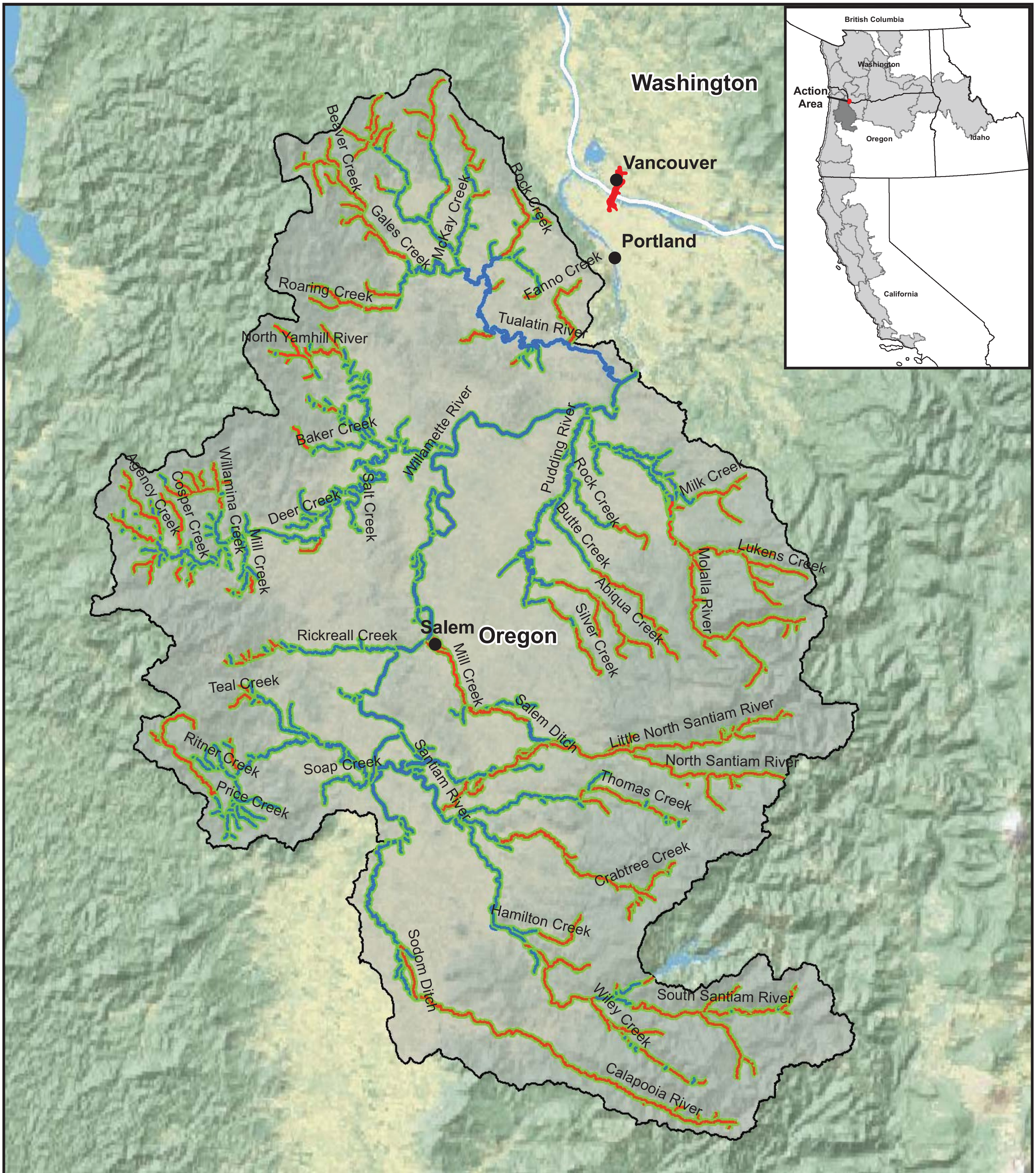

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USE TYPE

- Migration only
- Rearing and migration
- Spawning and rearing

- Steelhead DPS
- Action Area

Figure 4-14. General Distribution Map - Upper Willamette River Steelhead DPS

Map is intended to show distribution of the DPS, and not specific habitat use by life stage within the action area itself.

Columbia River CROSSING

Analysis by J. Koloszar; Analysis Date: Aug., 2009; Plot Date: File Name: ESUDPS_JL194.mxd

Table 4-12. Summary of Status for UWR Steelhead

Population	Legacy[a,d]	Core[b,d]	Abundance Estimate of Natural-Origin Spawners, 1990-2006, as available	Viable Abundance Goal[c,e]	Extinction Risk[f]
Molalla	No	No	350–2,900	1,400	Moderate
North Santiam	Yes	Yes	550–7,400	2,150	Moderate
South Santiam	Yes	Yes	1,000–4,950	2,150	Moderate
Calapooia	No	No	50–1,400	1,000	Moderate
Estimated Total for These Populations			**1,950–16,650**	**6,700**	

a Genetic Legacy designation by the Technical Recovery Team. Genetic legacy populations represent unique life histories or are relatively unchanged by hatchery influences.

b Core population designation by Technical Recovery Team. Core populations were the largest historical populations and were key to metapopulation processes.

c The delisting goals for abundance are the average number of wild spawners expected for a population whose probability of declining below the critical risk threshold during a 100-year period is 5% or less (i.e., low extinction risk) (ODFW 2007b). NOTE: These abundance goals are Draft and may be revised when the newer version of the draft recovery plan is released in early 2010.

d Source: WLCTRT 2003.

e Source: ODFW 2007b.

f Source: McElhany et al. 2007.

4.10.2 Limiting Factors

Limiting factors for UWR steelhead include habitat loss and degradation, tributary hydropower development, hatchery effects, fishery management and harvest decisions, and predation. Detroit and Big Cliff Dams have blocked access to spawning and rearing habitat in the North Santiam River. There are no winter-run steelhead hatchery programs in the upper Willamette basin; however, the potential exists for genetic introgression with the non-native summer-run steelhead hatchery program. Habitat has been particularly degraded in the lower reaches of tributaries to the Willamette, for example, by the reduction of channel complexity associated with the removal of large wood to improve navigability (NMFS 2009b). Based on recent analyses of the population criteria, the species risk of extinction is moderate, with the highest risk category being genetic diversity (McElhany et al. 2007).

4.10.3 Designated Critical Habitat

Critical habitat was designated for UWR Steelhead on September 2, 2005 (70 FR 52630). The designation includes a rearing and migration corridor, connecting the DPS with the Pacific Ocean. The corridor extends from the mouth of the Columbia to the Willamette River at its confluence with the Clackamas River. Only a small portion of the critical habitat unit occurs within the action area, near Kelley Point at the confluence of the Willamette with the Columbia River. PCEs present in the action area include freshwater migration and estuarine areas.

4.11 SR SOCKEYE SALMON

4.11.1 Status and Biological Context

This ESU includes all anadromous and residual sockeye salmon from the Snake River basin, Idaho, as well as artificially propagated sockeye from the Redfish Lake captive propagation program (70 FR 37160) (see Figure 4-15).

Within the action area, adult SR sockeye are present in the Columbia River and North Portland Harbor during upstream migration in June and July. Sockeye juveniles rear in freshwater lakes for 1 to 3 years prior to migrating to the ocean, and primarily use the lower Columbia River as a migration corridor (Burgner 1991 and Gustafson et al. 1997, as cited in Carter et al. 2009). Juvenile outmigration occurs from April to mid-September (CRC 2009); the limited information available indicates that sockeye outmigration through the action area peaks in May (Carter et al. 2009). There is some evidence that juvenile migration typically occurs between sunset and sunrise (Burgner 1991 and Gustafson et al. 1997, as cited in Carter et al. 2009). SR sockeye of both life stages likely spend some time holding and resting in the action area. SR sockeye are likely to be present in the Columbia River and North Portland Harbor during the time that in-water work will take place.

The extent to which SR sockeye use the Columbia Slough is unknown. Use is assumed to be similar to that previously described for Chinook ESUs and steelhead DPSs. SR sockeye may also use the Willamette River en route to seasonally wet areas of the Slough. SR sockeye do not use Burnt Bridge Creek.

Historic returns for SR sockeye were estimated to be between 25,000 and 35,000 returning adults. Returns for this ESU were limited to 16 sockeye during the 1990s. Between 1991 and 1998, all 16 of the natural origin adult sockeye salmon that returned to the weir at Redfish Lake were incorporated into the captive broodstock program. The program has used multiple rearing sites to minimize chances of catastrophic loss of broodstock and has produced several hundred thousand eggs and juveniles, as well as several hundred adults, for release into the wild. Between 1999 and 2007, more than 355 adults returned from the ocean from captive broodstock releases—almost 20 times the number of wild fish that returned in the 1990s (see Table 4-13). The program has been successful in its goals of preserving important lineages of Redfish Lake sockeye salmon for genetic variability and in preventing extinction in the near-term. In 2008, Lower Granite Dam sockeye counts were 902 fish; the second-highest count was 299 sockeye in 2000. Most of the returning fish are the product of large juvenile releases from the captive broodstock program. This ESU has a very high risk of extinction (NMFS 2008e).

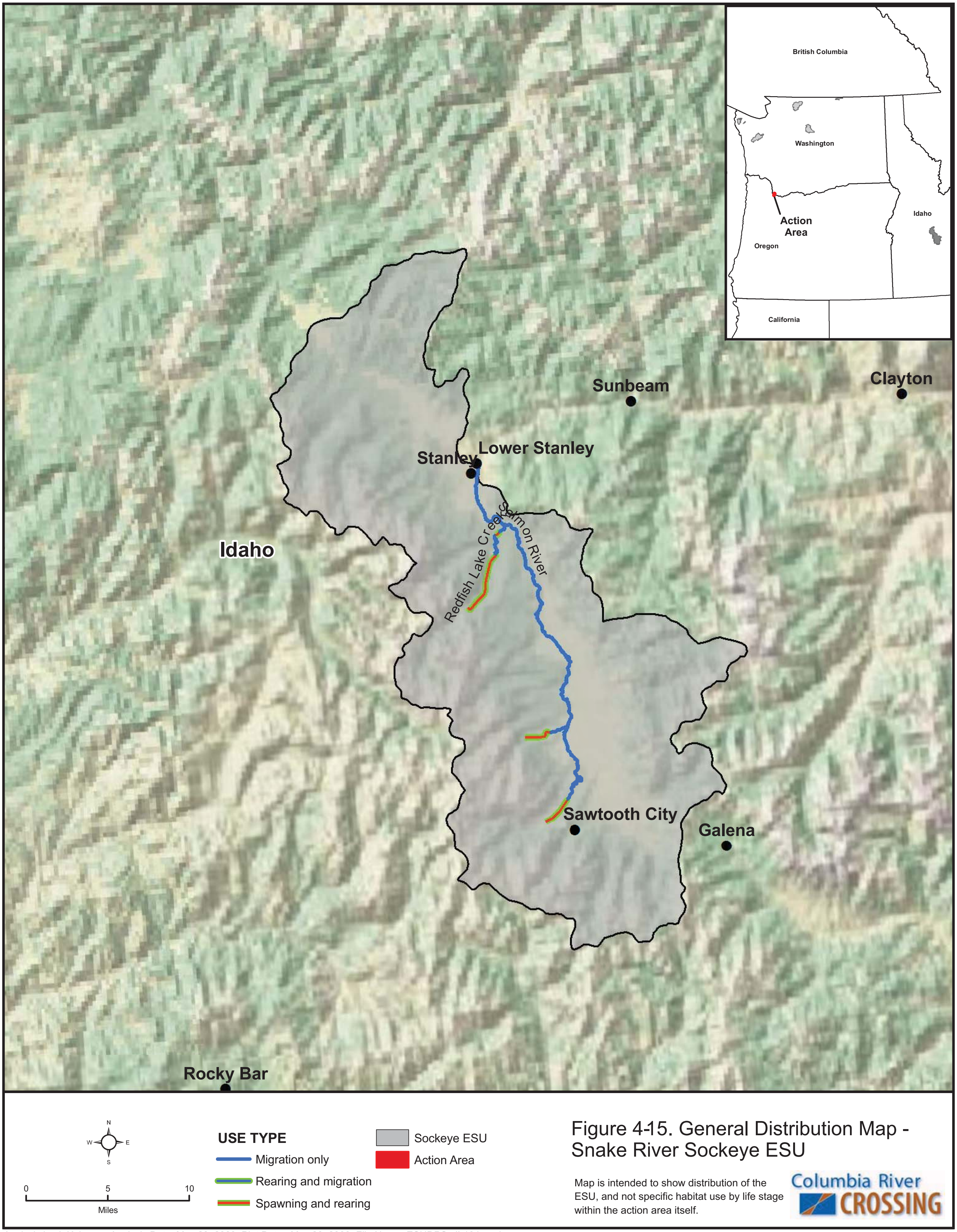


Figure 4-15. General Distribution Map - Snake River Sockeye ESU

Map is intended to show distribution of the ESU, and not specific habitat use by life stage within the action area itself.

Columbia River CROSSING

Analysis by J. Koloszar; Analysis Date: May 20, 2009; Plot Date: May 20, 2009; File Name: ESUDPS_JL194.mxd

Table 4-13. Summary of Status for SR Sockeye

Population	Abundance Estimate of Natural-Origin Spawners, 1999-2007	Viable Abundance Goal	Extinction Risk
Stanley Basin[a] (Redfish Lake)	355	2,000	Very High

Source: NMFS 2008e, NMFS 2006b.

a This ESU is characterized as a single population. No other extant populations or spawning groups have been identified.

4.11.2 Limiting Factors

At the time of listing in 1991, SR sockeye had declined to the point that there was no longer a self-sustaining, naturally spawning anadromous population. This has been the largest factor limiting the recovery of this ESU, important in terms of both risks due to catastrophic loss and potentially to genetic diversity. It is not yet clear whether the existing population retains sufficient genetic diversity to successfully adapt to variable conditions that occur within its natural habitat. However, genetic data indicate that the captive broodstock has levels of haplotype diversity similar to other sockeye populations in the Pacific Northwest, and that the program has been able to maintain rare alleles in the population over time. The broodstock program reduces the risk of domestication by using a spread-the-risk strategy, outplanting pre-spawning adults and fertilized eyed eggs as well as juveniles raised in the hatchery. The progeny of adults that spawn in the lakes and juveniles that hatch successfully from the eyed eggs are likely to have adapted to the lake environment rather than become “domesticated” to hatchery rearing conditions (NMFS 2008e).

4.11.3 Designated Critical Habitat

Critical habitat was designated for SR sockeye on December 12, 1993 (58 FR 68543), and is present in the action area in the Columbia River and North Portland Harbor. The designation includes the Columbia River rearing/migration corridor, which connects the ESU with the ocean and intersects the action area (Columbia River and North Portland Harbor).

The following PCEs occur within the action area: juvenile migration corridors and adult migration corridors. Essential features of the juvenile migration corridors include substrate, water quality, water quantity, water velocity, cover/shelter, food, riparian vegetation, space, and safe passage conditions.

The Columbia River migration corridor is considered to have a high conservation value. This corridor is used by rearing and migrating juveniles and migrating adults. The Columbia River estuary is an essential area for juveniles and adults making the physiological transition between life in freshwater and marine habitats (NMFS 2005a). The PCEs are generally limited by passage barriers (especially during periods of high summer temperatures) in the mainstem lower Snake and Salmon Rivers, passage mortality at the mainstem dams, and high sediment loads in the upper reaches of the mainstem Salmon River (NMFS 2008e).

4.12 LOWER COLUMBIA RIVER COHO

4.12.1 Status and Biological Context

The ESU includes all naturally spawned populations of coho salmon 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. This ESU also includes naturally spawned populations of coho in the Willamette River up to Willamette Falls, Oregon (70 FR 37160; June 28, 2005). The ESU includes 3 major population groups and 24 historical populations (see Figure 4-16). There are 25 artificial propagation programs for coho in this ESU.

LCR coho use the Columbia River within the action area for migration, holding, and rearing. Upstream migrating adults are present in the action area from approximately mid-August to mid-February (NMFS 2005a; CRC 2009). Rearing habitat is limited in the action area, but is present in off-channel areas downstream of the existing I-5 bridge (e.g., accessible areas of small tributaries, backwater areas, and other low-velocity refugia). Spawning habitat is not documented within the action area in the Columbia River. However, coho spawn upstream of the action area in the lower Columbia River near Ives Island and Hamilton Creek, at RM 143 (RKm 230), 3 miles downstream from Bonneville Dam (FPC 2008). Spawning occurs approximately from December to February (ODFW and WDFW 2008a). Rearing juveniles of this ESU are present in the action area year-round (Carter et al. 2009; CRC 2009). Outmigrating juveniles are present in the action area from mid-February to mid-September (CRC 2009), with peak juvenile outmigration occurring between April and June (Carter et al. 2009). Given that coho could be present in the action area year round, they will likely be present during in-water work.

Coho are known to use the Columbia Slough up to NE 18th Avenue, including the action area. Coho use the Columbia Slough for rearing and migration, as spawning habitat is absent from the Slough (COP 2009a). Coho are likely to be present in the Slough from fall through spring. As discussed previously, water temperatures during the summer (approximately June through September) often exceed tolerance thresholds for juvenile salmonids.

There is the potential for juvenile LCR coho presence in Burnt Bridge Creek at any time of year. The water temperature during the summer months is often above the range tolerated by coho (Sandercock 1991; Ecology 2008), and, as discussed in Section 4.1.1, numerous barriers limit access to the action area (WDFW 2007a). Nevertheless, coho spawning is documented within Burnt Bridge Creek. Spawning surveys conducted in November and December 2002 documented four coho redds in Burnt Bridge Creek, three redds between I-205 and the mouth of Burnt Bridge Creek, and one redd between the headwaters and the mouth of Burnt Bridge Creek (PSMFC 2003). One adult coho was observed during the spawning survey. This study did not specify exact locations of documented redds; therefore, it cannot be stated where they were located relative to the action area for this project. However, presence of these redds indicate that coho have access to, and successfully spawn in, portions of the creek adjacent to, if not within, the action area. Upstream of the action area, WDFW also documented two coho redds in Burnt Bridge Creek in November and December 2002, one between St. Johns Boulevard and NE 41st Circle and one between St. Johns Boulevard and Fourth Plain Boulevard (WDFW unpublished data).

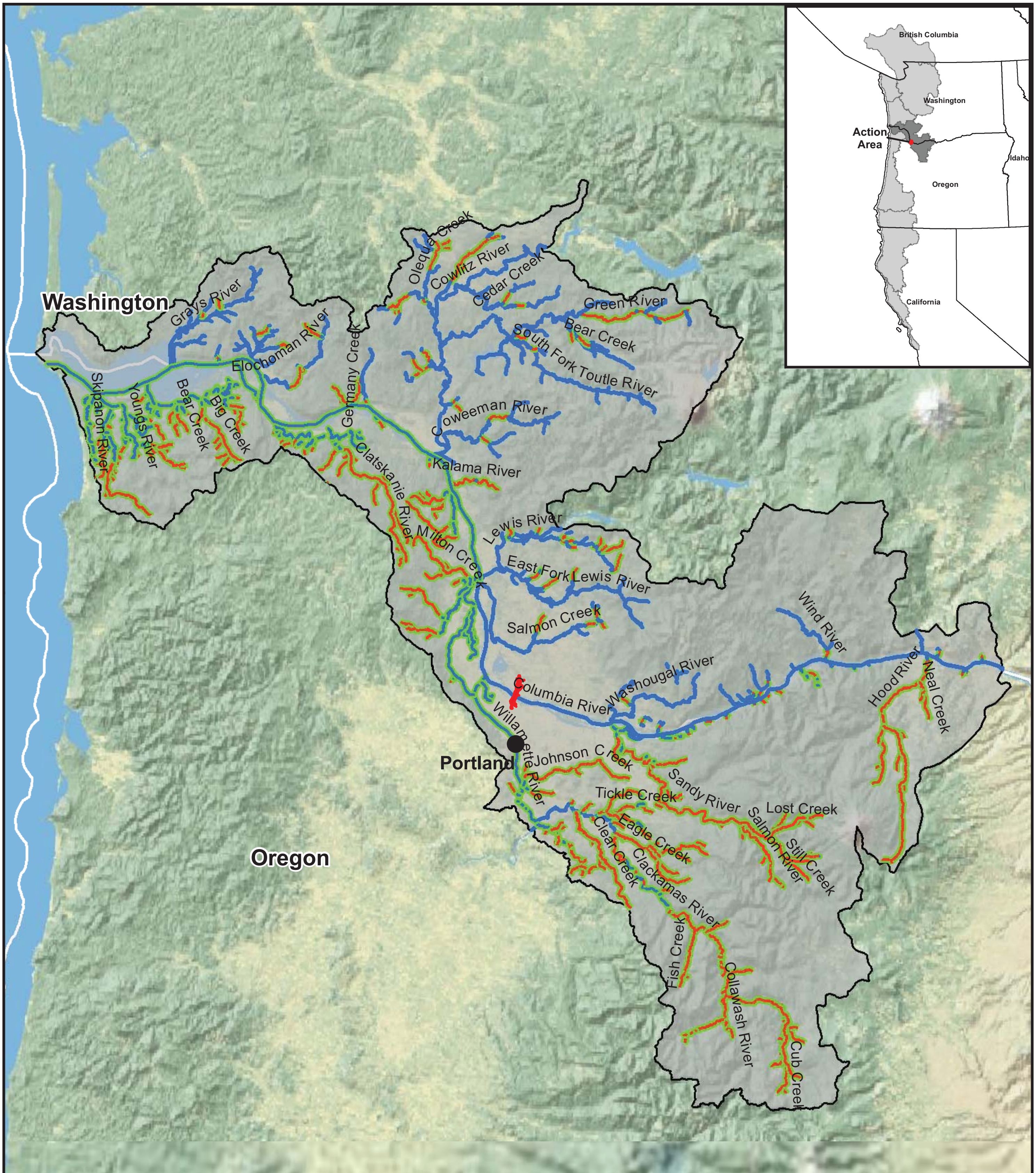


Figure 4-16. General Distribution Map - Lower Columbia River Coho ESU

Map is intended to show distribution of the ESU, and not specific habitat use by life stage within the action area itself.

Columbia River CROSSING

Analysis by J. Koloszar; Analysis Date: May 20, 2009; Plot Date: May 20, 2009; File Name: ESUDPS_JL194.mxd

Wild coho in the lower Columbia River have been in decline for the last 75 years. Returns of wild coho have fallen from historical highs of 600,000 or more fish (Chapman 1986) to as low as 400 fish in 1996 (Chilcote 1999). The abundance and distribution of wild coho has been significantly reduced throughout the basin, and all coho populations upstream of Hood River were extirpated nearly 50 years ago (McElhany et al. 2007). Coho production is likely reproductively dependent on the spawning of stray hatchery fish, with the exception of wild coho in the Clackamas and Sandy Rivers, where there has been an increase in the abundance of wild coho since 2002. Other wild coho populations showing a limited increase in abundance are those in the Scappoose and Clatskanie basins, although these populations were largely absent from those basins during a 10-year period in the 1990s.

Data on the status of natural-origin LCR coho are very limited. Most populations have low or very low numbers, and most natural runs largely have been replaced by hatchery production (NMFS 2008e). Several subpopulations migrate through the action area, but population-specific abundance estimates are available for only five populations, and trend estimates are available for only the Clackamas and Sandy populations (see Table 4-14). These two systems represent the only subbasins with appreciable numbers of wild coho remaining, and therefore are not representative of other LCR coho salmon populations (LCFRB 2004). The status of Washington populations is still under assessment; however, there is no evidence that self-sustaining populations of wild coho survived the poor marine survival period of the 1990s. This ESU has a high risk of extinction (McElhany et al. 2007) (see Figure 4-17).

Table 4-14. Summary of Status for LCR Coho in the CRC Project Area (Subpopulations Occurring Within or Above the Action Area Only)

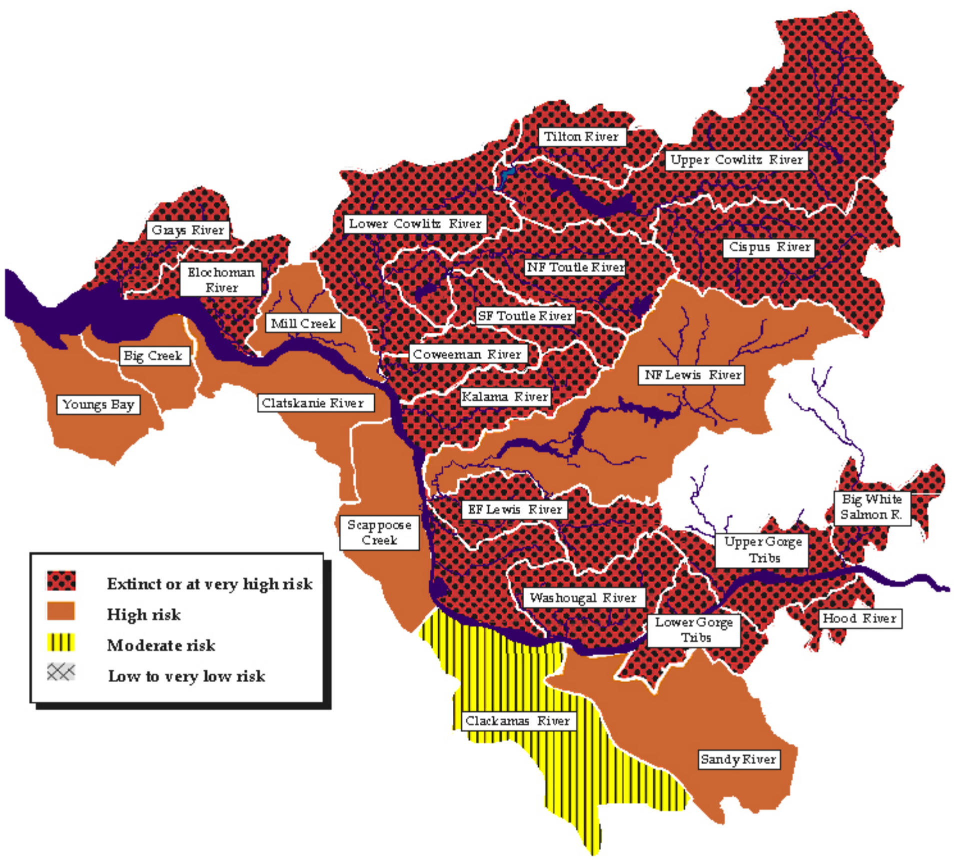
Subpopulation	Legacy[a,c]	Core[b,c]	Abundance Estimate of Natural-Origin Spawners		Viable Abundance Goal[c]	Current Viability[c]	Extinction Risk[d]
			McElhany et al. 2007	NMFS 2008e			
Cascade							
Clackamas	Yes	No	1693	482	1,200	Moderate	Moderate
Sandy	Yes	No	647	482	1,200	Low	High
Washougal	Yes	No	Insufficient Data		4,200	Very Low	Very High
Gorge							
Lower Gorge and Big White Salmon	No	No	Insufficient Data		2,400	Very Low	Very High
Upper Gorge and Hood River	No	No	Insufficient Data	1,317	2,300	Very Low	Very High
Estimated Total for These Populations			**2,340**	**2,281**	**11,300**		

a Genetic Legacy designation by the Technical Recovery Team. Genetic legacy populations represent unique life histories or are relatively unchanged by hatchery influences.

b Core population designation by Technical Recovery Team. Core populations were the largest historical populations and were key to metapopulation processes.

c Source: LCFRB 2004.

d Source: McElhany et al. 2007.



SOURCE: Lower Columbia River Fish Recovery Board 2004.
Lower Columbia Salmon Recovery and Fish & Wildlife Subbasin Plan

Figure 4-17.
Extinction Risk - Lower Columbia River Coho ESU

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Columbia River CROSSING

4.12.2 Limiting Factors

Limiting factors for LCR coho include habitat degradation (including tributary hydropower development), hatchery effects, fishery management and harvest decisions, and predation. Populations above Bonneville Dam are affected by upstream and downstream passage and, for Oregon populations, by inundation of some historical habitat by the Bonneville Pool. For populations originating in tributaries below Bonneville, migration and habitat conditions in the mainstem and estuary have been affected by hydropower flow operations. Tributary habitat degradation is pervasive due to development and other land uses, and Federal Energy Regulatory Commission (FERC)-licensed hydroelectric projects have blocked some spawning areas. Coho populations in the lower Columbia River have been heavily influenced by extensive hatchery releases. While those releases represent a threat to the genetic, ecological, and behavioral diversity of the ESU, some of the hatchery stocks at present also protect a significant portion of the ESU's remaining genetic resources (NMFS 2008e).

4.12.3 Designated Critical Habitat

Critical habitat has not been designated for LCR coho, but this issue is currently under review by NMFS.

4.13 COLUMBIA RIVER CHUM

4.13.1 Status and Biological Context

This ESU includes all naturally spawned populations of chum salmon in the Columbia River and its tributaries in Washington and Oregon (70 FR 37160; June 28, 2005) (see Figure 4-18). There are 16 historical populations in 3 major population groups in Oregon and Washington between the mouth of the Columbia River and the Cascade crest. There are three artificial propagation programs for chum in this ESU.

Columbia River (CR) chum in Washington occur primarily in Grays River, in areas immediately below Bonneville Dam, and in a more limited distribution just upstream of the I-205 bridge near Vancouver (McElhany 2005). All of the historical populations in Oregon are considered extirpated or nearly so. CR chum use the Columbia River within the action area for migration, holding, rearing, and spawning. Upstream migrating adults are present in the action area from approximately mid-October through mid-January (NMFS 2005a; ODFW and WDFW 2008a; CRC 2009).

Spawning occurs between approximately early November and mid-January (ODFW and WDFW 2008a). Historically, chum primarily spawned in the Columbia River mainstem and lower tributary reaches, exhibiting a preference for microhabitats with hyporheic flow (Rawding personal communication, as cited in McElhany et al. 2007). The vast majority of 2002 chum spawning occurred in the Grays River (downstream of the action area) and Lower Gorge tributaries (upstream of the action area), and in the mainstem Columbia between the I-205 Bridge and Bonneville Dam. Notable spawning also occurred in the Washougal River basin. Currently, the majority of spawning occurs on the Washington side of the Columbia. The only documented spawning locations in Oregon are occurrences of redds in the mainstem Columbia near McCord Creek and Multnomah Falls (McElhany 2005).

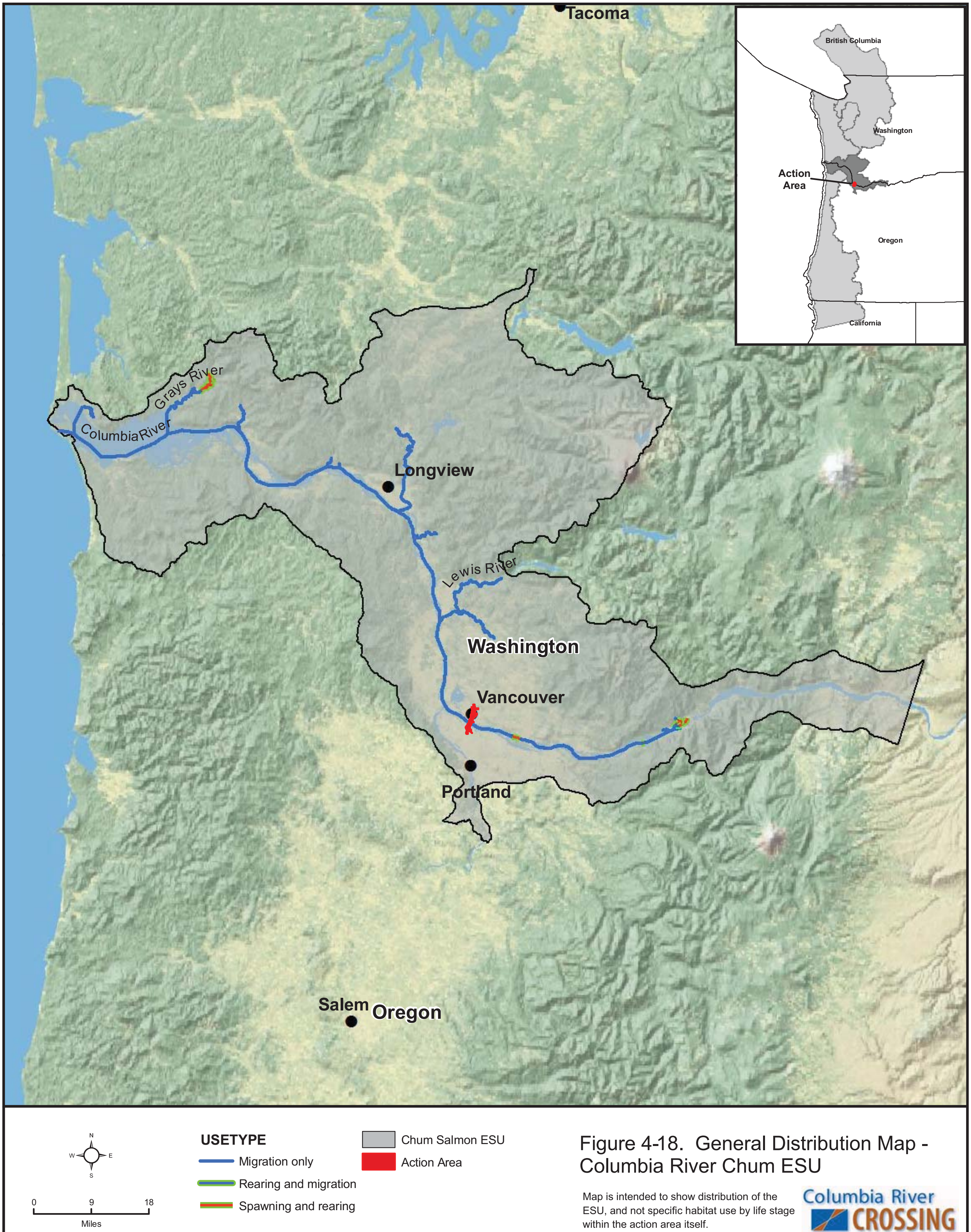


Figure 4-18. General Distribution Map - Columbia River Chum ESU

Map is intended to show distribution of the ESU, and not specific habitat use by life stage within the action area itself.

Columbia River CROSSING

Analysis by J. Koloszar; Analysis Date: Aug., 2009; Plot Date: File Name: ESUDPS_JL194.mxd

Surveys of chum spawning areas conducted in 2006 in the Pierce and Ives Islands Complex below Bonneville indicated that juvenile chum emergence began on February 13, peaked on April 5, and ended on April 27 (Tomaro et al. 2007).

Within the action area, chum spawn in the mainstem Columbia River at approximately 7 RM (11 RKm), upstream of the I-5 bridge near the I-205 bridge at RM 113 (RKm 182) (FPC 2008).

Chum fry spend very little time in fresh water, and begin their migration soon after emerging (Tomaro et al. 2007); emergence typically occurs at night (Salo 1991). What rearing is done in the lower Columbia River occurs from December through mid-March in off-channel areas (e.g., accessible areas of small tributaries, backwater areas, and other low-velocity refugia). Such rearing habitat is present to very limited extent in the action area at the western end of Government Island, in North Portland Harbor, and in small backwater areas along the mainstem channel. Outmigrating fry are present from February through May (NMFS 2005a; CRC 2009), peaking from mid-April through mid-May (Carter et al. 2009).

CR chum are likely to be present in the Columbia River and North Portland Harbor during the time that in-water work will take place. Chum do not use Burnt Bridge Creek, and the extent to which chum use the Columbia Slough is unknown. However, the potential presence of adult and juvenile chum cannot be wholly discounted because: (1) there are no physical barriers to the Slough; and (2) other upriver ESUs have been documented using the area. In the absence of definitive data to indicate otherwise, potential presence of migrating adults, and rearing and migrating juveniles, is assumed for the Columbia Slough.

Historical returns of CR chum are estimated to be over a million fish in some years (McElhany 2005). In recent years, returns have been limited to a few hundred to a few thousand, returning mainly to the Washington side of the Columbia River (McElhany 2005). Significant spawning now occurs for only two of the 16 historical populations, indicating that 88 percent of the historical populations are extirpated or nearly so (NMFS 2008e).

Several subpopulations of chum use the action area (see Table 4-15). Estimates of abundance and trends for naturally spawning populations occurring within the action area are available only for the Lower Gorge populations; geometric mean for the years 1996–2000 is 425m (NMFS 2008e). Abundances for these populations were low, but trends were relatively stable in the 1990s. They subsequently increased for several years before declining in 2005 (Keller 2006, as cited in NMFS 2008e). The risk of extinction is high or very high for all populations. All four of the populations on the Oregon side of the river are extirpated or nearly so, and those that remain are at very high risk of extinction (McElhany et al. 2007) (see Figure 4-19).

Table 4-15. Summary of Status for CR Chum in the CRC Project Area (Subpopulations Occurring Within or Above the Action Area Only)

Subpopulation	Legacy[a,c]	Core[b,c]	Abundance Estimate of Natural-Origin Spawners		Viable Abundance Goal[d]	Current Viability[d]	Extinction Risk[d,e]
			LCFRB 2004	NMFS 2008e			
Cascade							
Clackamas	No	Yes	<150	Insufficient data	1,100	Very low	Very high
Sandy	No	No	<150	Insufficient data	1,100	Very low	Very high
Washougal	No	No	<150	Insufficient data	1,100	Low	High
Gorge							
Upper Gorge	No	No	<100	Insufficient data	1,100	Very low	Very high
Lower Gorge	Yes	Yes	542	425	2,600	Medium	Moderate
Estimated Total for These Populations			**1,092**	**425**	**7,000**		

a Genetic Legacy designation by the Technical Recovery Team. Genetic legacy populations represent unique life histories or are relatively unchanged by hatchery influences.

b Core population designation by Technical Recovery Team. Core populations were the largest historical populations and were key to metapopulation processes.

c Source: WLCTRT 2003

d Source: LCFRB 2004

e Source: McElhany et al. 2007

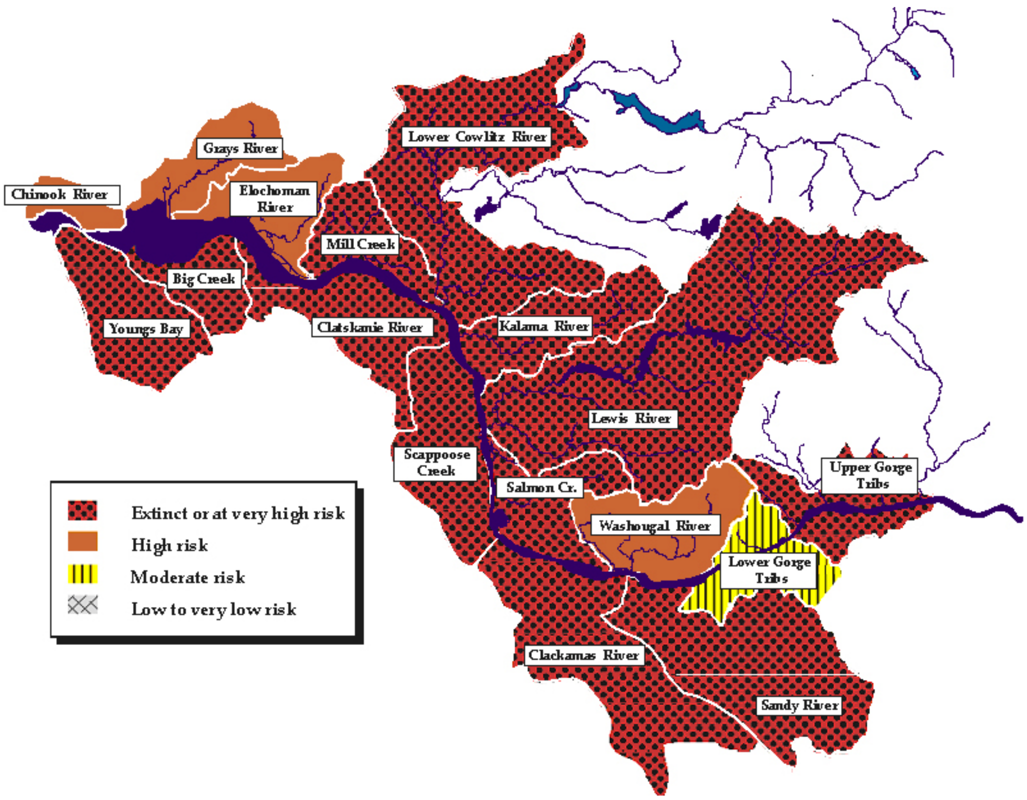
4.13.2 Limiting Factors

Limiting factors for CR chum include mainstem and tributary hydropower development (e.g., loss of historical spawning habitat; availability of spawning habitat for the mainstem population; adult and juvenile access to/from Hardy and Hamilton Creeks), migration and habitat conditions in the lower Columbia River and the estuary, and degradation of tributary habitat.

4.13.3 Designated Critical Habitat

Critical habitat was designated for CR chum on September 2, 2005 (70 FR 52630), and is present in the action area in the Columbia River and North Portland Harbor.

PCEs present in the action area include freshwater spawning, freshwater migration, freshwater rearing, and estuarine areas. In the lower Columbia River and its tributaries, major factors affecting PCEs are altered channel morphology and stability, lost and/or degraded floodplain connectivity, loss of habitat diversity, excessive sediment, degraded water quality, increased stream temperatures, reduced stream flow, and reduced access to spawning and rearing areas (NMFS 2008e).



SOURCE: Lower Columbia River Fish Recovery Board 2004.
Lower Columbia Salmon Recovery and Fish & Wildlife Subbasin Plan

Figure 4-19.
Extinction Risk - Columbia River Chum ESU

Columbia River CROSSING

4.14 TRANSIT TIME AND BEHAVIOR OF LISTED SALMON, STEELHEAD, AND EULACHON IN THE LOWER COLUMBIA RIVER

4.14.1 Transit Timing

Migration rates of anadromous salmonid juveniles through the lower Columbia River are variable and are influenced by river flow, species, and run type (e.g., stream or ocean type); distance from the ocean; time of year; time of day; and fish size (see Table 4-17). Most anadromous salmonid juveniles migrate quickly through the lower Columbia River, and juvenile passage rates there tend to be faster during high flows and faster later in their respective migration seasons. Larger juveniles generally move more rapidly than their smaller cohorts (Carter et al. 2009).

Studies on juvenile Chinook survival in the lower Columbia River and estuary indicate that travel time for subyearling and yearling Chinook from Bonneville Dam to the estuary is approximately 4.1 days, meaning that the fish average approximately 32-36 miles per day (McComas et al. 2008). Data collected beginning in 2007 indicate that yearling and subyearling Chinook and steelhead travel more slowly in the final 30 miles of the Columbia River than in the previous 120 miles, then substantially increase their travel rates as they exit the river and enter the Pacific Ocean, usually on an ebb tide (Carter et al. 2009).

Juvenile travel times and migration rates can be estimated from PIT-tagged juveniles detected at Bonneville Dam and downstream at the annual trawl surveys in the Columbia River estuary (FPAC 2009). Table 4-16 presents average travel time (duration) and rates from Bonneville Dam to the CRC project area along with instantaneous velocity (m/s). Average velocity ranged from 0.39 to 1.15 m/s for LCR spring-run Chinook and SR sockeye, respectively.

Table 4-16. Travel Time and Migration Rates for Select Populations of Chinook, Sockeye, and Steelhead Juveniles

Species	ESU/DPS and Population	Mean Travel Time (days)[a]	Mean Migration Rate (distance/day)	Mean Migration Rate (m/s)[a]	Period of Record
Chinook	LCR Spring-Run (Hatchery)	4.1 (1.92– 4.52)	20.9 mi 33.7 km	0.39 (0.28–0.51)	1999–2008
	SR Spring/ Summer-Run	0.58 (0.35-0.82)	56.9 mi 91.6 km	1.06 (0.85–1.19)	1999–2008
	SR Fall-Run	0.75 (0.67-0.86)	50.4 mi 81.2 km	0.94 (0.81–1.03)	1999–2008
Sockeye	SR	0.67	61.7 mi 99.4 km	1.15 (1.41–0.63)	1999–2008
Steelhead	LCR Summer-Run	0.77 (0.56-0.96)	50.4 mi 81.2 km	0.94 (0.81–1.03)	1999–2008
	LCR Winter-Run	1.37 (0.63-2.57)	47.8 mi 76.9 km	0.89 (0.60–1.13)	2005–2008
	MCR Summer-Run	0.66 (0.56–0.88)	57.4 mi 92.5 km	1.07 (0.79–1.25)	1999–2008

Species	ESU/DPS and Population	Mean Travel Time (days)[a]	Mean Migration Rate (distance/day)	Mean Migration Rate (m/s)[a]	Period of Record
	UCR Summer-Run	0.64 (0.54–0.80)	59.0 mi 95.0 km	1.10 (0.87–1.29)	1999–2008
	SR Summer-Run	0.85 (0.6–2.60)	58.0 mi 93.3 km	1.08 (0.88–1.19)	1999–2008

Source: FPAC 2009.

Note: Statistics are based on PIT tag detections at Bonneville Dam and in the Columbia River estuary.

a Data range.

Coho juveniles are thought to migrate through the action area (Columbia River and North Portland Harbor) at rates varying from approximately 2 to 15 miles per day (Dawley et al. 1986, as cited in Carter et al. 2009). Coho move passively downstream in strong currents and hold in low-velocity habitats; therefore, their movement is influenced by river flow (Bottom et al. 2005, as cited in Carter et al. 2009).

Transit times of eulachon are not well studied. It is expected that larval eulachon have poor swimming ability and travel at the rate of the current (LCFRB 2004), which has been conservatively estimated to be 0.6 m/s under general conditions (CRC 2008). Observations suggest that transit times vary widely and are dependent on river flow, water temperature, tides, and other environmental conditions (Carter et al. 2009). Large groups of adult eulachon have been observed holding low in the estuary for extended periods before promptly migrating to the Cowlitz River in 2 days (Langness 2009 personal communication).

Table 4-17. Transit Times of Chinook, Steelhead, and Coho Juveniles in the Lower Columbia River

Species	River Miles	Mean Travel Time (days)	Migration Rate (m/d)	Migration Rate (km/day)	Migration Rate (m/s)	Reference
Chinook	Bonneville 138–5	4.1	32.46	54.1	0.6	McComas et al. 2008
Steelhead	140–45	1.91–2.78	34.2–49.8	57–83	0.7–1.0	Ledgerwood et al. 2004
Coho	140–45	5.99–45.23	2.1–15.84	3.5–26.4	0.0–0.3	Dawley et al. 1986

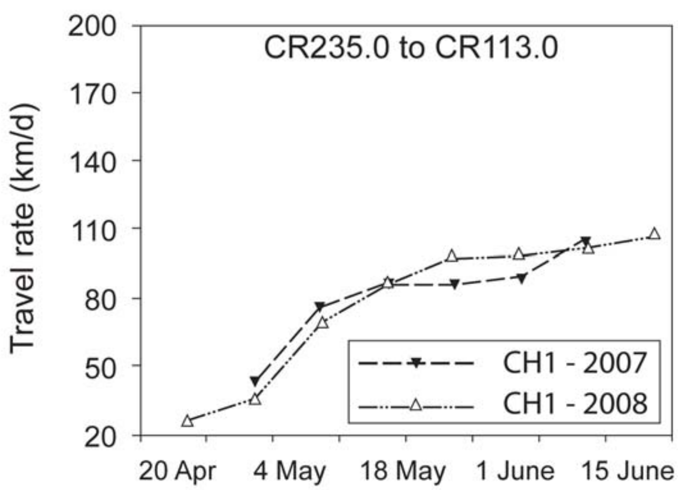
In a 4-year study of acoustic-tagged juveniles migrating in the Columbia River estuary, Carter et al. (2009) observed that juveniles travel faster in the upper reaches of the estuary than in the lower (see Table 4-18). Yearling Chinook traveled at a rate of approximately 50 miles (80 km)/day from Bonneville Dam to Vancouver, Washington, and then slowed to a rate of approximately 37 miles (60 km) per day from Vancouver to just before the mouth of the Columbia River (RM 5.2/RKm 8.4). Other juveniles exhibited a similar pattern. Extrapolating from these results, and assuming comparable flows, water temperatures, season timing, and other environmental variables, we estimate that steelhead and Chinook juveniles may travel at an average rate of 0.5 to 1.1 m/s through the action area (see Table 4-18). The data are inconclusive regarding diel travel patterns and the number of hours per day that fish travel. Therefore, this estimate assumes 24-hour per day travel and does not attempt to calculate differential migration rates by time of day.

Table 4-18. Migration Rates for Chinook and Steelhead Juveniles Traveling Downstream of Bonneville Dam

		Bonneville Dam to Vancouver			Vancouver to RM 5.2/RKm 8.4		
Species	Year	Mean (km/d)	Median (km/d)	Mean Migration Rate (m/s)	Mean (km/d)	Median (km/d)	Mean Migration Rate (m/s)
Subyearling Chinook	2007	64.3	65.3	0.7	40.8	42.0	0.5
Yearling Chinook	2007	76.1	82.1	0.9	57.6	60.5	0.7
Yearling Chinook	2008	79.9	82.1	0.9	60.7	63.6	0.7
Steelhead	2008	97.0	97.9	1.1	76.8	76.6	0.9

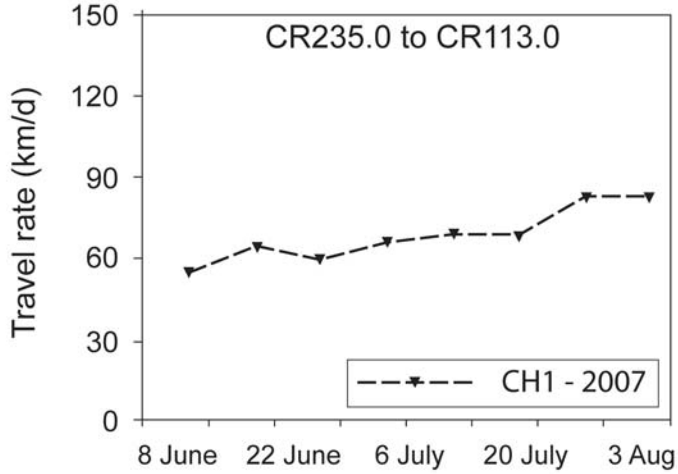
Source: Carter et al. 2009.

Carter et al. (2009) also found that outmigrating yearling Chinook, subyearling Chinook, and steelhead consistently traveled more quickly in the late spring than in the early spring (see Figure 4-20 to Figure 4-22). For example, in April 2008, yearling Chinook traveled between Bonneville Dam (RM 146/RKm 235) and Cottonwood Island (RM 70.2/RKm 113) at an average rate of approximately 20 km/day. By mid-June of the same year, yearling Chinook traveled the same distance at a rate of approximately 100 km/day.



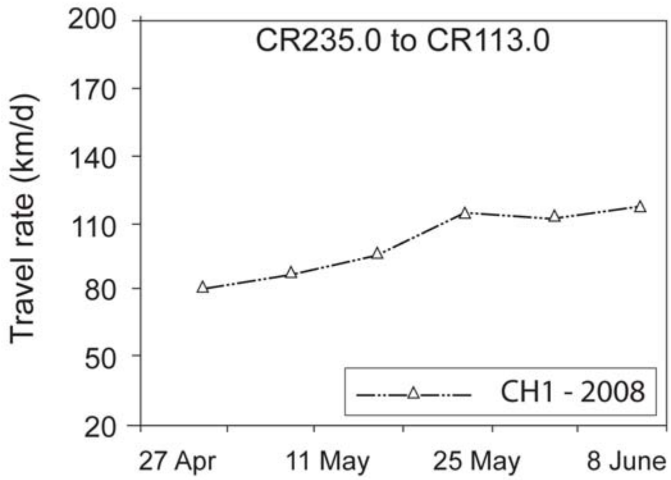
Source: Carter et al. 2009.

Figure 4-20. Weekly Median Travel Rates for Yearling Chinook Between Bonneville Dam and Cottonwood Island, 2007–2008



Source: Carter et al. 2009.

Figure 4-21. Weekly Median Travel Rates for Subyearling Chinook Between Bonneville Dam and Cottonwood Island, 2007



Source: Carter et al. 2009.

Figure 4-22: Weekly Median Travel Rates for Steelhead Between Bonneville Dam and Cottonwood Island, 2008

Extrapolating from these data, we estimate that yearling Chinook may travel through the action area at an average rate of 0.5 to 1.16 m/s, subyearling Chinook at a rate of 0.64 to 0.98 m/s, and steelhead at a rate of 0.93 to 1.30 m/s (see Table 4-19 to Table 4-21). As with other travel rate estimates, a 24-hour-travel day is assumed.

Table 4-19. Weekly Median Travel Rates for Yearling Chinook Between Bonneville Dam and Cottonwood Island, 2007–2008

Year	Day	Km/day	Feet/s	m/s
2007	2-May	45	1.71	0.52
	9-May	78	2.96	0.90
	16-May	80	3.04	0.93
	23-May	79	3.00	0.91
	30-May	80	3.04	0.93
	6-Jun	100	3.80	1.16
2008	25-Apr	25	0.95	0.29
	2-May	40	1.52	0.46
	9-May	70	2.66	0.81
	16-May	80	3.04	0.93
	23-May	85	3.23	0.98
	30-May	85	3.23	0.98
	6-Jun	97	3.68	1.12
	13-Jun	100	3.80	1.16

Source: Carter et al. 2009.

Table 4-20. Weekly Median Travel Rates for Subyearling Chinook Between Bonneville Dam and Cottonwood Island, 2007

Date	Km/day	Feet/s	m/s
13-Jun	55	2.09	0.64
20-Jun	62	2.35	0.72
27-Jun	60	2.28	0.69
4-Jun	63	2.39	0.73
11-Jun	64	2.43	0.74
18-Jul	63	2.39	0.73
25-Jul	85	3.23	0.98
1-Aug	85	3.23	0.98
13-Jun	55	2.09	0.64

Source: Carter et al. 2009.

Table 4-21. Weekly Median Travel Rates for Juvenile Steelhead Between Bonneville Dam and Cottonwood Island, 2008

Date	Km/day	Feet/s	m/s
2-May	80	3.04	0.93
9-May	85	3.23	0.98
16-May	90	3.42	1.04
23-May	112	4.25	1.30
30-May	110	4.18	1.27
6-Jun	112	4.25	1.30
2-May	80	3.04	0.93
9-May	85	3.23	0.98
16-May	90	3.42	1.04

Source: Carter et al. 2009.

In summary, migration rates for juvenile salmonids are reasonably well understood. However, rates vary between species and populations and also by time of year. While it would be inappropriate to calculate an overall average juvenile velocity across species and studies, it can be observed from the preceding data that a general tendency for downstream migrant salmonids may be in the range of 0.8–0.9 m/s.

4.14.1.1 Adult Migration

From 2003 to 2009, Columbia Basin Research counted PIT-tagged adult salmon and steelhead on return migrations at selected dams in the Columbia Basin, posting yearly results through interactive, online Data Analysis in Real Time (DART) reports (CBR 2009). Their counts include an estimate of mean travel time between dams. The dams nearest the project area at which CRB made counts are between Bonneville Dam (RM 146/ RKm 235) and McNary Dam (RM 293/RKm 471), a distance of 236 km. These dams do not occur in the action area, but, nevertheless, these data represent the best estimates available for adult transit time in the lower Columbia. Table 4-22 shows DART report estimates of mean travel time for migratory salmonids from Bonneville Dam to McNary Dam. Extrapolating from their data, we estimate transit time in meters per second and assume 24-hour-per-day travel. Because currents are stronger in the action area than they are between Bonneville and McNary Dams (CRC 2008; CEG 2008), it is reasonable to expect adult salmon and steelhead transit rates to be slower than in the action area.

Table 4-22. Historical Mean Travel Time Estimates for Adult Salmon and Steelhead from Bonneville Dam to McNary Dam

	2002	2003	2004	2005	2006	2007	2008	2009	Mean Rate (m/s)
SR Sockeye									
Mean travel time (days)	***	4.96	***	***	4.47	4.42	5.05	5.98	
Rate (m/s)	***	0.55	***	***	0.61	0.62	0.54	0.46	0.56
UCR Spring/Summer-Run Chinook									
Mean travel time (days)	8.11	8.68	6.54	6.91	7.88	8.49	7.91	6.47	
Rate (m/s)	0.34	0.31	0.42	0.40	0.35	0.32	0.35	0.42	0.36
UCR Spring-Run Chinook									
Mean travel time (days)	9.25	***	5.34	6.26	6.73	5.78	6.93	6.32	
Rate (m/s)	0.30	***	0.51	0.44	0.41	0.47	0.39	0.43	0.42
SR Fall-Run Chinook									
Mean travel time (days)	5.34	6.17	8.49	5.48	6.46	6.06	6.87	6.84	
Rate (m/s)	0.51	0.44	0.32	0.50	0.42	0.45	0.40	0.40	0.43
SR Steelhead									
Mean travel time (days)	27.83	37.29	31.47	28.65	38.25	34.48	31.66	14.49	
Rate (m/s)	0.10	0.07	0.09	0.10	0.07	0.08	0.09	0.19	0.10

	2002	2003	2004	2005	2006	2007	2008	2009	Mean Rate (m/s)
MCR Steelhead									
Mean travel time (days)	47.04	54.09	54.20	38.71	54.94	38.68	45.80	17.31	
Rate (m/s)	0.06	0.05	0.05	0.07	0.05	0.07	0.06	0.16	0.07
UCR Steelhead									
Mean travel time (days)	15.87	30.09	19.41	17.54	***	***	15.17	13.47	
Rate (m/s)	0.17	0.09	0.14	0.16	***	***	0.18	0.20	0.16

Source: CBR 2009.

4.14.2 Habitat Use and Behavior

In general, larger (yearling) juvenile salmonids occur in the deeper, offshore channel areas of the lower Columbia River. Numerous studies have documented smaller fish (subyearling Chinook) utilizing nearshore habitats (Johnsen and Sims 1973; Dawley et al. 1986; McCabe et al. 1986; Ledgerwood et al. 1991, as cited in Carter et al. 2009), frequently at depths of 3 meters or less (Carlson et al. 2001, as cited in Carter et al. 2009). Data indicate that most active outmigration occurs in or near the navigation channel, although off-channel migration routes are also utilized (Carter et al. 2009).

There are limited data regarding the depths at which the different types of juvenile salmonids travel through the lower Columbia River and the estuary. Sampling efforts between RM 47 (RKm 76) and the mouth of the river suggested that 95 percent of juvenile fall-run Chinook were within 3 meters of the surface (Dawley et al. 1986, as cited in Carter et al. 2009).

There are studies indicating that juvenile Chinook less than 50–60 mm in length typically occupy shallow water (<1 meter), fish 60–100 mm in length occupy slightly deeper habitats (shoals, channels), and fish greater than 100 mm in length occupy both deep and shallow water habitats (Carlson et al. 2001; Bottom et al. 2005, as cited in Carter et al. 2009). Most coho salmon juveniles are found near shore in the mid-morning to late afternoon, and are found in mid-river areas at dawn and dusk (Pearson et al. 2005, as cited in Carter et al. 2009). Data indicate that juvenile chum less than 50–60 mm in length typically occupy shallow water (e.g., <1 meter), fish 60–100 mm in length occupy slightly deeper habitats (shoals, channels), and fish greater than 100 mm in length occupy both deep and shallow water habitats (Carlson et al. 2001; Bottom et al. 2005, as cited in Carter et al. 2009).

Another study found that juvenile salmonids were significantly higher in the water column during the day than during the evening and night; the same study found that most juvenile salmonids close to shore were detected within 2 meters of the bottom during both day and night (Carlson et al. 2001, as cited in Carter et al. 2009). Laboratory and field studies have shown that juvenile salmonids prefer to occupy surface waters, but will move up or down in the water column in response to changes in conditions, including temperature and oxygen levels (Birtwell and Kruzynksi 1989, as cited in Carter et al. 2009). NMFS states that salmonid use of the water column greater than 20 feet deep is rare (NMFS 2002).

Juvenile salmonids tend to move through the lower Columbia River throughout the day, with more movement during daylight hours (Dawley et al. 1986; Ledgerwood et al. 1991; Carlson et al. 2001, as cited in Carter et al. 2009; McComas et al. 2008). Yearling and subyearling Chinook are most likely to be moving between sunrise and early afternoon (Ledgerwood et al. 1991). Nearshore and mid-river catches of coho indicated a fairly uniform migration throughout the day (Ledgerwood et al. 1991, as cited in Carter et al. 2009). Using beach and purse seines, most coho were captured during the day between 0600 and 2000 hours (Dawley et al. 1986, as cited in Carter et al. 2009). One study showed steelhead moving mainly between noon and early evening (Ledgerwood et al. 1991).

Habitat preferences of eulachon within the Columbia River are not well understood. With the exception of preferred spawning habitat (which is typically coarse sand or pea-sized gravel substrate), observational data suggest that migrating eulachon exhibit little preference for habitat type, and may utilize deep, shallow, brightly lit, and/or shaded portions of the river. Out-migrants may occur anywhere along the river's transect, and at all depths (Langness 2009 personal communication). Larval eulachon have been found in some studies at greater densities at the bottom of the water column, compared to mid-level or near the surface, and may occur in greater densities outside the navigation channel than within the channel (Howell et al. 2001). However, because they are relatively weak swimmers, larval eulachon distribution and use of the water column is thought to be determined by local hydraulic conditions rather than by depth at a particular site (Langness 2009 personal communication; Howell et al. 2001).

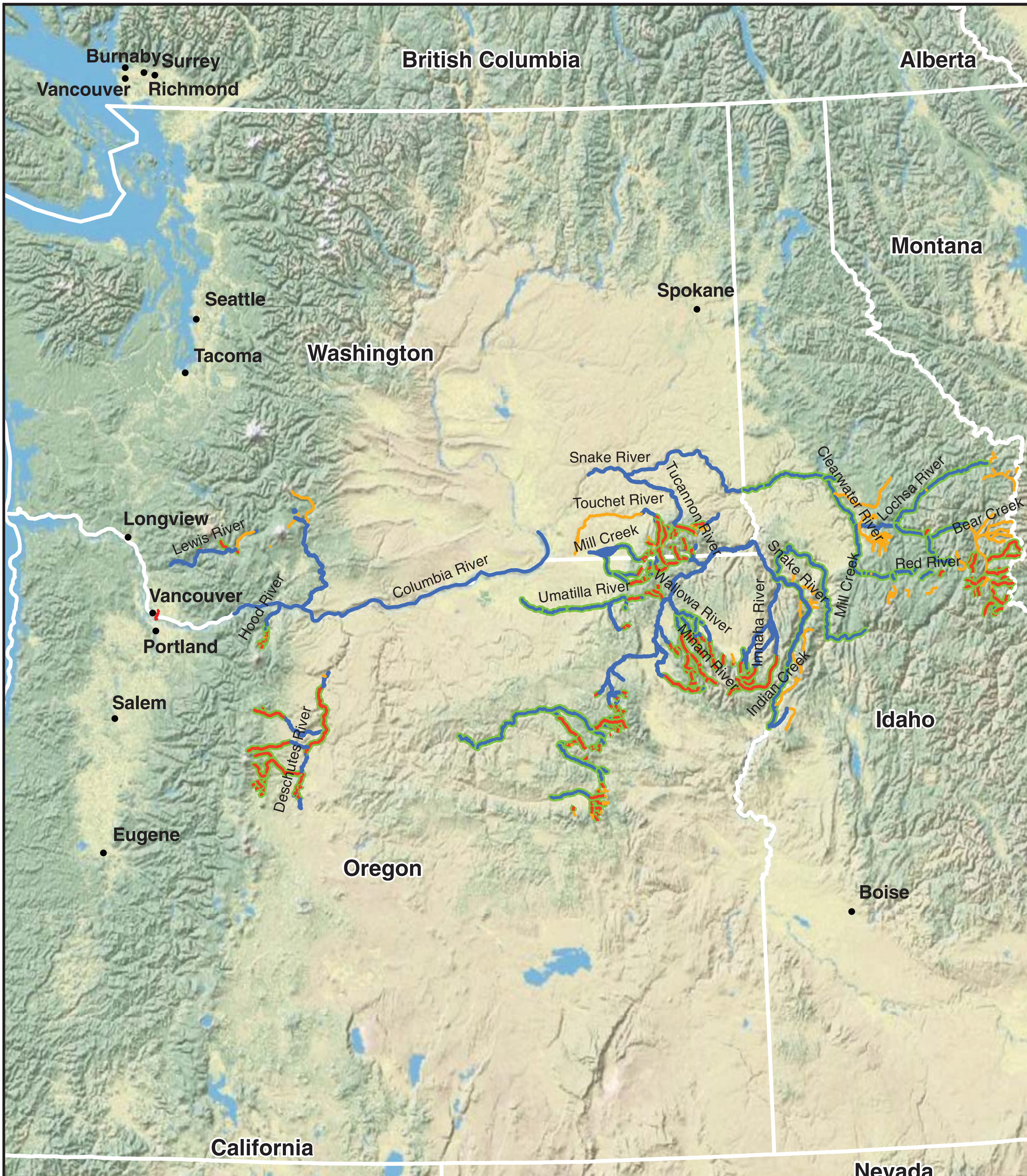
Typical or optimal water velocities for eulachon migration or spawning are not known (Langness 2009 personal communication).

4.15 COLUMBIA RIVER BULL TROUT

4.15.1 Status and Biological Context

The CR bull trout DPS includes the entire Columbia River basin within the United States, with the exception of the Jarbidge River in Nevada. The Columbia River distribution includes all tributaries in Oregon and Washington downstream of the Snake River confluence near the town of Pasco, Washington (64 FR 58909; November 1, 1999) (see Figure 4-23).

Bull trout in the lower Columbia River below Bonneville Dam primarily inhabit tributary systems, including the Lewis, Klickitat, and Hood Rivers. Within the Lewis River system, local populations of bull trout occur in Cougar, Pine, and Rush Creeks. These populations are restricted to portions of the Lewis River upstream of Merwin Dam. Anecdotal reports of bull trout below Merwin Dam suggest that bull trout may occasionally be flushed below the dam; however, the dam does not allow fish passage, and any bull trout below the dam would not have access to upstream habitat (USFWS 2002). One local population is known in the West Fork of the Klickitat River (USFWS 2002).



USE TYPE

- Migration only
- Rearing and migration
- Spawning and rearing
- Unknown
- Action Area

Figure 4 -23. General Distribution Map - Columbia River Bull Trout DPS

Map is intended to show distribution of the DPS, and not specific habitat use by life stage within the action area itself.

Columbia River CROSSING

Analysis by J. Koloszar; Analysis Date: Sept. 2009; File Name: ESUDPS_JL194.mxd

The Hood River and its tributaries contain two local populations: Clear Branch and Hood River. The Clear Branch local population occupies the Clear Branch Hood River, Laurance Lake, and Pinnacle Creek; the Hood River local population occupies Bear Creek, Coe Branch, Compass Creek, Eliot Branch, the mainstem Hood River, and Tony Creek. Bull trout have also been sighted in East Fork Hood River tributaries and in the West Fork of Hood River; however, these populations are not well defined. Within the Hood River system, bull trout spawn in the headwater creeks (e.g., Pinnacle Creek, the Coe Branch of the Middle Fork Hood River) and use the mainstem Hood River for migration to and from the mainstem Columbia River (USFWS 2002) (see Figure 4-23). Information is lacking on bull trout presence and use of the Sandy River. No populations are currently known to occur in the White Salmon, Cowlitz, or Kalama Rivers, although bull trout may have historically occupied these rivers and suitable habitat may be present.

Current bull trout abundance, spatial distribution, and temporal use of the mainstem Columbia River have not been thoroughly documented. Bull trout exhibit both anadromous and resident (or fluvial) life histories; bull trout in the lower Columbia River basin are thought to be of the resident life history form, remaining in creeks and tributaries throughout their life cycle. Current knowledge does not support anadromous populations occurring in the mainstem Columbia River; however, the Lower Columbia Recovery Team considers the mainstem Columbia River to contain core habitat for foraging, migrating, and overwintering, which may be important for full species recovery to occur (USFWS 2002). Bull trout use of the mainstem Columbia River in the lower Columbia River basin is largely unknown and is the subject of ongoing research efforts (USFWS 2002).

Bull trout populations were historically linked by the Columbia River, and in higher reaches of the Columbia River watershed (e.g., Wenatchee and Walla Walla Rivers) bull trout are known to migrate seasonally to some extent from tributaries downstream into the Columbia River to overwinter and feed (USFWS 2002). The extent to which this occurs in the lower Columbia River (below Bonneville Dam) is not well documented, although populations in some tributaries (bull trout from Hood River, in particular) are known to migrate to the mainstem Columbia River as part of their normal life history strategy.

Documented occurrences of bull trout in the lower Columbia River are listed in Appendix J. Since 2000, three bull trout have been incidentally caught and documented at Bonneville Dam or immediately downstream of the dam at the mouth of Hamilton Creek; during this time period, there were also several records of bull trout upstream of Bonneville near Drano Lake, the mouth of the Klickitat River, and John Day Dam. There are nine records of bull trout at or near Bonneville Dam between 1941 and 1998 (see Appendix J). The sightings for which measurements are available indicate that observed bull trout were from 9 to 15 inches in length, consistent with the expected size of the resident form. The majority of sightings since 1941 have occurred between late March and late May, with a few sightings between mid-June and early September. In 2009, there were sightings of one fish on May 30 and two on June 2 at Bonneville Dam. The fish appeared to be bull trout, but recent genetic analyses have revealed that arctic char are also present in the Columbia River. Arctic char are indistinguishable from bull trout by sight, so the identification could not be confirmed.

Based on current knowledge, non-anadromous subadult and adult bull trout may be present at low levels in the lower Columbia River within the action area. If present, they would be expected to occur in the action area between late March and early September.

Based on historical data collected since 1941, bull trout could potentially be present in the Columbia River and North Portland Harbor over the time period when in-water work will take place. However, based on the locations and numbers of bull trout documented in the lower Columbia River, the number of bull trout that may occur would likely be very limited.

Bull trout do not use Burnt Bridge Creek, the Willamette River, or the Columbia Slough (63 FR 31647).

4.15.2 Limiting Factors

Limiting factors for bull trout include habitat degradation and fragmentation, migratory barriers, degraded water quality, angler harvest and poaching, entrainment into diversion channels and dams, and introduced non-native species. Land and water management activities impacting bull trout populations and habitat include dams and other diversion structures, forest management practices, livestock grazing, agriculture, road construction and maintenance, mining, and urban and rural development. Some threats to bull trout are the continuing effects of past land management activities (USFWS 2002).

4.15.3 Proposed Critical Habitat

Critical habitat was designated for CR bull trout on September 26, 2005 (70 FR 56211), but is not present in the action area. The nearest designated critical habitat is in the Hood River, approximately 64 RM (103 RKm) upstream of the action area.

A revised designation of critical habitat was proposed on January 14, 2010. Under this proposal, the lower Columbia River within the action area would be included in critical habitat (75 FR 2269). The following PCEs of proposed critical habitat are present within the action area: migratory habitats; an abundant food base; complex river environments and processes; suitable water temperatures; suitable river flows; and sufficient water quality and quantity such that normal growth and survival are not inhibited.

4.16 NORTHERN (STELLER) SEA LION – EASTERN DPS

4.16.1 Status and Biological Context

The Eastern DPS of Steller sea lions extends from California to Alaska, including the Gulf of Alaska, to 144° W longitude (a line near Cape Suckling, Alaska) (62 FR 24345; May 5, 1997).

As shown on Figure 4-24, the Steller sea lion range follows the coastline from southern California, north to Alaska, west through the Aleutian Islands and eastern Russia, and south to the northern Japan islands. In the Pacific Northwest, they occur primarily in coastal habitats in Oregon and Washington, but are present year-round in the lower Columbia River, usually downstream of the confluence of the Columbia and Cowlitz Rivers (RM 70/RKm 113) (ODFW 2008b). However, in recent years, adult and subadult male Steller sea lions have been observed at Bonneville Dam, where they prey primarily on white sturgeon (*Acipenser transmontanus*) and some Chinook that congregate below the dam.

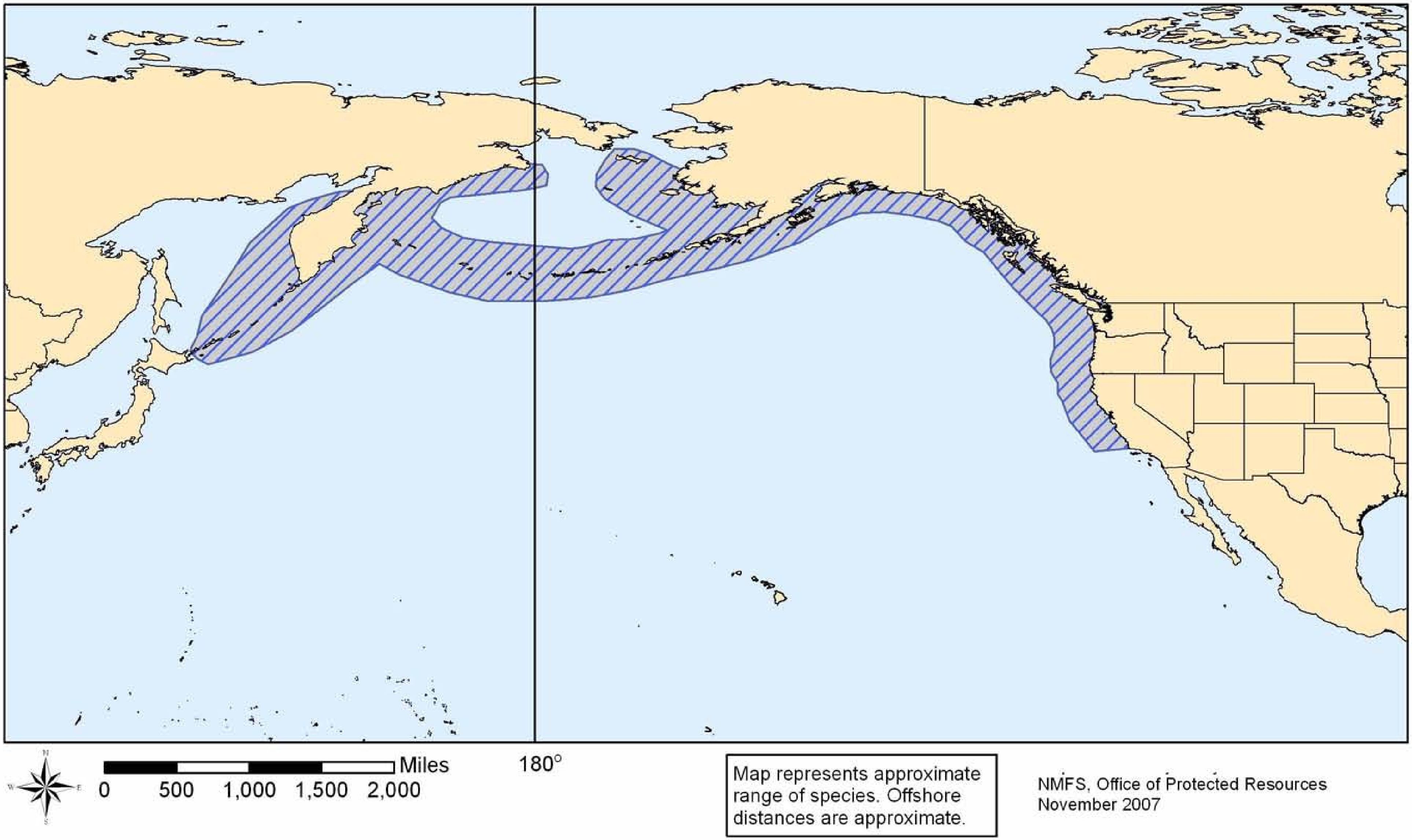


Figure 4-24. Steller Sea Lion Range

Columbia River CROSSING

In 2002, USACE began monitoring seasonal presence, abundance, and predation activities of marine mammals in the Bonneville Dam tailrace (Tackley et al. 2008). Steller sea lions have been documented every year since 2003; the lowest abundance was two Steller sea lions in 2004, and the highest was 26 in 2009 (Stansell et al. 2009).

Steller sea lions arrive at the dam in late fall (November), although occasionally individuals are sighted near Bonneville Dam as early as October (Stansell et al. 2009). Steller sea lions are present at the dam through May, and can travel between the dam and the mouth of the Columbia River several times during these months (Tackley et al. 2008). It is assumed that Steller sea lions could be present in the action area any time during the November–May window as they transit between the mouth of the river and Bonneville Dam.

Steller sea lions use the Columbia River for travel, foraging, and resting as they move between haul-out sites and the dam. There are no documented haul-out sites within the action area. The nearest known haul-out in the Columbia River is a rock formation (Phoca Rock) approximately 8 miles downstream of Bonneville Dam (approximately 32 miles upstream of the action area) (Tennis 2009a personal communication). Up to 40 Steller sea lions were observed hauled out at Phoca Rock in November and December 2009 (Stansell 2010 personal communication). Steller sea lions are also known to haul out on the south jetty at the mouth of the Columbia River, near Astoria, Oregon. There are no rookeries located in or near the action area. The nearest Steller sea lion rookery is on the northern Oregon coast at Three Arch Rocks near Oceanside (ODFW 2010a), more than 150 miles from the action area.

No tagged Steller sea lions have been observed at Bonneville Dam to date (Tennis 2009 personal communication); therefore, transit times between the south jetty and Bonneville Dam are not available for this species. However, PSFMC leads a tagging and tracking program for California sea lions, observing that transit time for California sea lions between Astoria and Bonneville Dam is 30-36 hours (upstream), and 15 hours from Bonneville Dam to Astoria (downstream) (Tennis 2009b personal communication). CRC assumes similar transit times for Steller sea lions, using California sea lions as the closest available proxy.

Steller sea lions are likely to be transiting in the Columbia River and North Portland Harbor during the time that in-water work will take place.

The abundance of the Eastern DPS of Steller sea lions is increasing throughout the northern portion of its range (Southeast Alaska and British Columbia), and stable or increasing slowly in the central portion (Oregon through central California). In the southern end of its range (Channel Islands in southern California), it has declined significantly since the late 1930s, and several rookeries and haul-outs have been abandoned. Changes in ocean conditions (e.g., warmer temperatures) may be contributing to habitat changes that favor California sea lions over Steller sea lions in the southern portion of the Steller range (NMFS 2007). The overall annual rate of increase for the Eastern DPS is 3.1 percent throughout most of the range (Oregon to southeastern Alaska) (Angliss and Allen 2007). The total population of the Eastern DPS of Steller sea lions is estimated to be approximately 45,095 to 55,832 (Angliss and Allen 2007). The most recent minimum count for Steller sea lions in Oregon and Washington was 5,813 in 2002. Trend counts in Oregon were relatively stable in the 1980s, with uncorrected counts between 2,000 and 3,000 sea lions (NMFS 1992). Counts in Oregon have shown a gradual increase from 1,486 in 1976 to 4,169 in 2002 (NMFS 2007).

4.16.2 Limiting Factors

Limiting factors for recovery of Steller sea lions include reduced food availability, possibly resulting from competition with commercial fisheries; incidental take and intentional kills during commercial fish harvests; subsistence take; entanglement in marine debris; disease; pollution; and harassment.

The change in food availability, associated with lowered nutritional status of females and consequent reduced juvenile recruitment, may be the primary cause of the decline (60 FR 51968). Declines of this species in the early 1980s were associated with exceedingly low juvenile survivorship, whereas declines in the 1990s were associated with disproportionately low fecundity (Holmes and York 2003). Steller sea lions are also sensitive to disturbance at rookeries during pupping and breeding and at haul-out sites.

4.16.3 Designated Critical Habitat

Critical habitat was designated for Steller sea lions on August 27, 1993 (58 FR 45269), but is not present within the action area. The nearest designated critical habitat is on the southern Oregon coast at Orford Reef, approximately 5 miles northwest of Port Orford and more than 200 miles from the project area (NMFS 2008h).

4.17 GREEN STURGEON (SOUTHERN DPS)

4.17.1 Status and Biological Context

The Southern DPS of green sturgeon includes coastal and Central Valley populations south of the Eel River in California, with the only known spawning population in the Sacramento River (71 FR 17757, April 7, 2006). Adults and subadults from this DPS migrate up the coast and use coastal estuaries, including the lower Columbia River, for resting and feeding during the summer (see Figure 4-25).

Green sturgeon occur in the Columbia River up to Bonneville Dam (RM 146/RKm 235), but are predominantly distributed below RM 37 (RKm 60) (68 FR 4433). Adult green sturgeon enter the Columbia River estuary when water temperatures reach 15ºC (59ºF) in June and spend the warm summer months resting, in general preferring the salt water portions of the lower estuary. There is also evidence of feeding use of the estuary during the summer months (Langness 2008 personal communication). Adult and subadult green sturgeon in the Columbia River estuary feed on crangonid shrimp, burrowing thalassinidean shrimp (primarily the burrowing ghost shrimp *Neotrypaea californiensis*), amphipods, clams, juvenile Dungeness crab (*Cancer magister*), anchovies, sand lances (*Ammodytes hexapterus*), lingcod (*Ophiodon elongatus*), and other, unidentified fish species (NMFS 2008c). Studies indicate that green sturgeon utilizing the lower Columbia River are subadults and adults (13 years and older and at least 90 cm fork length) (Langness 2009 personal communication). Green sturgeon usually leave the estuary by September to return to winter habitat in the southern portions of their range.

Green sturgeon are potentially present in the Columbia River and North Portland Harbor portions of the action area from mid-May until September (CRC 2009), including the time that in-water work will take place. However, suitable habitat (i.e., estuarine areas with higher salinity and an abundance of preferred prey species) for this species is extremely limited within the action area.

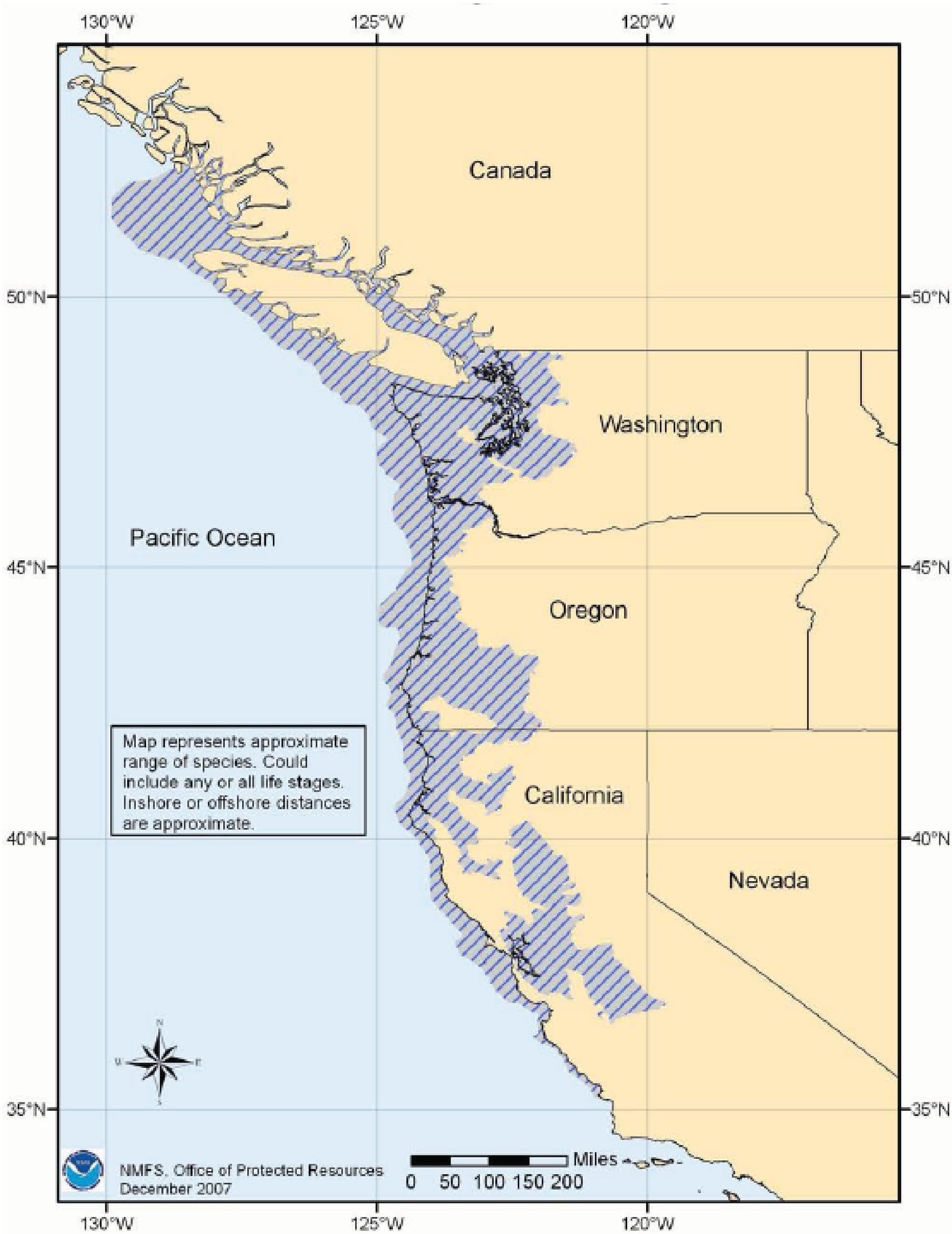


Figure 4-25. Green Sturgeon Range

Map is intended to show distribution of the species, and not specific habitat use by life stage within the action area itself. The southern DPS includes coastal and Central Valley populations south of the Eel River in California. Adults and subadults from this DPS use coastal estuaries, including the Lower Columbia River, during the summer.

Columbia River CROSSING

Green sturgeon do not use Burnt Bridge Creek or the Columbia Slough.

There is little to no comprehensive data on current population sizes or trends. Available population data are limited to harvest numbers, data gathered incidentally during monitoring of white sturgeon populations in certain bays in California, and extrapolation of white sturgeon population trends. Some studies suggest that, based on commercial catch rates, all west coast sturgeon have experienced approximately an 88 percent decline in abundance since the late 1800s (Adams et al. 2002). Limited data are available that exhibit a negative trend in juvenile green sturgeon abundance (71 FR 17757). Rates of green sturgeon harvested (in pounds) in Columbia River commercial landings are available, but do not indicate trends (Adams et al. 2002).

4.17.2 Limiting Factors

The primary limiting factors for recovery of the Southern DPS of green sturgeon are the degradation of overall habitat quality and the significant reduction of spawning habitat across the range of the species: current spawning habitat is limited to portions of the Sacramento River below the Keswick Dam. Because the Sacramento River contains the only known green sturgeon spawning population in this DPS, the concentration of spawning adults in one river places the DPS at risk of catastrophic events. Spawning habitat in other portions of the species' historical range has been significantly modified by land use and water diversions, and/or is not accessible (e.g., spawning habitat in the Feather River has been blocked by Oroville Dam) (71 FR 17757).

Habitat quality in the Sacramento River and Delta system has been degraded by agricultural, municipal, and industrial land uses. Elevated water temperatures and contamination from pesticides, PCBs, and heavy metals limit species recovery in the Sacramento River as well as in other large estuary systems, including the Columbia River. Green sturgeon have also experienced high levels of entrainment at water pumping stations in the Sacramento Delta (Adams et al. 2002).

The lack of adequate population abundance or trend data is a limiting factor in assessing recovery and population status. Assessing Southern DPS green sturgeon abundance in the Columbia River is complicated by the fact that green sturgeon are harvested from the Southern DPS as well as the Northern DPS (which is not protected under the ESA). Since it is unknown to what extent either DPS is part of the Columbia River summer concentrations and their associated fisheries, it is impossible to differentiate the harvest impact between the two DPSs (Adams et al. 2002).

4.17.3 Designated Critical Habitat

Critical habitat was designated for the green sturgeon Southern DPS on October 9, 2009 (74 FR 52300). The critical habitat designation includes the Columbia River up to RM 46 (RKm 74), over 50 miles downstream of the action area.

4.18 SOUTHERN RESIDENT DPS KILLER WHALE

4.18.1 Status and Biological Context

As shown on Figure 4-26, the distribution of the Southern Resident Killer Whale DPS includes the inland waterways of Puget Sound, Strait of Juan de Fuca, and Southern Georgia Strait during the spring, summer, and fall. They are known to occur in the coastal Pacific Ocean off of Oregon, Washington, Vancouver Island, and more recently, off the coast of central California in the south and off the Queen Charlotte Islands to the north. They do not occur in the freshwater action area water bodies described in this BA. Little is known about the winter movements and range of the Southern Resident stock. Southern Residents are not known to associate with other resident whales, and genetic data suggest that Southern Residents interbreed with other killer whale populations rarely if at all (70 FR 69903**)**. The Southern Resident Killer Whale DPS consists of three pods, identified as J, K, and L pods. Although the entire Southern Resident DPS has the potential to occur in the coastal waters at any time during the year, occurrence is more likely from November through April. For additional information about the Southern Resident Killer Whale DPS, see Appendix H.

Southern Residents spend the majority of their time from late spring to early autumn in inland waterways of Washington State and British Columbia (Strait of Georgia, Strait of Juan de Fuca, and Puget Sound) (Bigg 1982; Ford et al. 2000; Krahn et al. 2002). Typically, J, K and L pods arrive in May or June and spend most of their time in the core area of Georgia Basin and Puget Sound until departing in October. K and L pods also make frequent trips to the outer coasts of Washington and southern Vancouver Island during this time; these trips generally last a few days (Ford et al. 2000).

The Southern Residents were formerly thought to range southward along the coast to about Grays Harbor (Bigg et al. 1990) or the mouth of the Columbia River (Ford et al. 2005). However, recent sightings of members of K and L pods in Oregon (in 1999 and 2000) and California (in 2000, 2003, 2005, 2006 and 2008) have considerably extended the southern limit of their known range (NMFS 2008b). There have been 40 verified sightings or strandings of J, K, or L pods along the outer coast from 1975 to the present, with most made from January to May. These include 16 records off Vancouver Island and the Queen Charlottes, 11 off Washington, 4 off Oregon, and 9 off central California. Most records have occurred since 1996, but this is more likely because of increased viewing effort along the coast during this time period.

Although there is little information available regarding the historical abundance of Southern Resident killer whales, two methods have been used to estimate a historical population size of 140 to 200. The minimum estimate (~140) is the number of whales killed or removed for public display in the 1960s and 1970s added to the remaining population at the time of the captures. The maximum estimate (~200) is based on a recent genetic analysis of microsatellite DNA (NMFS 2003).

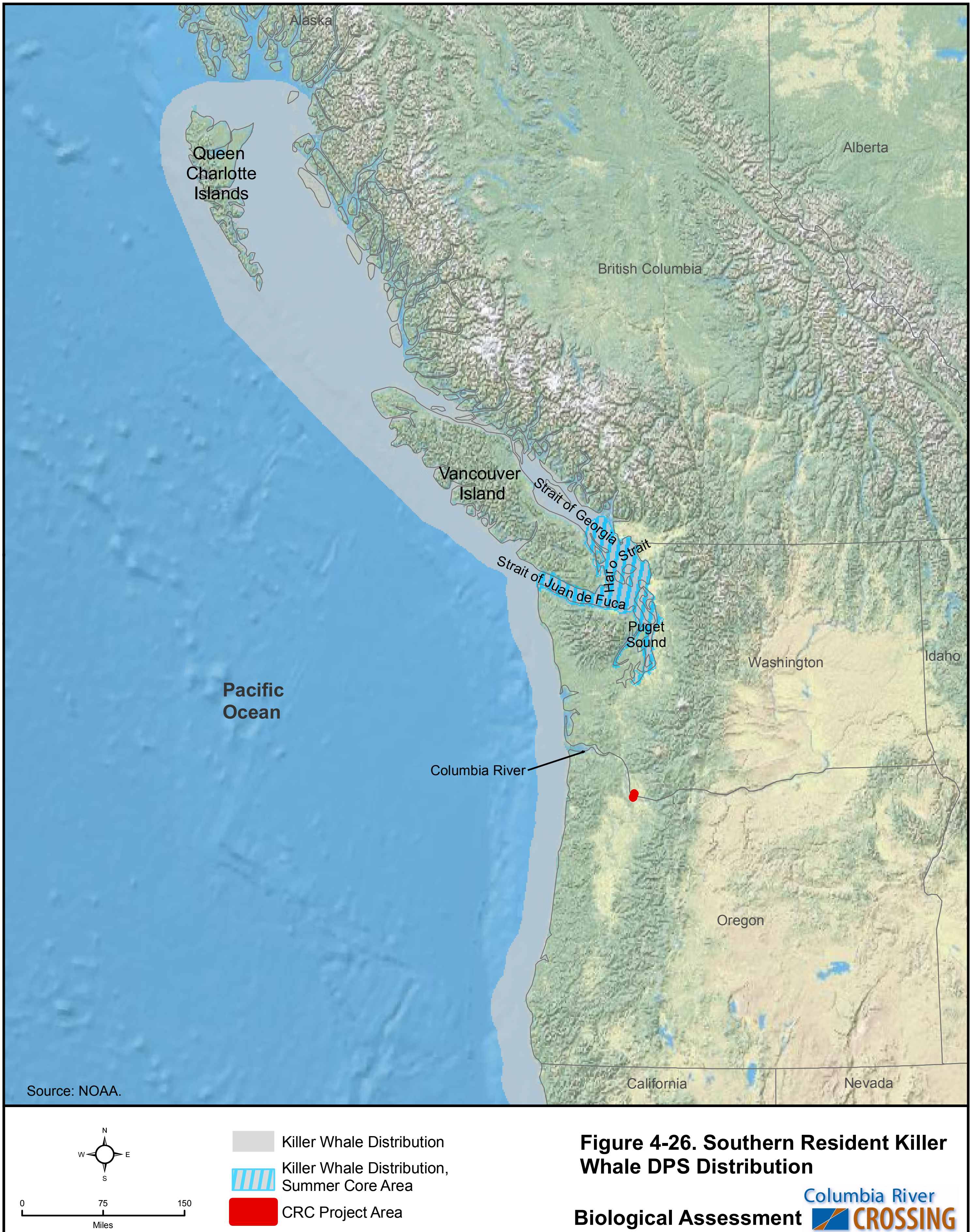


Figure 4-26. Southern Resident Killer Whale DPS Distribution

Biological Assessment Columbia River CROSSING

At present, the Southern Resident population has declined to essentially the same size as estimated during the early 1960s, when it was considered as likely depleted (Olesiuk et al. 1990). Since censuses began in 1974, J and K pods have steadily increased their numbers. However, the DPS population suffered approximately a 20 percent decline from 1996–2001, largely driven by declines in L pod. There have been recent increases in the population from 2002–2006, indicating that L pod's decline may have ended; however, such a conclusion is premature. The 2007 census counted 87 Southern Resident killer whales, 25 in J pod, 19 in K pod, and 43 in L pod. As of November 2009, the Southern Resident population totaled 87 individuals: 27 in J pod, 19 in K pod, and 41 in L pod (Balcomb 2009 personal communication).

4.18.2 Limiting Factors

Limiting factors for Southern Resident killer whales include quantity and quality of prey, toxic chemicals which accumulate in top predators, and disturbances from sound and vessel traffic. Recent studies have documented high concentrations of polychlorinated biphenyls (PCBs), dichlorodiphenyltrichloroethane (DDT), and polybrominated diphenylethers (PBDEs) in killer whales (Ross et al. 2000; Ylitalo et al. 2001; Reijnders and Aguilar 2002; Krahn et al. 2004). As top predators, when killer whales consume contaminated prey they accumulate the contaminants in their blubber. When prey is scarce, killer whales metabolize their blubber and the contaminants are mobilized (Krahn et al. 2002). Nursing females transmit large quantities of contaminants to their offspring. The mobilized contaminants can reduce the whales' resistance to disease and can affect reproduction.

Several studies in the inland waters of Washington State and British Columbia have observed changes in killer whale behavior in the presence of vessels (Kruse 1991; Williams et al. 2002a,b; Foote et al. 2004; Bain et al. 2006). These behavioral changes can affect the whales' foraging efficiency and the amount of energy they expend in migrating, foraging, and other activities. Sound from vessels can also interfere with communication and prey location.

Oil spills have also been identified as a potential risk factor for this DPS. In marine mammals, acute exposure to petroleum products can cause changes in behavior and reduced activity, inflammation of the mucous membranes, lung congestion, pneumonia, liver disorders, and neurological damage (Geraci 1990; Wursig 1990). In addition, oil spills have the potential to adversely impact habitat and prey populations, and, therefore, may adversely affect Southern Residents by reducing food availability.

4.18.3 Designated Critical Habitat

Critical habitat was designated for Southern Resident killer whales on November 29, 2006 (71 FR 69054). Designated critical habitat includes the summer core area of Puget Sound, the Strait of San Juan de Fuca, and Haro Strait. Critical habitat is not present within the action area.

4.19 EULACHON – SOUTHERN DPS

4.19.1 Status and Biological Context

Figure 4-27 illustrates the eulachon range. The Southern DPS of this species has been determined to be threatened under the ESA; the final ruling will become effective on May 17, 2010 (75 FR 13012). The Southern DPS of eulachon consists of populations that spawn in rivers south of the Nass River in British Columbia, up to and including the Mad River in California. Within the range of the Southern DPS, major production areas or ‘‘core populations’’ for this species include the Columbia River (74 FR 10857).

The majority of the eulachon production south of the U.S./Canadian border is in the Columbia River basin; the largest and most consistent spawning runs in the basin occur in tributaries of the Columbia River from RM 25 (RKm 40) to RM 146 (RKm 235), directly downstream of Bonneville Dam, and in the Cowlitz River (73 FR 13187). The timing of adult entry into the Columbia system is highly variable. This is particularly evident for the Sandy River that provides the last significant spawning area for eulachon upstream of the CRC area, although some mainstem and tributary spawning occurs and is known locally (Langness 2009 personal communication). The annual catch record shows eulachon to be absent from the Sandy River in one or more consecutive years (JCRMS 2007; NOAA 2008). The ODFW typically investigates first reports of eulachon presence in the Sandy River and maintains records of first arrival (North 2009 personal communication). Eulachon runs have been recorded 31 of 81 years (1929–2009), with sustained absences in 1958–1970 and 1989–2000. January 23 and April 20 were the earliest and latest landings, respectively. March timing for first entry is most common; the median entry date for the Sandy River was March 24. Note that first entry is not the peak abundance of the run which occurs some time later, potentially into the early summer.

Spawning occurs in fresh water in the lower Columbia basin soon after entry (January through May), at water temperatures between 4 and 10ºC (40ºF and 50ºF). Preferred spawning habitat consists of coarse sand or pea-sized gravel substrates (Smith and Saalfeld 1955; Romano et al. 2002). Spawning depth generally ranges from 8 to 20 feet, with a preference for calm water near a shoreline (Langness 2009 personal communication; LCFRB 2004). Eggs are demersal and adhesive and develop over a period of 30-40 days depending on water temperature, and then immediately begin non-volitional drift downstream to tidal estuarine habitats. Larvae are 4 to 8 mm in length at hatching (WDFW and ODFW 2001). Adults are semelparous (die soon after spawning).

Outmigration (larval drift) in the lower Columbia River generally occurs between February and mid-June, peaking in February and March (73 FR 13187; WDFW and ODFW 2001; ODFW and WDFW 2008b; LCFRB 2004). However, larval presence in the CRC project area can be expected to be as variable by month and year as the adult returns indicate for the Sandy River. Larval drift beyond June and into peak summer water temperatures is uncertain and potentially dependent on peak water temperatures.

After entering the lower Columbia River system, eulachon adults are observed to occupy and utilize mainstem and tributary habitats progressively upstream, with the Sandy River being the latest (Langness 2009 personal communication). Therefore, while eulachon enter the river beginning in December or January, they would be expected to arrive in the Columbia River and North Portland Harbor portions of the action area from late January through the end of August. However, adult presence may be limited by sustained water temperatures exceeding 10–11ºC, the temperature range at which adult movements (net migration) markedly decrease (Langness 2009 personal communication). Larval eulachon may be present in the action area from mid-April into the summer months, assuming that in most years unknown temperature/survival thresholds are not reached. Thus, they are likely to be present during in-water work. Eulachon do not use Burnt Bridge Creek or the Columbia Slough (74 FR 10857).

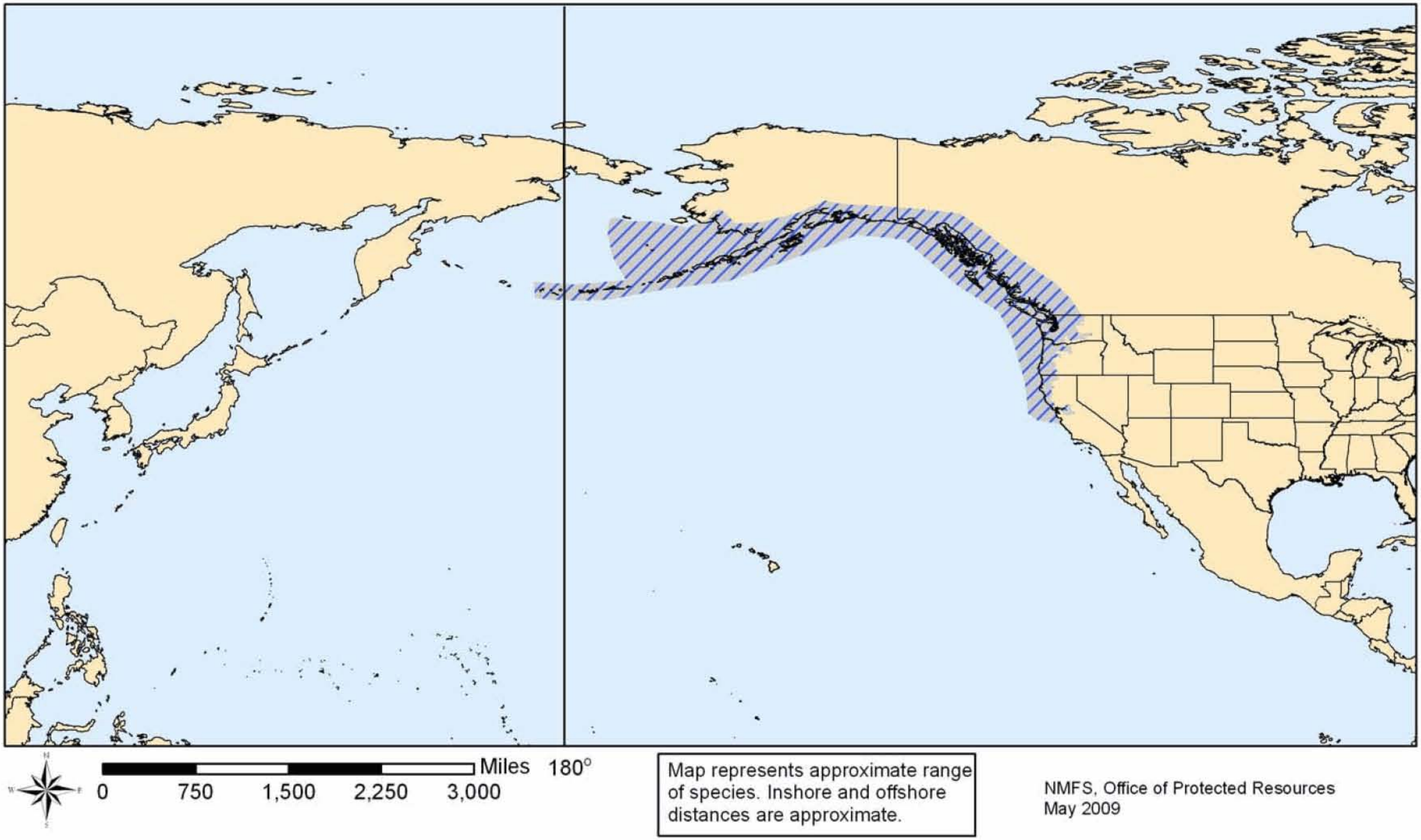


Figure 4-27. Eulachon Range

The Columbia River and its tributaries support the largest known eulachon run. Direct estimates of adult spawning stock abundance are unavailable, although records of commercial fishery landings are available from 1888 to the current time (LCFRB 2004). Commercial eulachon landings are influenced by market and environmental conditions as well as by population abundance, and do not provide a quantitative measure of spawning stock abundance. However, in the absence of direct stock abundance estimates, commercial landings may be a useful metric of relative annual run strength (ODFW and WDFW 2008b). Available catch and effort information indicate an abrupt decline in eulachon abundance in the early 1990s, with no evidence that the population has since rebounded. Commercial catch levels were consistently high (usually greater than 500 metric tons and often greater than 1,000 metric tons) from about 1915 to 1992. In 1993, the catches experienced a sudden decline, yielding only 233 metric tons; between 1994 and 2000 the catches declined to an average of less than 40 metric tons. From 2001 to 2004, the catches increased to an average of 266 metric tons before falling to an average of less than 5 metric tons from 2005 to 2008 (ODFW and WDFW 2008b). Since 2005, the fishery has been managed under the most conservative level allowed as a result of the low returns (74 FR 10857).

4.19.2 Limiting Factors

The primary limiting factor identified for eulachon is changes in ocean conditions due to climate change. Run size in the Columbia River is driven more by ocean conditions than by the size of the parent run or subsequent larval production (Langness 2009 personal communication). Changes in air and surface temperatures associated with climate change are likely to modify freshwater, estuarine, and marine habitats of this species by affecting peak flows that influence freshwater temperatures and spawning, affecting the distribution and abundance of prey species (e.g., zooplankton) and redistributing eulachon predators (piscivorous birds [e.g., gulls, terns], sea lions, and sturgeon) and competitors (e.g., Pacific hake).

Additional limiting factors include the effects of dams and water diversions on freshwater systems, and reductions in water quality in freshwater systems. Alteration of the natural hydrograph of river systems reduces the magnitude of spring freshets with which eulachon have evolved. Dams can also impede or alter bedload movement, changing the composition of river substrates important to spawning eulachon (74 FR 10857). Degradation of water quality in spawning habitat due to elevated water temperatures and chemical contaminants is a potential, yet undocumented, limiting factor to recovery.

Commercial harvest levels of eulachon in the Columbia and Fraser Rivers are orders of magnitude lower than historic harvest levels, and a relatively small number of vessels operate in this fishery. No significant commercial fishing for eulachon occurs in the Klamath or British Columbia Rivers north of the Fraser River (74 FR 10857).

4.19.3 Designated Critical Habitat

Critical habitat has not been designated or proposed for eulachon.