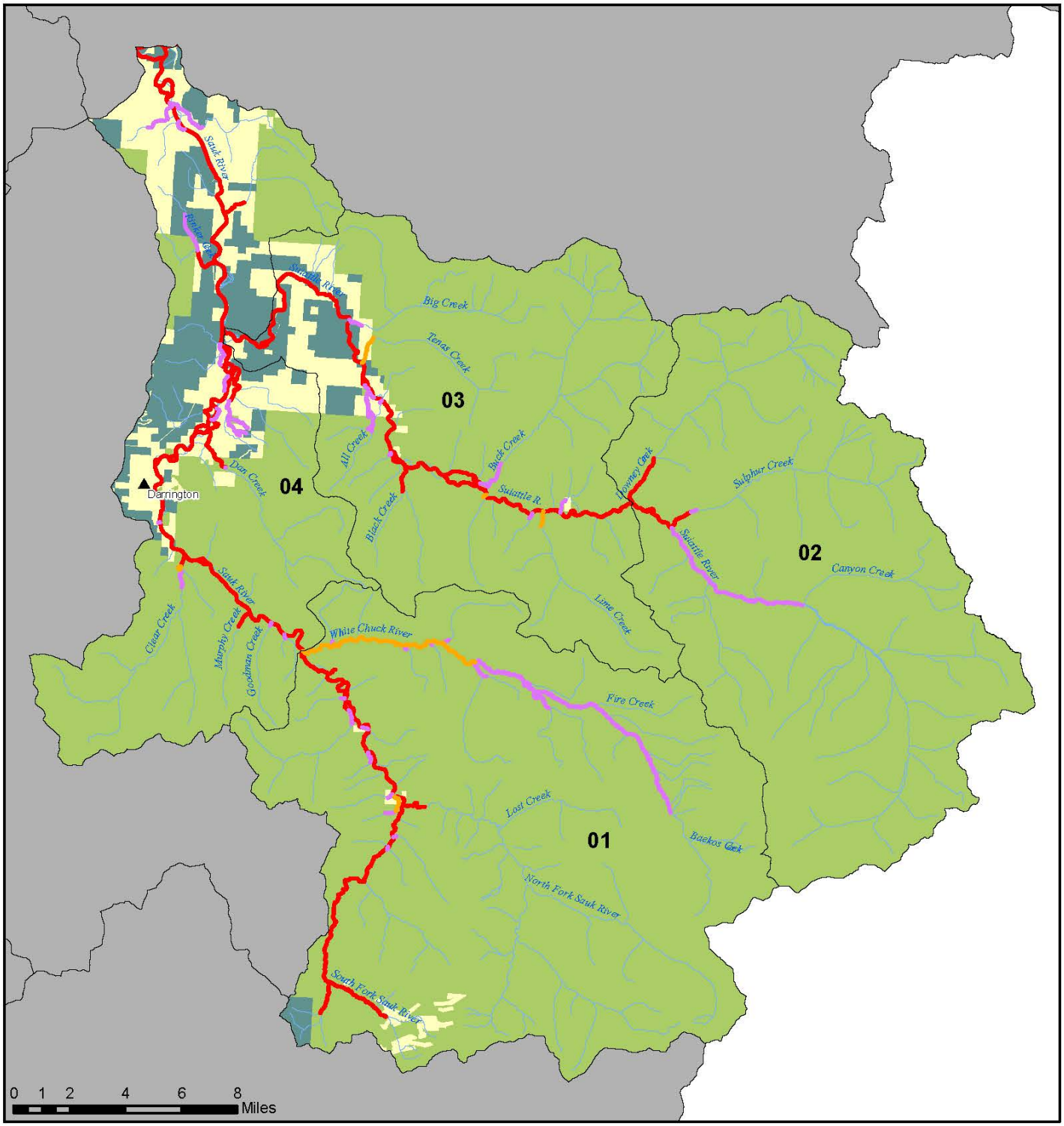


The watershed code is the subbasin number with the two digit watershed code appended to the end (i.e., Subbasin = 1711007, watershed = 171100701)

Note: This map is for general reference only

Legend

- Cities
- Streams (1:100,000)
- Spawning/Rearing
- Rearing/Migration
- Migration/Presence
- Watersheds
- Private
- Federal
- State/Local
- Tribal



Puget Sound Steelhead Distribution

Sauk Subbasin 17110006

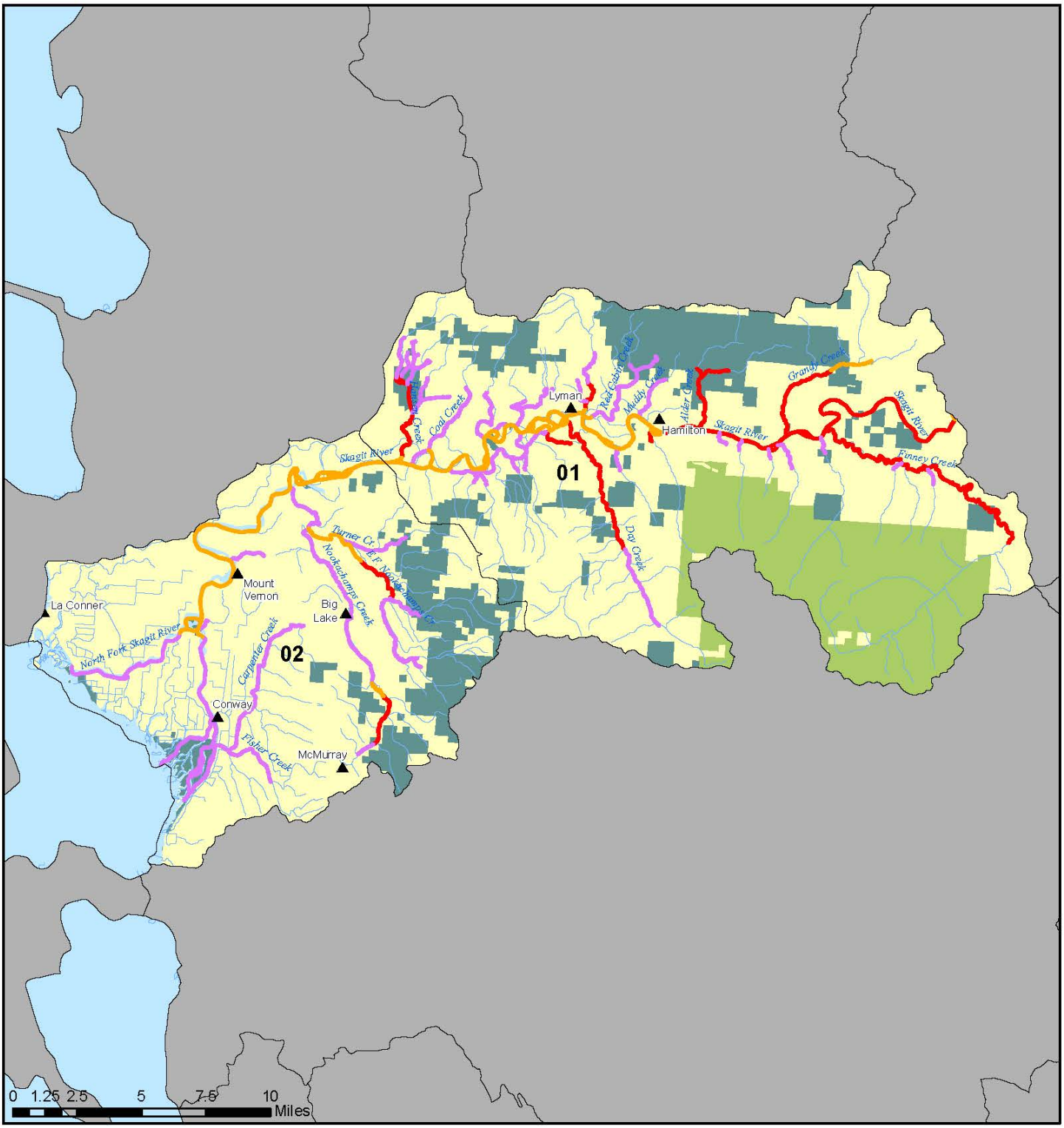
Map B4

The watershed code is the subbasin number with the two digit watershed code appended to the end (i.e., Subbasin = 1711007, watershed = 171100701)

Note: This map is for general reference only

Legend

- Cities
- Streams (1:100,000)
- Spawning/Rearing
- Rearing/Migration
- Migration/Presence
- Watersheds
- Private
- Federal
- State/Local
- Tribal

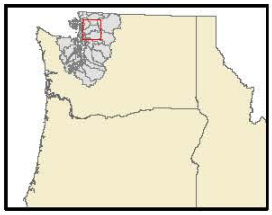


N

Puget Sound Steelhead Distribution

Lower Skagit Subbasin 17110007

Map B5

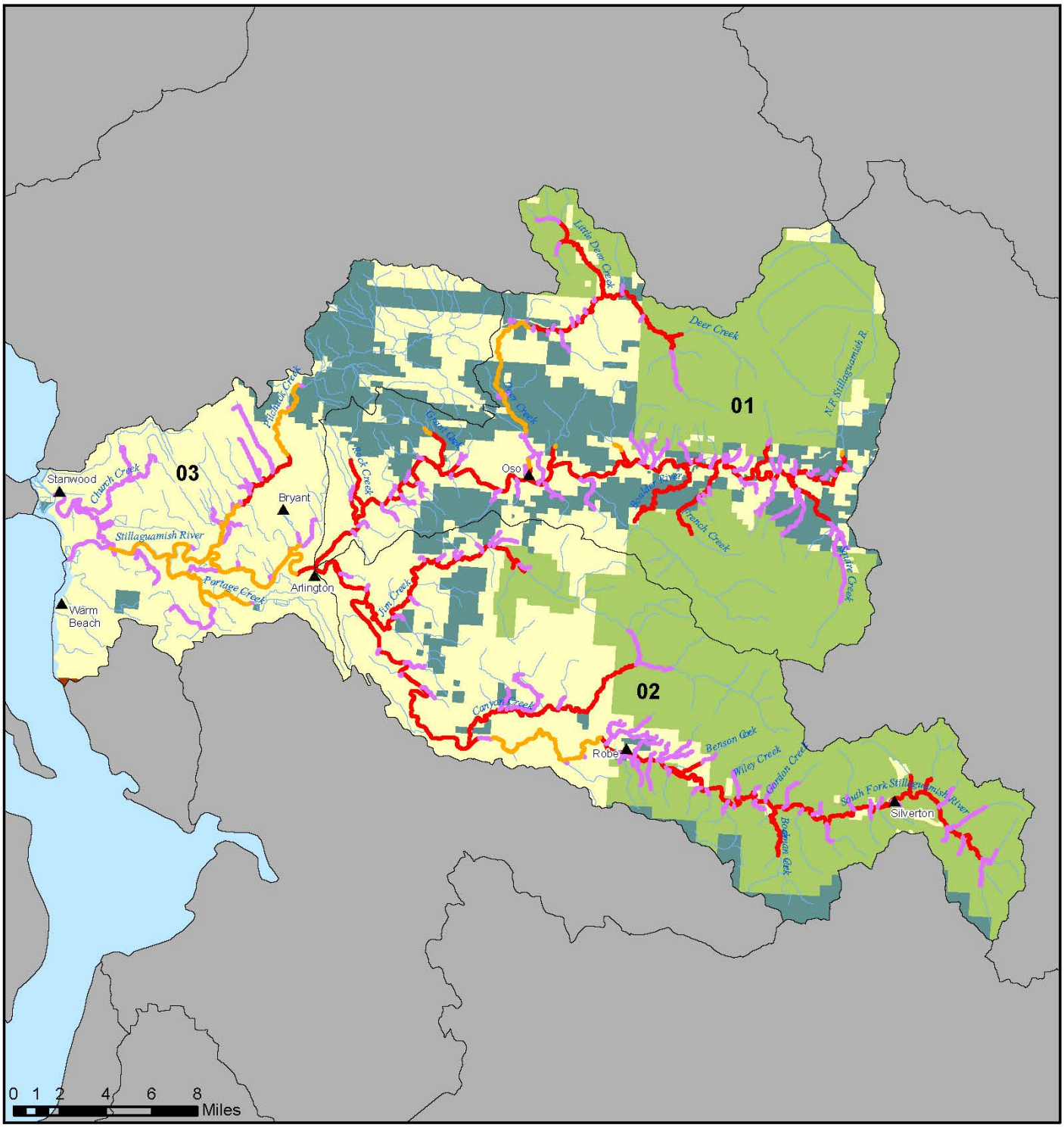


The watershed code is the subbasin number with the two digit watershed code appended to the end (i.e., Subbasin = 1711007, watershed = 171100701)

Note: This map is for general reference only

Legend

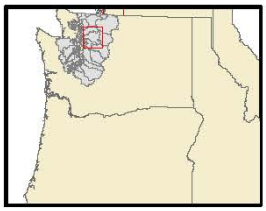
- Cities
- Streams (1:100,000)
- Spawning/Rearing
- Rearing/Migration
- Migration/Presence
- Watersheds
- Private
- Federal
- State/Local
- Tribal



Puget Sound Steelhead Distribution

Stillaguamish Subbasin 17110008

Map B6

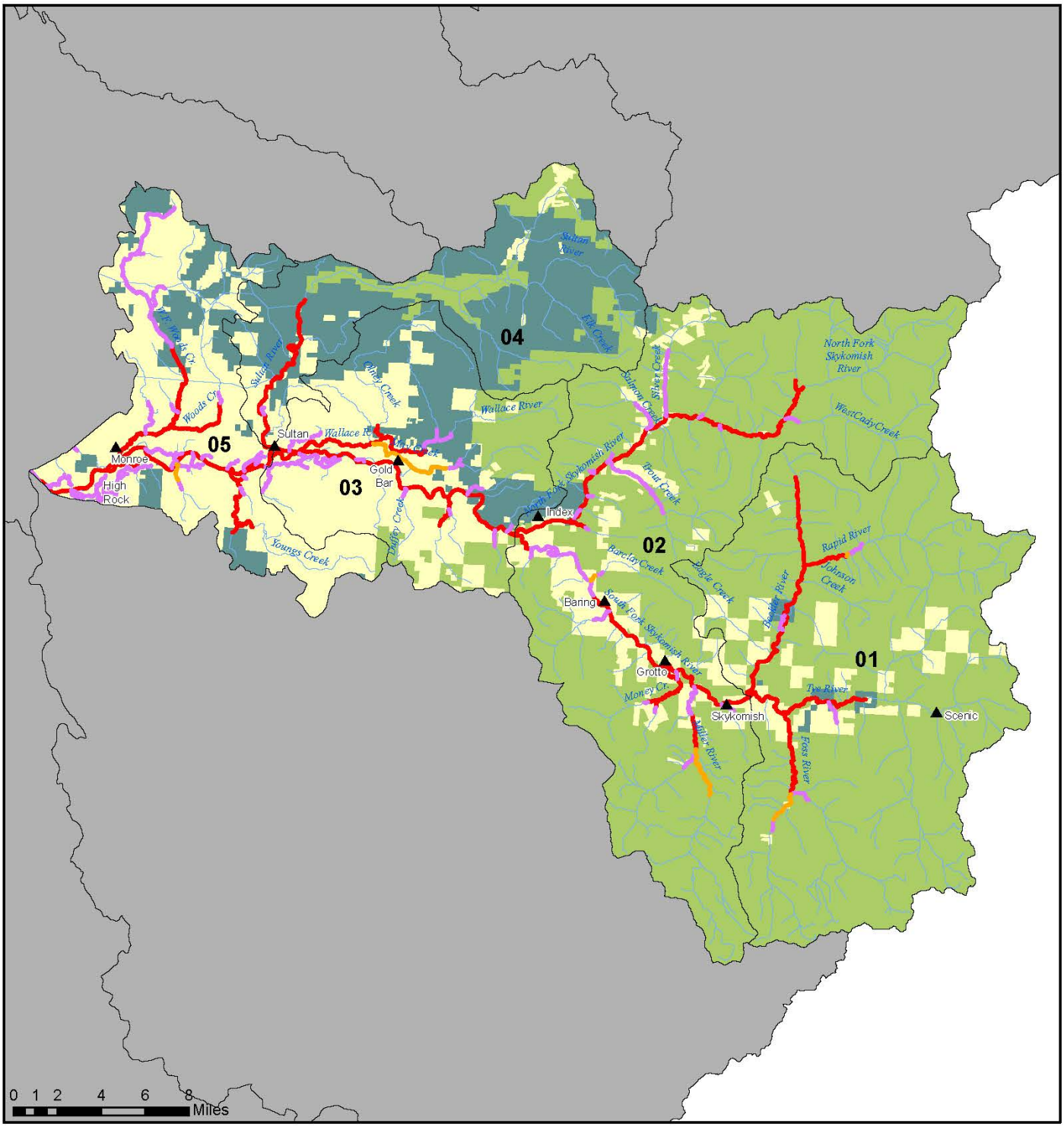


The watershed code is the subbasin number with the two digit watershed code appended to the end (i.e., Subbasin = 1711007, watershed = 171100701)

Note: This map is for general reference only

Legend

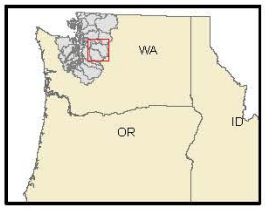
- Cities
- Streams (1:100,000)
- Spawning/Rearing
- Rearing/Migration
- Migration/Presence
- Watersheds
- Private
- Federal
- State/Local
- Tribal



Puget Sound Steelhead Distribution

Skykomish Subbasin 17110009

Map B7

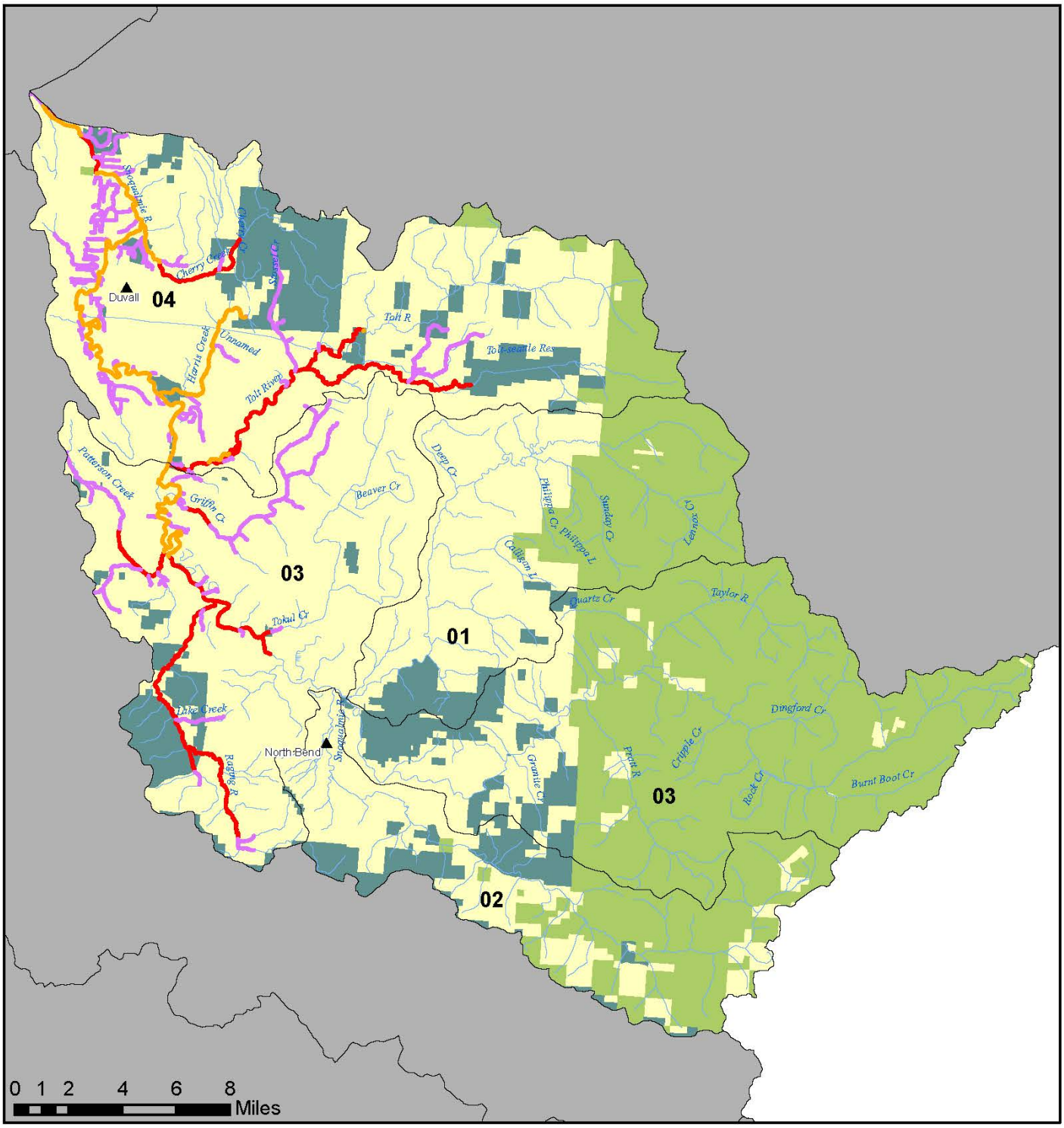


The watershed code is the subbasin number with the two digit watershed code appended to the end (i.e., Subbasin = 1711007, watershed = 171100701)

Note: This map is for general reference only

Legend

- Cities
- Streams (1:100,000)
- Spawning/Rearing
- Rearing/Migration
- Migration/Presence
- Watersheds
- Private
- Federal
- State/Local
- Tribal



Puget Sound Steelhead Distribution

Snoqualmie Subbasin 17110010

Map B8

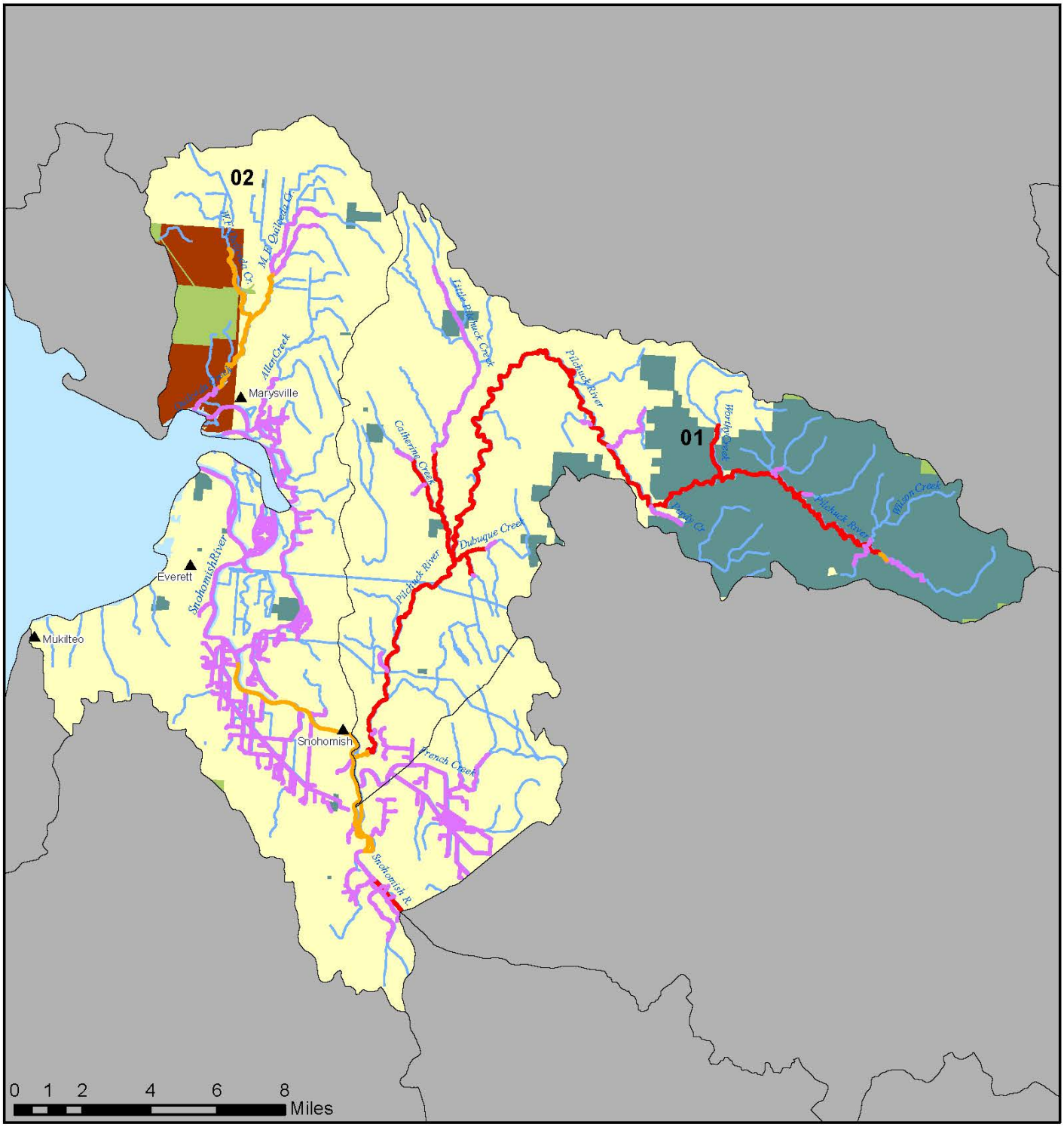
N

The watershed code is the subbasin number with the two digit watershed code appended to the end (i.e., Subbasin = 1711007, watershed = 171100701)

Note: This map is for general reference only

Legend

- Cities
- Streams (1:100,000)
- Spawning/Rearing
- Rearing/Migration
- Migration/Presence
- Watersheds
- Private
- Federal
- State/Local
- Tribal

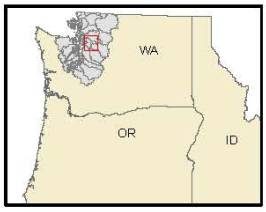


Puget Sound Steelhead Distribution

Snohomish Subbasin 17110011

Map B9

N

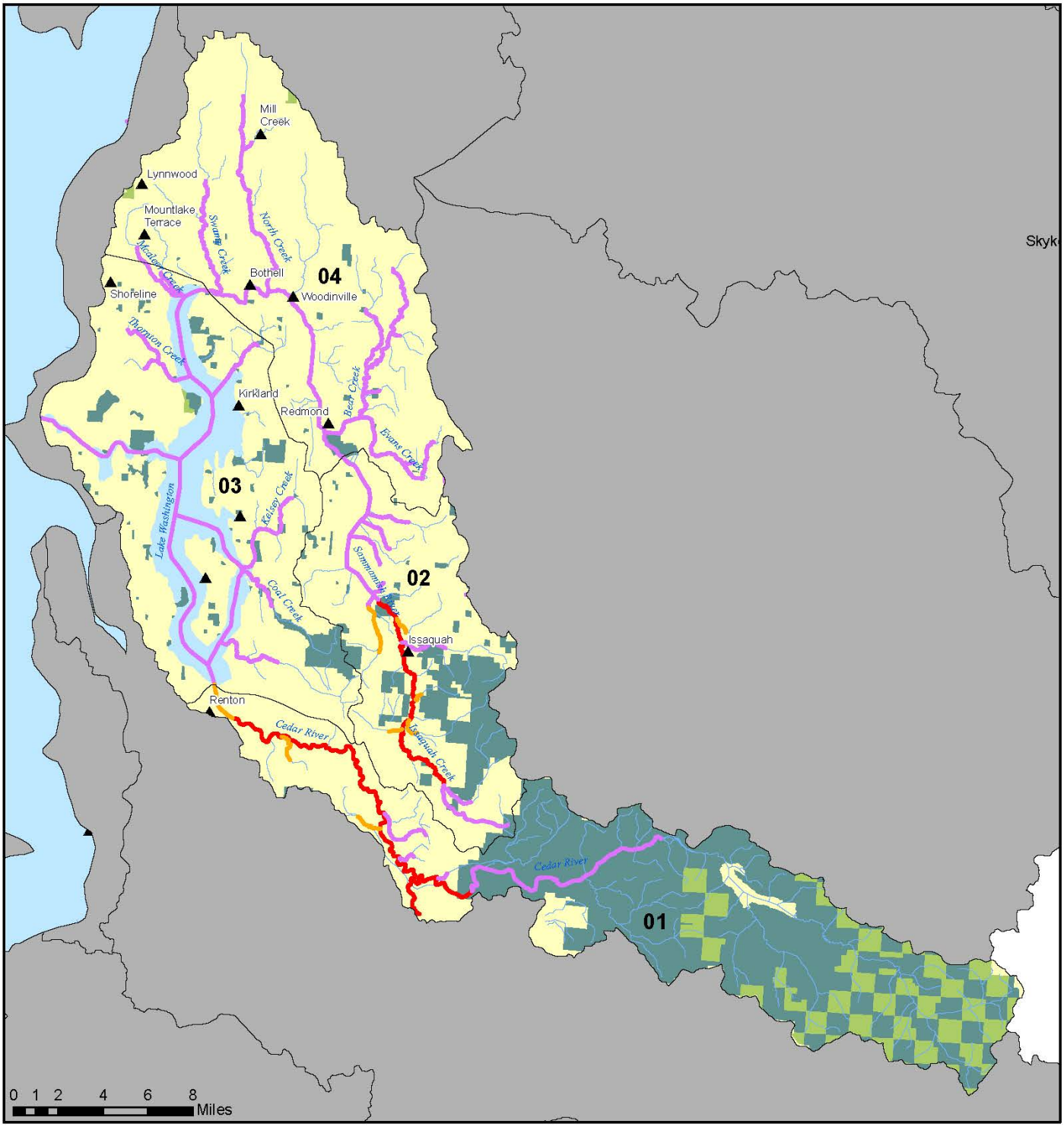


The watershed code is the subbasin number with the two digit watershed code appended to the end (i.e., Subbasin = 1711007, watershed = 171100701)

Note: This map is for general reference only

Legend

- Cities
- Streams (1:100,000)
- Spawning/Rearing
- Rearing/Migration
- Migration/Presence
- Watersheds
- Private
- Federal
- State/Local
- Tribal

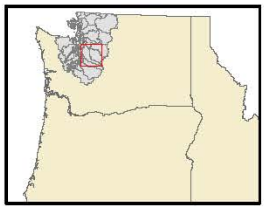


N

Puget Sound Steelhead Distribution

Lake Washington Subbasin 17110012

Map B10

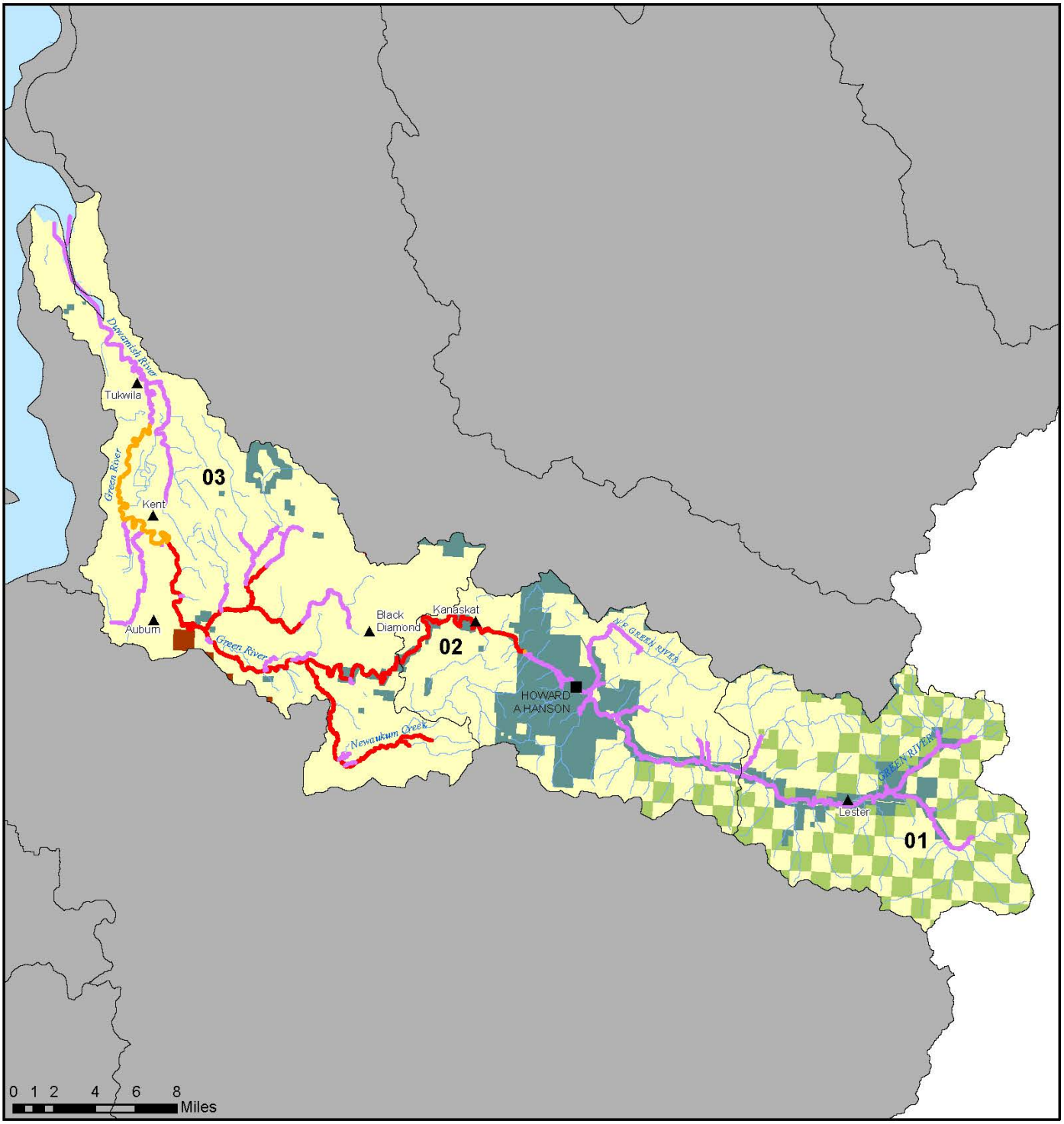


The watershed code is the subbasin number with the two digit watershed code appended to the end (i.e., Subbasin = 1711007, watershed = 171100701)

Note: This map is for general reference only

Legend

- Cities
- Streams (1:100,000)
- Spawning/Rearing
- Rearing/Migration
- Migration/Presence
- Watersheds
- Private
- Federal
- State/Local
- Tribal

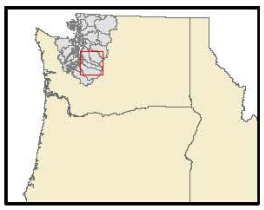


N

Puget Sound Steelhead Distribution

Duwamish Subbasin 17110013

Map B11



The watershed code is the subbasin number with the two digit watershed code appended to the end (i.e., Subbasin = 1711007, watershed = 171100701)

Note: This map is for general reference only

Legend

- Cities
- Dams/Barriers
- Streams (1:100,000)
- Spawning/Rearing
- Rearing/Migration
- Migration/Presence
- Watersheds
- Private
- Federal
- State/Local
- Tribal

N

Puget Sound Steelhead Distribution

Puyallup Subbasin 17110014

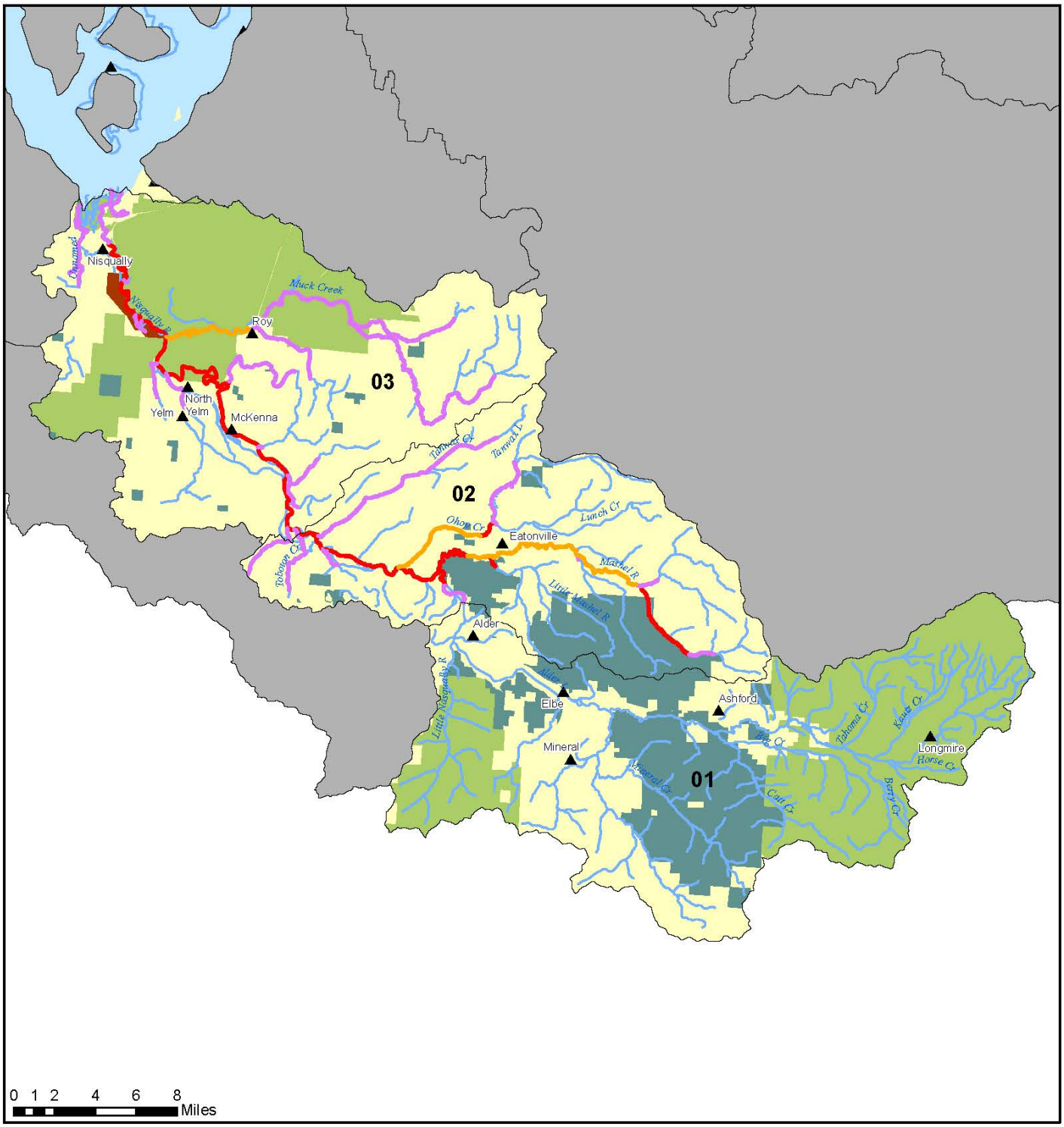
Map B12

The watershed code is the subbasin number with the two digit watershed code appended to the end (i.e., Subbasin = 1711007, watershed = 171100701)

Note: This map is for general reference only

Legend

- Cities
- Streams (1:100,000)
- Spawning/Rearing
- Rearing/Migration
- Migration/Presence
- Watersheds
- Private
- Federal
- State/Local
- Tribal



Puget Sound Steelhead Distribution

Nisqually Subbasin 17110015

Map B13

The watershed code is the subbasin number with the two digit watershed code appended to the end (i.e., Subbasin = 1711007, watershed = 171100701)

Note: This map is for general reference only

Legend

- Cities
- Streams (1:100,000)
- Spawning/Rearing
- Rearing/Migration
- Migration/Presence
- Watersheds
- Private
- Federal
- State/Local
- Tribal

Puget Sound Steelhead Distribution

Deschutes Subbasin 17110016

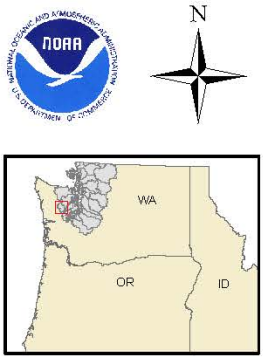
Map B14

The watershed code is the subbasin number with the two digit watershed code appended to the end (i.e., Subbasin = 1711007, watershed = 171100701)

Note: This map is for general reference only

Legend

- Cities
- Streams (1:100,000)
- Spawning/Rearing
- Rearing/Migration
- Migration/Presence
- Watersheds
- Private
- Federal
- State/Local
- Tribal



N

Puget Sound Steelhead Distribution

Skokomish Subbasin 17110017

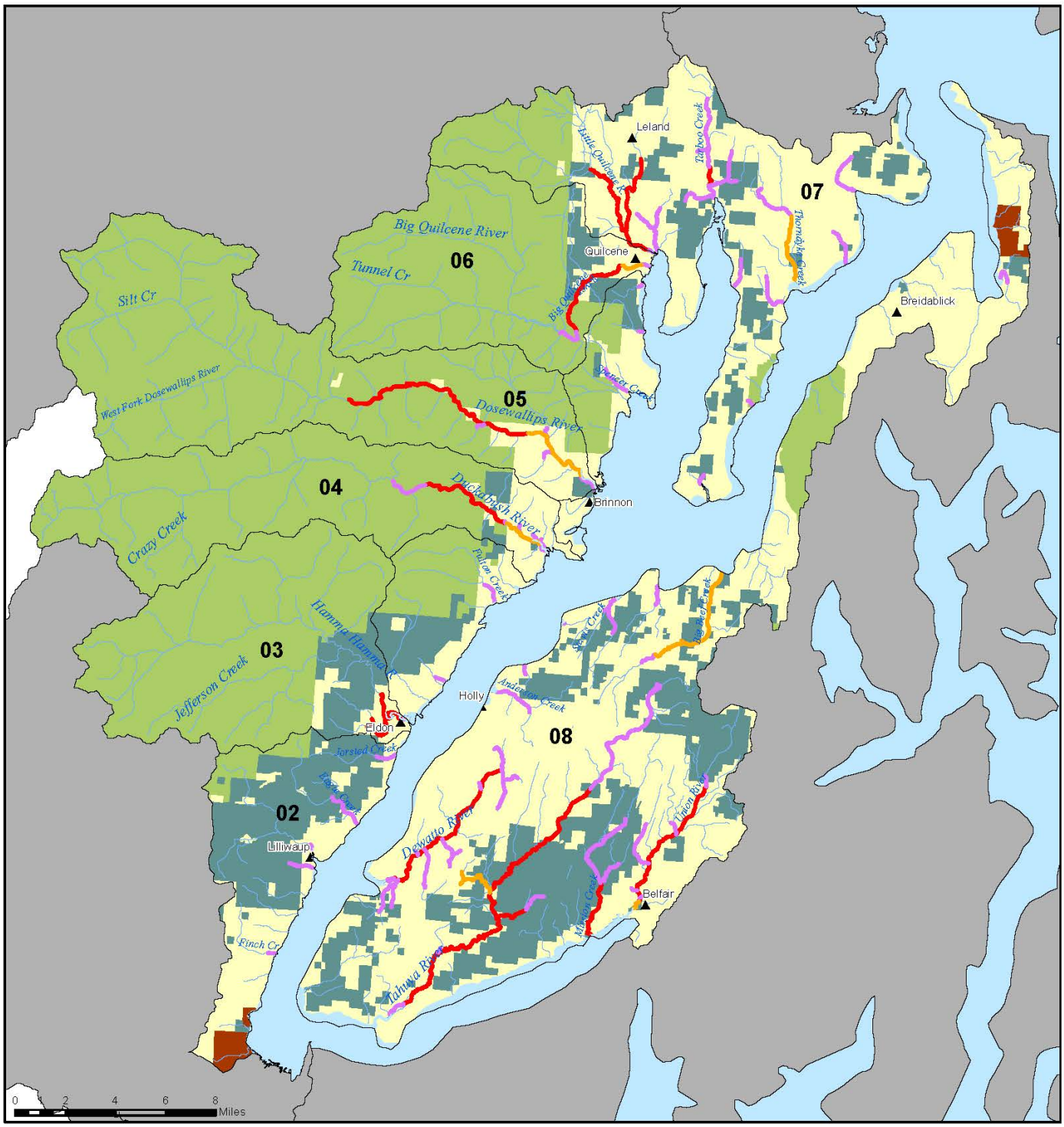
Map B15

The watershed code is the subbasin number with the two digit watershed code appended to the end (i.e., Subbasin = 1711007, watershed = 171100701)

Note: This map is for general reference only

Legend

- Cities
- Streams (1:100,000)
- Spawning/Rearing
- Rearing/Migration
- Migration/Presence
- Watersheds
- Private
- Federal
- State/Local
- Tribal



Puget Sound Steelhead Distribution

Hood Canal Subbasin 17110018

Map B16

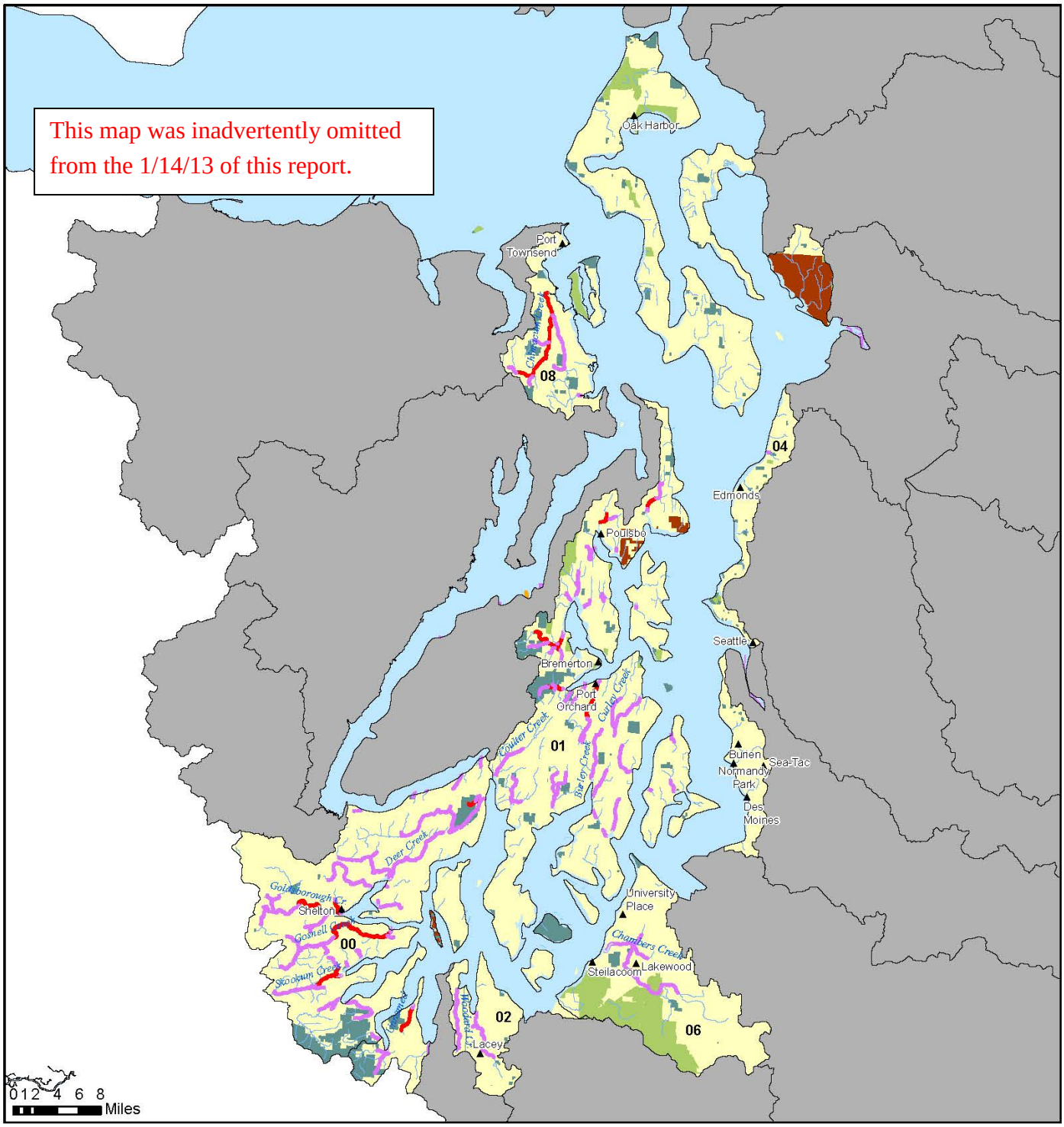
The watershed code is the subbasin number with the two digit watershed code appended to the end (i.e., Subbasin = 1711007, watershed = 171100701)

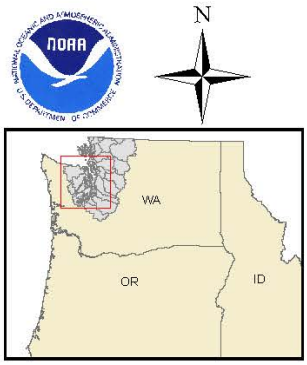
Note: This map is for general reference only

Legend

- Cities
- Streams (1:100,000)
- Spawning/Rearing
- Rearing/Migration
- Migration/Presence
- Watersheds
- Private
- Federal
- State/Local
- Tribal

This map was inadvertently omitted from the 1/14/13 of this report.





N

Puget Sound Steelhead Distribution

Kitsap Subbasin 17110019

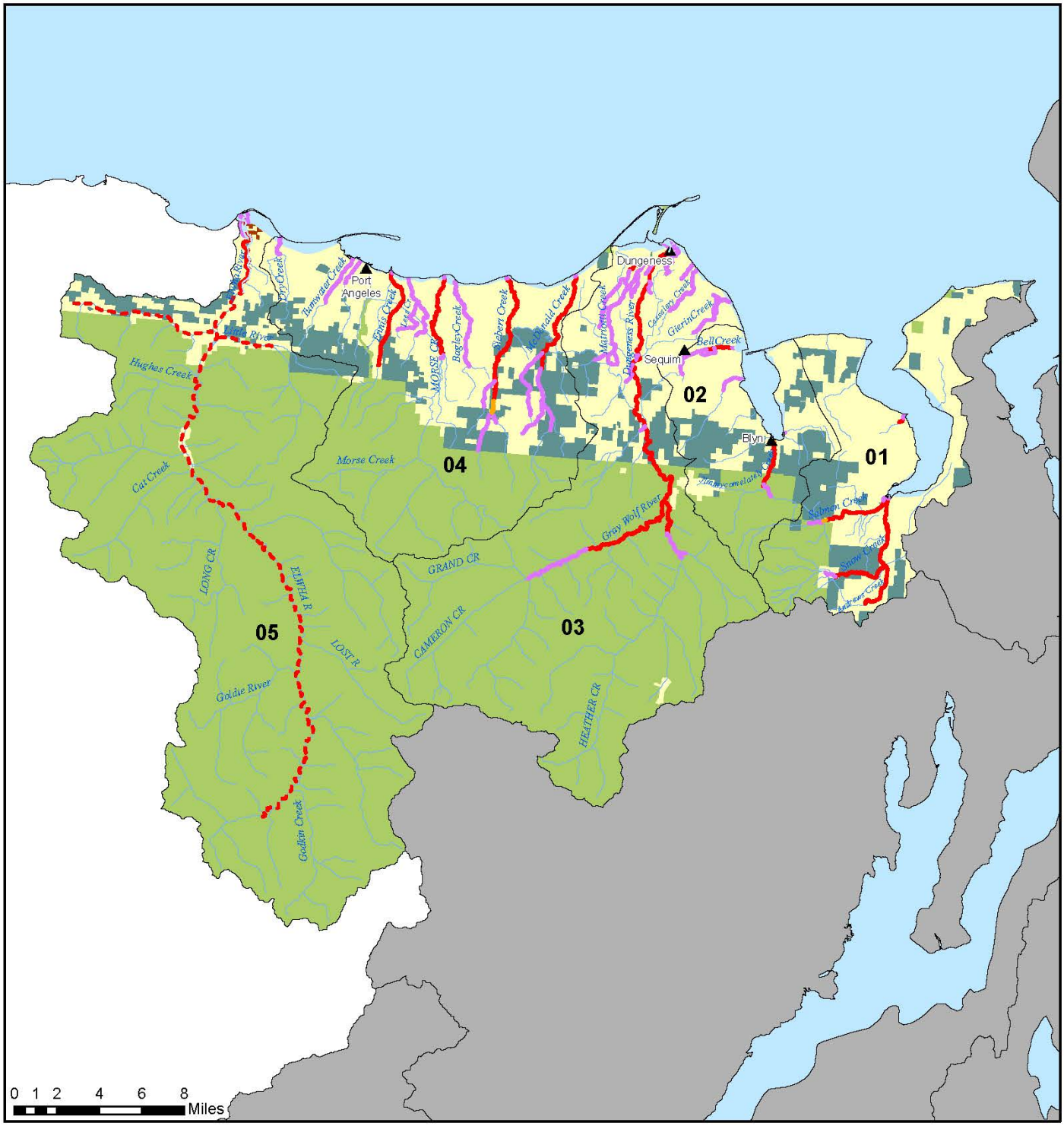
Map B17

The watershed code is the subbasin number with the two digit watershed code appended to the end (i.e., Subbasin = 1711007, watershed = 171100701)

Note: This map is for general reference only

Legend

- Cities
- Streams (1:100,000)
- Spawning/Rearing
- Rearing/Migration
- Migration/Presence
- Watersheds
- Private
- Federal
- State/Local
- Tribal



Puget Sound Steelhead Distribution

Dungeness-Elwha Subbasin 17110020

Map B18

The watershed code is the subbasin number with the two digit watershed code appended to the end (i.e., Subbasin = 1711007, watershed = 171100701)

Note: This map is for general reference only

Legend

- Cities
- Streams (1:100,000)
- Unoccupied, Essential for Conservation
- Spawning/Rearing
- Rearing/Migration
- Migration/Presence
- Watersheds
- Private
- Federal
- State/Local
- Tribal

Appendix C. CHART Conclusions Regarding ESA Section 7 Leverage

Table C1 identifies, for each DPS, those watersheds that met the following "low leverage" profile identified by NMFS habitat biologists:

- less than 25 percent of the land area in federal ownership
- no hydropower dams, and
- no consultations likely to occur on 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 (COE) 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 COE. 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.

The table below includes the CHART's assessment as to whether the watershed was in fact likely to be "low leverage," and the CHART's conclusion as to whether excluding a "low leverage" watershed would significantly impede the conservation of the DPS. These findings were obtained via discussions with each CHART during meetings conducted in the spring/summer of 2011 and were subsequently used in the agency's draft ESA 4(b)(2) analysis (NMFS, 2012b).

References

NMFS, 2012a. Designation of Critical Habitat for Lower Columbia River Coho Salmon and Puget Sound Steelhead: Draft Economic Analysis. NMFS Northwest Region Report. October 2012.

NMFS, 2012b. Designation of Critical Habitat for Lower Columbia River Coho Salmon and Puget Sound Steelhead: Draft 4(b)(2) Report. NMFS Northwest Region Report. October 2012

Table C1. Summary of CHART Conclusions Regarding Possible ESA Section 7 Leverage

DPS	Watershed Name	Watershed Code	Conservation Value Rating		Likely to be Low Leverage?	Comments
			Benefit of designating watershed	Benefit of designating connectivity corridor		
Lower Columbia River Coho Salmon	Beaver Creek/ Columbia River	1708000302	Medium	na	No	CHART determined that consultations were likely to yield significant leverage in this HUC5 due to several recent U.S. Army Corps of Engineers consultations in this watershed.
Lower Columbia River Coho Salmon	Green River	1708000505	High	na	No	CHART determined that consultations were likely to yield significant leverage in this HUC5, noting that despite there being less than 25% Federal lands in the HUC5, Federal lands are located adjacent to a significant number of stream reaches used as spawning habitat.
Lower Columbia River Coho Salmon	South Fork Toutle River	1708000506	High	na	No	CHART determined that consultations were likely to yield significant leverage in this HUC5, noting that despite there being less than 25% Federal lands in the HUC5, Federal lands are located adjacent to a significant number of stream reaches used as spawning habitat.

DPS	Watershed Name	Watershed Code	Conservation Value Rating		Likely to be Low Leverage?	Comments
			Benefit of designating watershed	Benefit of designating connectivity corridor		
Puget Sound Steelhead	Chambers Creek	1711001906	Low	na	No	CHART determined that consultations were likely to yield significant leverage in this HUC5, noting the presence of the Garrison Springs Hatchery dam (non-hydropower) and potential consultations associated with it.

Appendix D. CHART Conclusions Regarding Areas Under Consideration for Exclusion from Critical Habitat

The CHARTs considered whether excluding particular areas from critical habitat designation would significantly impede conservation (see NMFS 2012) of the lower Columbia River coho and Puget Sound steelhead DPSs. The CHARTs considered each areas alone and in combination with other areas eligible for economic exclusion. In considering whether exclusion of areas on economic grounds would significantly impede conservation, the CHARTs also assumed that certain military areas and HCP areas would be excluded for other reasons. In making this determination, the CHARTs considered such factors as the role the particular areas play 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. Table D1 contains the CHART conclusions for each DPS.

The CHARTs also assessed whether the combined exclusions would result in the extinction of either DPS. They concluded that this would not be the case for the following reasons:

- The habitat areas considered for exclusion are not concentrated on specific populations or major population groups. Instead they are well distributed throughout, and representative of, the major population groups for each DPS.
- The few cases where an entire watershed was proposed for exclusion (due to economic impacts) all involved habitat areas that the CHARTs deemed to be of low conservation value.
- Most stream reaches proposed for exclusion are short (amounting to less than 10 miles per watershed) and occur in a checkerboard pattern wherein excluded reaches are interspersed with reaches proposed for designation as critical habitat.
- The proposed HCP and Indian land exclusions involve stream reaches that are already co-managed for salmonid conservation. In addition, the HCP exclusions in particular may provide an incentive to other landowners to seek conservation agreements with NMFS.

References

NMFS. 2012. Designation of Critical Habitat for Lower Columbia River Coho Salmon and Puget Sound Steelhead: Draft 4(b)(2) Report. NMFS Northwest Region Report. October 2012.

Table D1. Summary of CHART Conclusions Regarding Areas Under Consideration for Exclusion from Critical Habitat

DPS	Watershed Name	Watershed Code	Conservation Value Rating		CHART Determination re: Whether Exclusion Would Significantly Impede Conservation
			Benefit of designating watershed	Benefit of designating connectivity corridor	
Lower Columbia River Coho Salmon	Abernethy Creek	1709000704	Low	na	No – Low conservation value reflects low numbers of fish and limited PCEs in this HUC5. Adjacent HUC5s have much greater conservation value to the Clackamas River population of coho salmon.
Puget Sound Steelhead	Lake Sammamish	17110001202	Low	na	No – Low conservation value reflects low numbers of fish and limited PCEs in this HUC5. The nearby Cedar River HUC5 is the most important of the four watersheds supporting the Lake Washington population of steelhead.
Puget Sound Steelhead	Lake Washington	17110001203	Low	Medium (Cedar River HUC5 is upstream)	No – Low conservation value reflects low numbers of fish and limited PCEs in this HUC5. The adjacent Cedar River HUC5 is the most important of the four watersheds supporting the Lake Washington population of steelhead.
Puget Sound Steelhead	Sammamish River	17110001204	Low	na	No – Low conservation value reflects low numbers of fish and limited PCEs in this HUC5. The nearby Cedar River HUC5 is the most important of the four watersheds supporting the Lake Washington population of steelhead.
Puget Sound Steelhead	Puget Sound/ East Passage	17110001904	Low	na	No – Low conservation value reflects low numbers of fish and limited PCEs in this HUC5. Other HUC5s (e.g., Green River and Puyallup River watersheds) have much greater conservation value to steelhead in the Central and South Puget Sound major population group.