State of Oregon Department of Environmental Quality

# 2018/2020 Integrated Report Delisting Rationale

### Clarification of Resident Rainbow Trout and Coastal Cutthroat Spawning Use in the Coquille mainstem, RM 20 to RM 35.6, the South Fork Coquille River from RM 0 to RM 2.8, and the North Fork Coquille River from RM 0 to RM 3.1

DEQ provides the following information to clarify that resident rainbow trout and coastal cutthroat trout spawning does not occur (i.e. not "an active spawning area used by resident trout") in the tidally influenced freshwaters in the mainstem Coquille River, lower South Fork Coquille River, and lower North Fork Coquille River (Table 1; Figures 1 and 2). Currently, the mainstem of the Coquille from the mouth to approximately RM 20 is designated as estuary. In this stretch, the estuarine dissolved oxygen criteria is applicable and there is no designated trout spawning. The rationale below supports that trout spawning is not a beneficial use in the tidally influenced freshwaters of the Coquille River, from RM 20 to RM 35.6, the South Fork Coquille River from RM 0 to RM 2.8, and the North Fork Coquille River from RM 0 to RM 3.1 for the following reasons: (1) flow velocities in tidal waters are not consistent enough to aerate resident rainbow trout and coastal cutthroat redds; (2) loose, clean gravel substrates are not present in these mainstem and tributary reaches; (3) pool and riffle habitats preferred by spawning trout are absent; and (4) water depths exceed levels preferred by resident trout for spawning.

Benner's "Historical Reconstruction of the Coquille River and Surrounding Landscape" supports the determination that resident rainbow trout and coastal cutthroat spawning did not historically occur in areas subject to tidal inundation but rather in source waters to these areas. The main channel of the Coquille was once flanked by tidal marshes that occupied a large portion of the Coquille valley. Extensive diking and drainage of those marshes began in the mid 1800s for agricultural land reclamation (Kreag, 1979). At the time of ODFW's research report in 1979, only 373 acres of natural tidal marsh, located near Bandon, remain undiked (Akins and Jefferson 1973) which amounted to 3-4% of the marshes that historically covered between 9,000 and 12,000 acres (Kreag, 1979). In addition, the use of splash dams to drive logs down river ruined long stretches of river habitat and carried cobble, silt, and debris into the estuary (Thompson et al. 1972).

| Tidally Influenced Waters of the Coquille River | |
|---|---|
| **Coquille Sub-basin Stream Name** | **Segment (approximate River Miles[1])** |
| Coquille River | 20 – 35.6 |
| South Fork Coquille River | 0 – 2.8 |

[1]River mile locations from the USGS' 7.5' quad maps. Oregon Water Resources Department and the U.S. Geological Survey.000

| Tidally Influenced Waters of the Coquille River | |
|---|---|
| **Coquille Sub-basin Stream Name** | **Segment (approximate River Miles[1])** |
| North Fork Coquille River | 0 – 3.1 |

*Table 1. Tidally Influenced Waters of the Coquille River*

There are approximately 80 miles of creeks and drainage channels in the Coquille valley according to USGS topographic maps. Most minor marsh channels were filled or diked at the mouth while larger channels were also filled, and replaced by straight drainage ditches (Kreag, 1979). These hydromodifications were constructed during conversion of the Coquille estuary into agricultural land, and by the late 1800's most of the marshes had been converted to farmland (Kreag, 1979). The extent of tidal range and currents in the riverine subsystem are likely more extreme now than when they were moderated by flow through the marshes (Kreag, 1979).

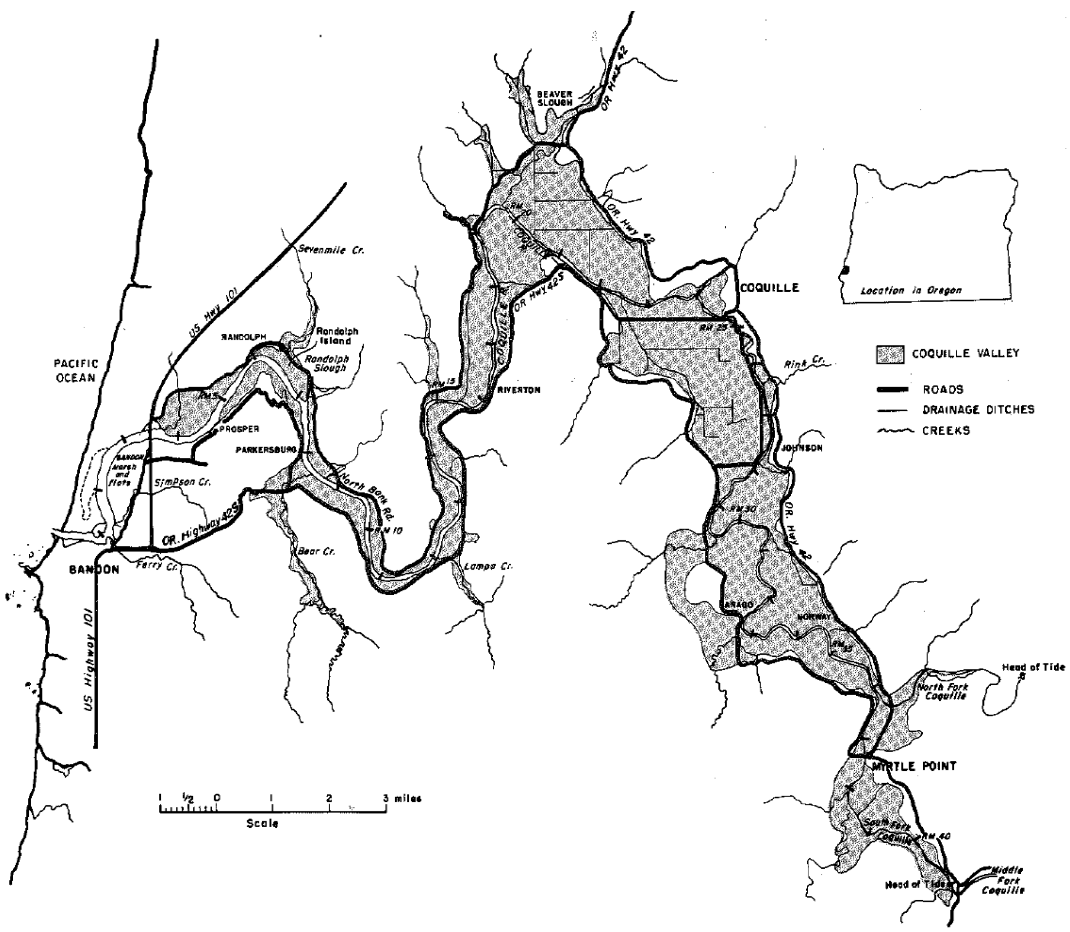


*Figure 1: Coquille estuary as taken from Oregon Department of Fish & Wildlife's (ODFW) Natural Resources of the Coquille Estuary*

Figures 1 and 2 display the estuarine and tidally influenced waters of the Coquille River system, both as originally identified by ODFW's Estuary Inventory Report: Natural Resources of the Coquille Estuary in 1979 (Figure 1) and as defined by the Coastal and Marine Estuarine Classification Standard (CMECS) in 2012 (Figure 2). CMECS is a federal classification standard developed jointly by the USGS, NOAA, and the EPA to delineate estuary zones and implemented by local agencies[2]. Oregon used the CMECS classification system to demarcate estuarine versus fresh water boundaries on the Oregon coast. Additionally, it also indicates the current extent of riverine tidal influence into freshwaters. Additional information is provided in the ODEQ document titled *Methods for Delineating Estuarine Water Type for Mapping Beneficial Uses and Applying Criteria.* DEQ used the categories "Estuarine Tidal Riverine Coastal" and "Estuarine Tidal Riverine Coastal – Diked" to indicate the extent of tidally influenced freshwaters (Figure 2).

DEQ did not include the tidally influenced freshwaters in its definition of "estuarine" because these reaches are freshwater and have salinity below the gradient. Rather, DEQ classified them as freshwaters. However, these freshwater, but tidally influenced riverine reaches of the Coquille mainstem and lower reaches of the South and North Forks of the Coquille River are not active spawning areas used by resident trout for purposes of applying the DO spawning criterion, rather they support trout rearing and migration.

The CMECS categories "Estuarine Tidal Riverine Coastal" and "Estuarine Tidal Riverine Coastal – Diked" include freshwaters with a salinity gradient less than 0.5 parts per trillion at least 90% of the time and the current extent of the head of tide.

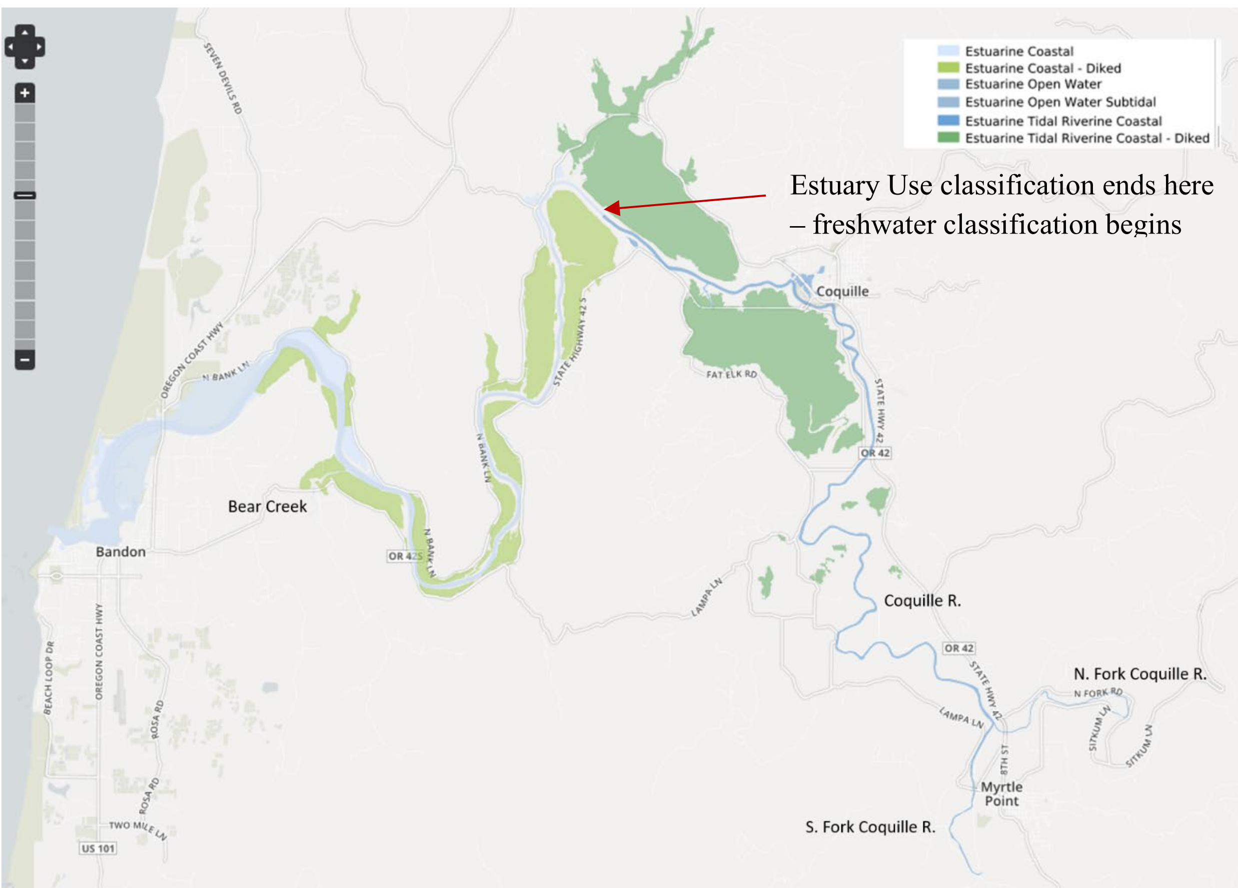


*Figure 2: Overview of tidally-influenced brackish and fresh waters of the Coquille River estuary. Source: Oregon Dept. of Land Conservation and Development Coastal Atlas https://www.coastalatlas.net/estuarymaps/*

[2] https://iocm.noaa.gov/cmecs/

## Current Beneficial Use Designation

DEQ worked with Oregon Department of Fish and Wildlife (ODFW) in 2003 to develop spatial and temporal mapping of designated fish use subcategories used in the temperature standard, including “salmon and trout rearing and migration” and “salmon and steelhead spawning.” DEQ did not map spawning areas for freshwater trout species, such as the rainbow trout and coastal cutthroat in the Coquille subbasin, because the necessary data was not available and there is not a temperature-spawning criterion specific to these species. Benner’s “Historical Reconstruction of the Coquille River and Surrounding Landscape” recounts a survey of the river bottomlands in 1858 that described the channel as, “a deep still stream navigable at all seasons" which supports the determination that resident rainbow trout and coastal cutthroat spawning in tidally influenced areas was not expected to have been a historic beneficial use.

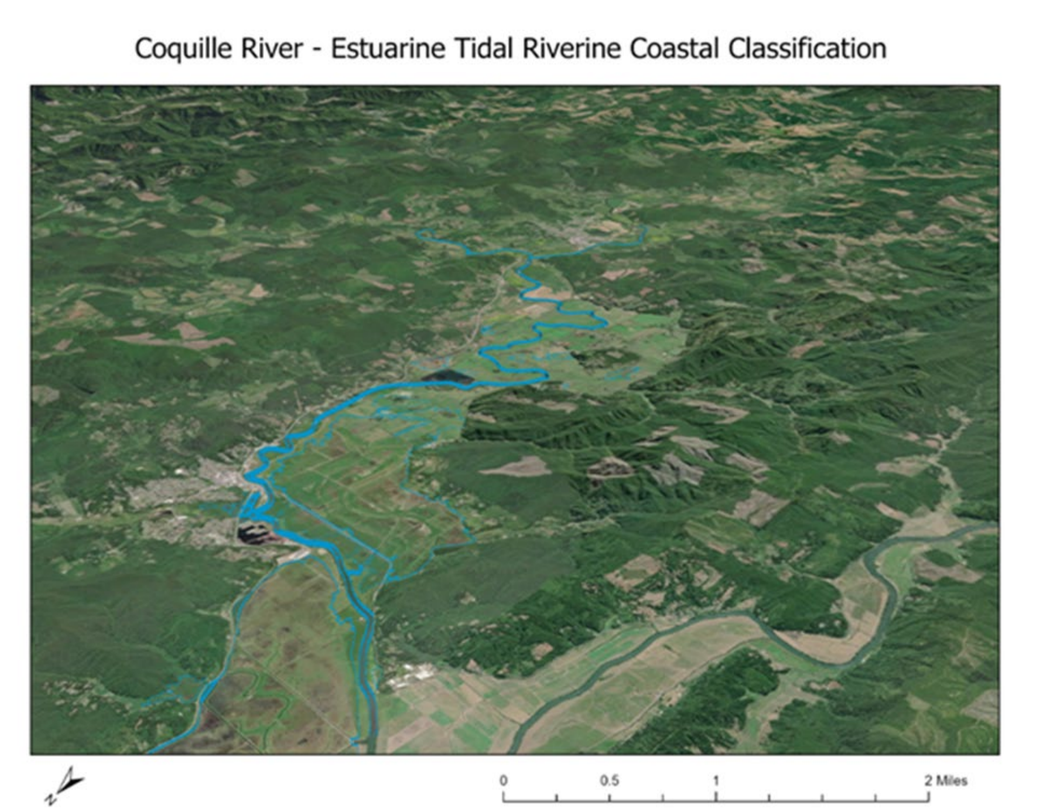


*Figure 3: 3-D image of the Coquille River estuary. Tidal riverine freshwaters are shown in light blue.*

Per OAR 340-41-Figure 300A (2003), Fish Use Designations, these reaches of the Coquille River mainstem and lower reaches of the South and North Fork Coquille River are currently designated as supporting salmon and trout rearing and migration. As shown in OAR 340-41 Figure 300B (2003), these reaches are not designated for salmon and steelhead spawning use. Similarly, they are not active spawning areas used by resident trout species. The types of resident trout that utilize these coastal waterbodies include both cutthroat and rainbow trout. Sea-run cutthroat trout spawn in the smallest tributaries of small and moderate-size streams. They migrate to the very headwaters of these streams to spawn in reaches often less than two feet wide (Crocker, 1995). Cutthroat trout spawning tributaries are smaller and higher in the stream system than those used by Coho salmon and steelhead (Crocker, 1995). The spawning period for sea-run cutthroat trout can extend from December through May. February appears to be the peak spawning period for sea-run cutthroat in most Oregon streams (Crocker, 1995). Resident rainbow trout would typically spawn in the months of February through May, when the stream system is least suitable to trout spawning (i.e. flow velocities, water depth) (Roberge et al., 2002). See Table 3 below.

Spawning surveys by ODFW staff typically occur where spawning is known to occur thus ODFW spawning surveys are absent for the tidally influenced lower portions of the South and North Forks of the Coquille River and the mainstem (shown in blue) since the physical habitat characteristics do not indicate spawning is likely to occur in these reaches. Figures 3 and 4 identify habitat use reported in ODFW's Fish Distribution Database for the Coquille basin. The fish distribution maps highlight that resident trout spawning almost exclusively occurs upstream of salmon spawning (Figures 4–6).

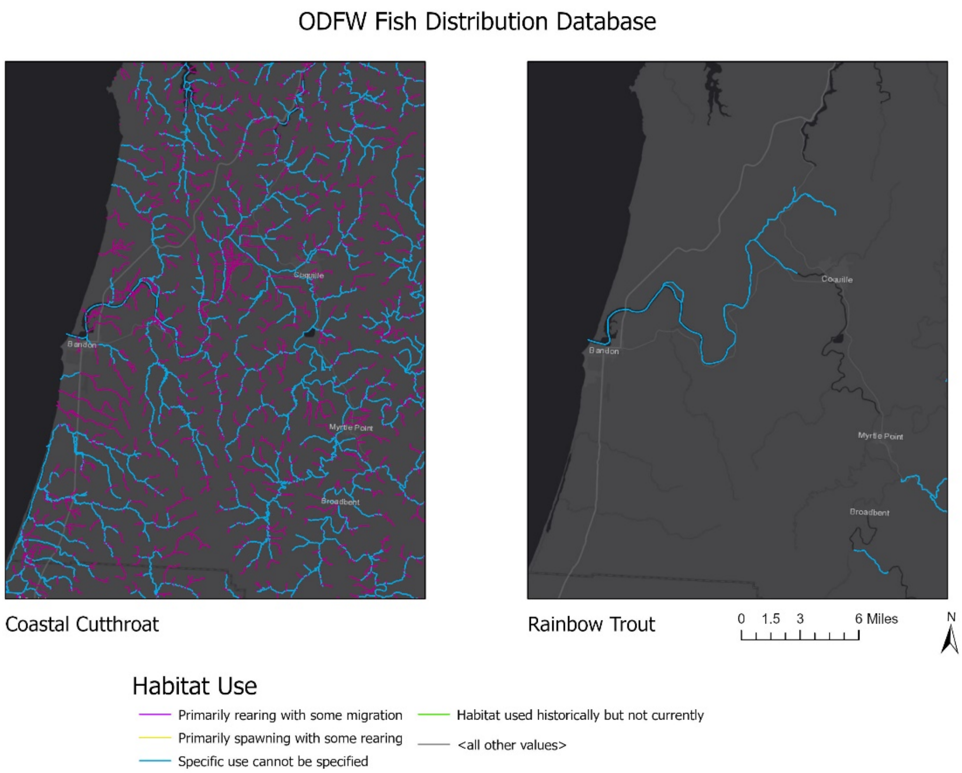


*Figure 4: Reported habitat use by Coastal cutthroat and Rainbow trout in the Coquille basin as reported in the ODFW Fish Distribution Database.*

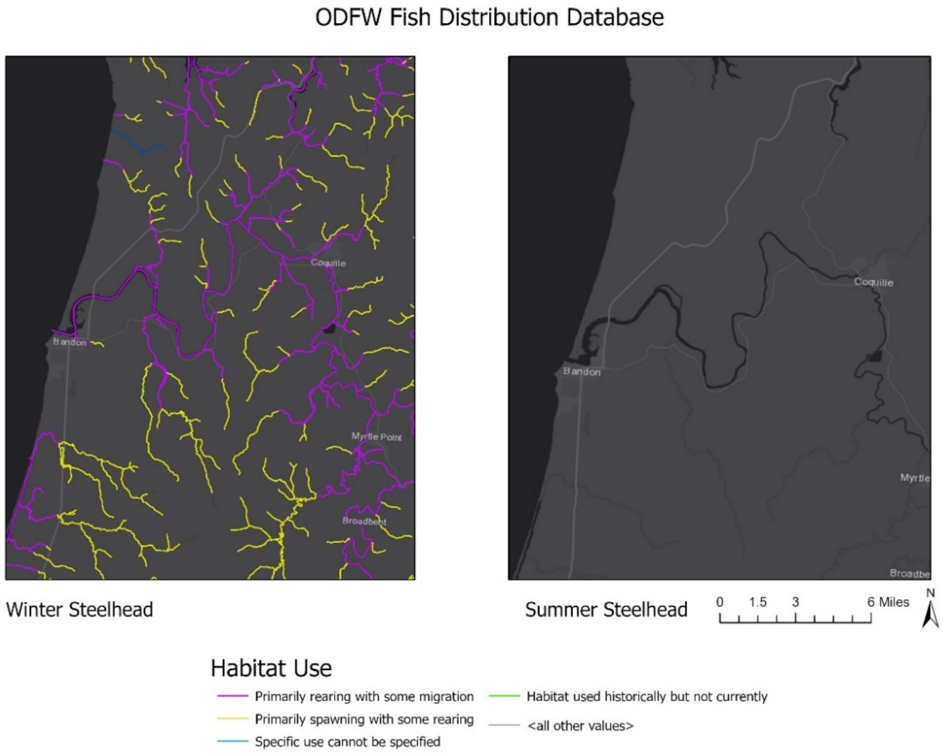


*Figure 5: Reported habitat use by summer and winter steelhead in the Coquille basin as reported in the ODFW Fish Distribution Database.*

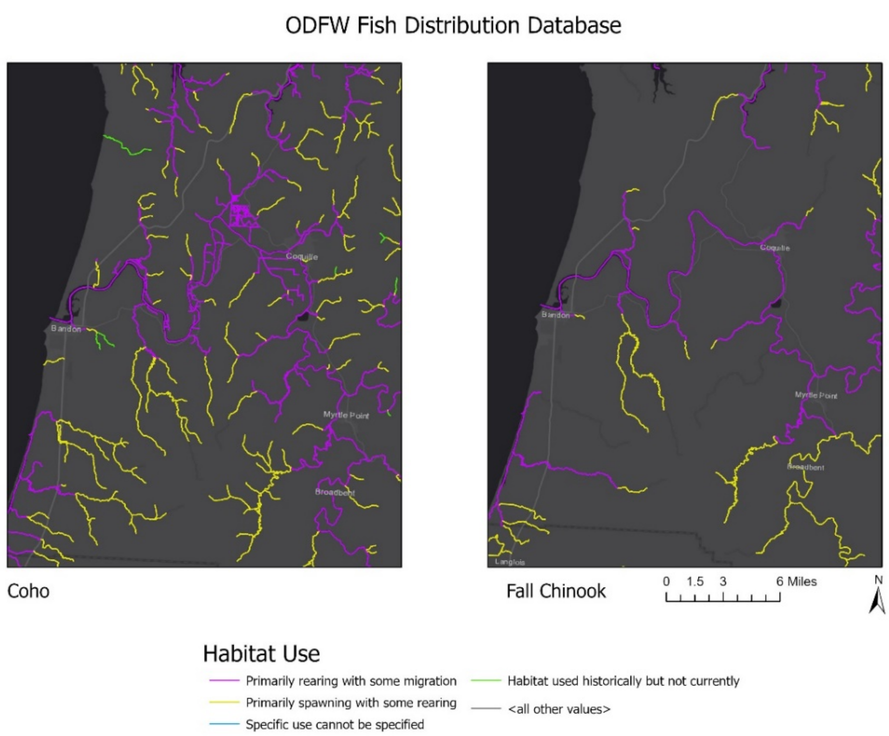


*Figure 6: Reported habitat use by Coho salmon and Chinook salmon in the Coquille basin as reported in the ODFW Fish Distribution Database.*

**2018/2020 Integrated Report Delisting Rationale**

The mainstem Coquille River is a tidally influenced river segment (USGS, 2012). Tidal influence extends from the mouth of the Coquille River for approximately 41 miles, a tidewater distance exceeded only by the Columbia River estuary. The estuary's drainage basin covers 1,058 square miles, which is the largest drainage area of an estuary arising entirely from the Oregon coastal mountains (Natural Resources of the Coquille Estuary, ODFW 1979). A 2008 Nature Conservancy report titled "The Coastal Connection: assessing Oregon estuaries for conservation planning" considered the boundaries of an estuary as extending from the mouth (or the tips of the jetties) to the head of tide, to be consistent with state and federal regulatory authorities and other conservation efforts (Schlesinger 1997; ODLCD 1987). Head of tide in the Coquille River extends as high as River Mile 41 (ODFW, 1979), ).Based on Figures 1 and 2, the lower 2.8 miles of the South Fork Coquille River, and the lower 3.1 miles of the North Fork Coquille River are also subject to tidal inundation and do not support resident rainbow trout and coastal cutthroat spawning. For purposes of this analysis, DEQ is focused on the stretch of the mainstem Coquille that extends from River Mile 20 to the confluence of the North and South Forks at River Mile 35.6 (AU ID: OR_SR_1710030505_02_104992), the lower 2.8 miles of the South Fork Coquille River (AU OR_SR_1710030502_02_104970), and the lower 3.1 miles of the North Fork Coquille River (AU OR_SR_1710030504_02_104981).

## Coquille River mainstem RM 20 to RM 35.6

The Coquille River estuary is designated as a Shallow Draft Development estuary under the Oregon Estuary Classification system. The geomorphology of the area is that of a Drowned River Mouth estuary. Generally, in drowned river mouth estuaries, freshwater inflows are large in the winter season, and they are highly stratified and well flushed with fairly short residence times (Simenstad 1983). In the summer, as freshwater inflows decrease relative to marine inputs, these estuaries become well-mixed, largely due to tidal action (Nature Conservancy, 2008).

A 2012 USGS Report titled "Preliminary Assessment of Channel Stability and Bed-Material Transport in the Coquille River Basin, Southwestern Oregon" identified the reach from the mouth of the Coquille to the confluence of the North and South Fork Coquille Rivers as a "low-gradient reach that promotes deposition of bed and suspended loads from upstream sources". The report goes on to say gradients are much lower in this reach than in upper parts of the watershed (0.00002 m/m) and substantial transport of gravel-sized bed material is unlikely. Bedload, and consequently most bed material in this reach, is mostly sand and finer particles, much of which was likely transported as suspended load from the steeper upstream sections (USGS 2012), which is not the loose, clean gravel preferred by spawning resident trout.

Multiple anthropogenic processes and disturbances such as agriculture, logging, dredging, mining and splash damming have had substantial effects on sediment yield and transport and channel morphology within the Coquille River basin, and the riverine subsystem channel is highly modified (USGS, 2012). Splash damming in the Coquille River basin likely increased the frequency and magnitude of peak floods and associated flux of sediments within the river network and scouring of the channel bed (possibly to bedrock) (USGS, 2012). Other alterations to maximize splash dam efficiency, such as blasting of boulders and removal of in-channel wood and riparian vegetation, also contributed to reducing channel complexity while increasing sediment flux and bank instability (Benner, 1991).

The lower section of the riverine subsystem has a wide channel with one large island (Randolph Island) and five small islands. Depths average 10-20 feet (Kreag, 1979). In the mid-section the channel narrows and averages 10-15 feet deep. One hole more than 60 feet deep is located at RM 16. The upper section is narrow and shallow. Reimers et al. (1978) found several areas less than 6 feet deep in the summer and no areas deeper than 20 feet. As a result of subsidence, dikes and tidegates must be adequately maintained in many areas to prevent permanent flooding. Although they commonly keep summer high tides from flooding the valley, winter freshwater flow (resident trout spawning period) often floods the entire valley (Kreag, 1979).

The anatomy of the Coquille River mainstem is not suitable for resident trout spawning. Shallow riffle habitats preferred by spawning trout are absent in this tidally influenced reach. DEQ staff sampled the mainstem Coquille at River Mile 30 for the National Rivers and Streams Assessment (NRSA) in 2014 and 2018 (Figure 6, Table 2). Data collected at the site from the 2014 event identified the reach as 100% slow water (glides + pools). Loose, clean gravel substrates, preferred by resident trout, are also not present in this reach. Substrate samples during the 2014 event were 100% sand and fines. Mean water depth in the thalweg of 7.6 feet in August, generally considered a low flow time, exceeds levels preferred by resident trout of less than 1.0 feet (ODFW, 1985, USDA, 2007).

| Mean wetted width, m | Mean depth, ft. | Percent fines | Percent sand and fines | % slow water (glides + pools) | Protocol |
|---|---|---|---|---|---|
| 47.3 | 7.6 | 100 | 100 | 100 | Boatable |

*Table 2. 2014 Habitat Measurements, Coquille River mainstem at River Mile 30*

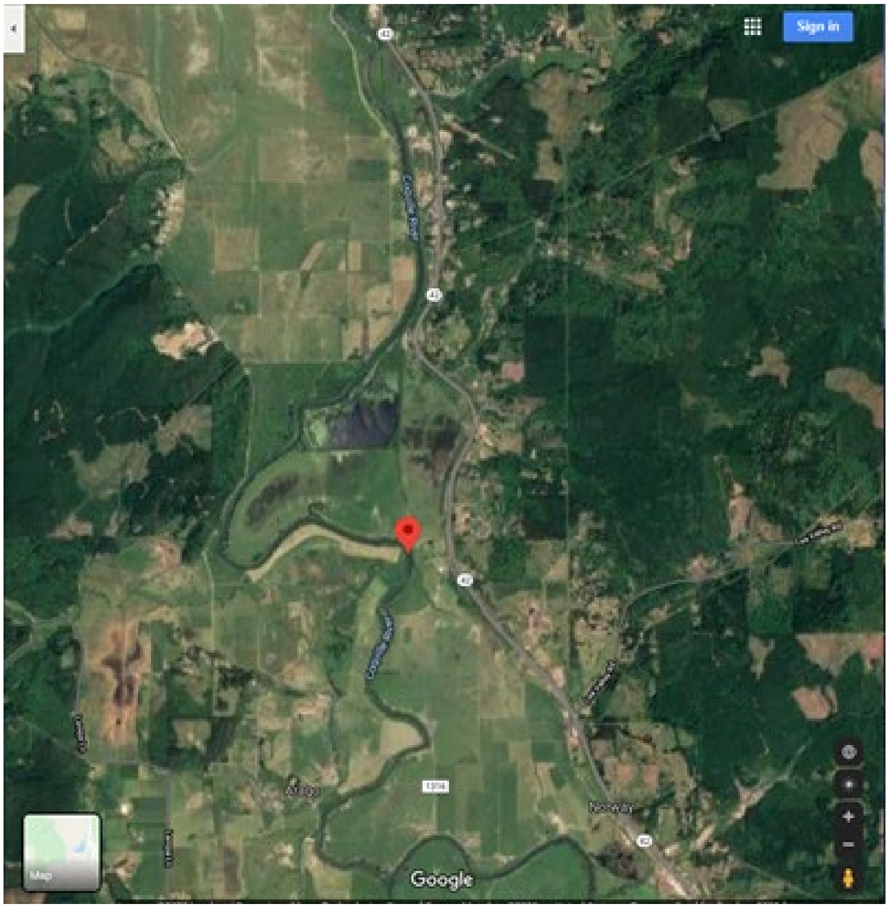


*Figure 7: 2014 NRSA monitoring location Coquille River mainstem, RM 30.*

Incoming and outgoing tides result in flow reversals and regular periods of slack water in this reach of the Coquille. The National Atmospheric and Oceanic Administration (NOAA) maintains a tide gage at river mile 25.5 on the mainstem of the Coquille River. Although data records are not available for the spawning time-period of February through June, daily fluctuation of tides can be seen for the October 2017 dates (Figure 7). This daily fluctuation in tides and regular periods of slack water precludes resident trout from spawning in the mainstem. The mean range of tidal fluctuation for the time-period June 24, 2017 through October 18, 2017 was 3.98 feet.

The physical characteristics of the Coquille River channel related to the natural features of the waterbody do not provide a proper flow regime for resident trout spawning and prevent the formation of riffles. These conditions are determined to be unrelated to water quality and preclude attainment of intergravel dissolved oxygen sufficient to support resident rainbow trout and coastal cutthroat spawning. If the mainstem were fully restored to historic conditions, trout spawning would not occur due to the tidal nature of flows in the mainstem.

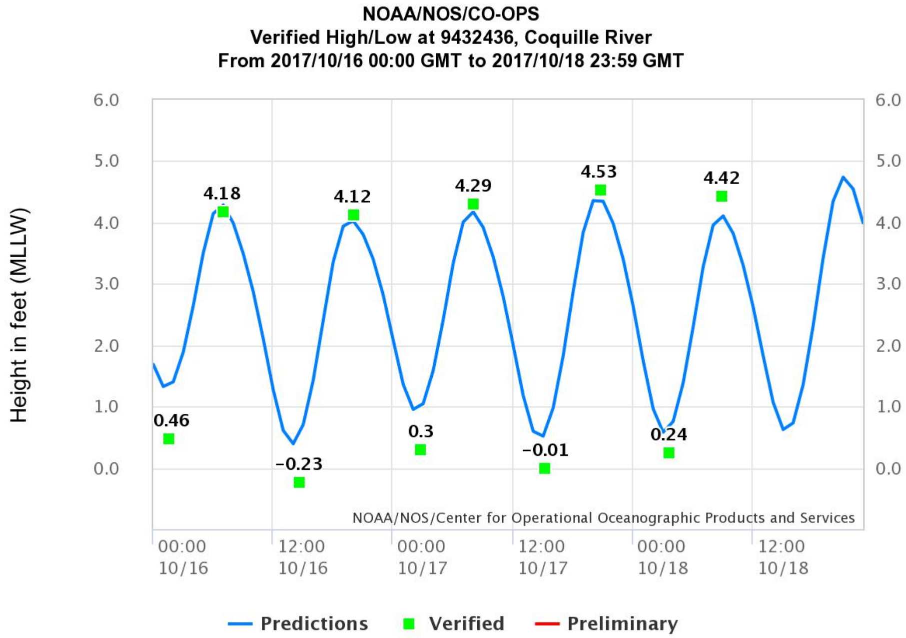


*Figure 8: Graph of daily tidal inundation on the Coquille River, River Mile 25.5, October 2017*

## South Fork Coquille River RM 0 to RM 2.8 (AU_ID OR_SR_1710030502_02_104970

The mainstem Coquille River is a tidally influenced river segment encompassing from the mouth of the Coquille River for approximately 41 miles, which extends into the lower South Fork Coquille River to approximately RM 2.8. The channel in this tidally affected reach of the lower South Fork Coquille is composed primarily of alluvium and is also a low-gradient reach that promotes the deposition of bed and suspended loads from upstream sources (USGS, 2012). CMECS classifies substrates in the South Fork Coquille River as fine unconsolidated mineral substrate of sandy mud (particle size < 2 mm) from the confluence of the Coquille mainstem to the mouth of the Middle Fork Coquille River, approximately RM 0 – 2.8 (Soils, 2013). The width of the active channel varies from 28 to 62 meters, and particle measurements as cited in the USGS report, from a 2003 Clearwater Biostudies report indicated that median particle sizes (D50) and fine sediments increased in riffles as the river approached its confluence with the North Fork Coquille River (USGS, 2012, LiDAR 2008)

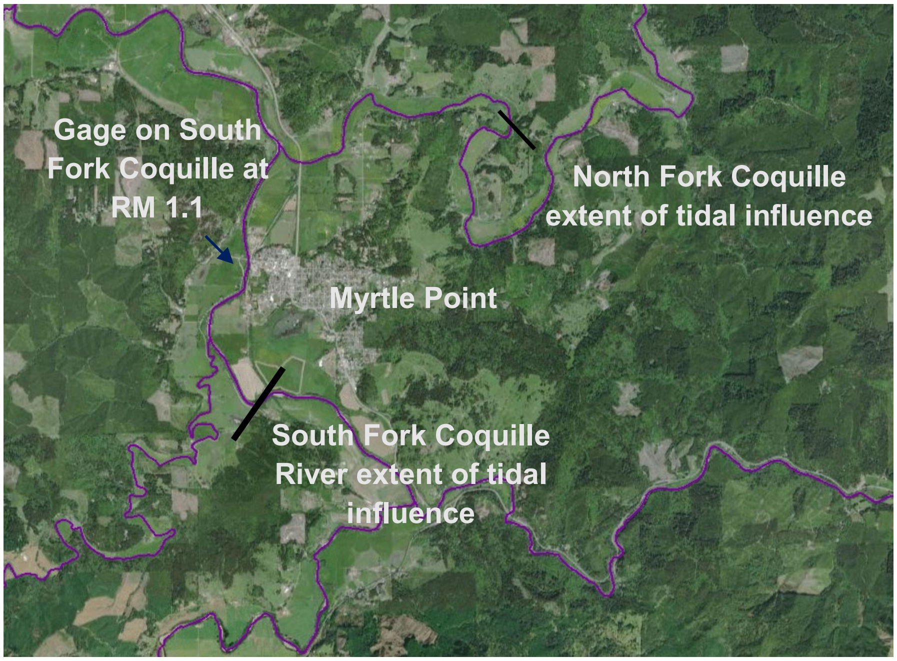


*Figure 9: Map of tidally influenced reaches of the North and South Fork Coquille Rivers*

Similar to the mainstem, incoming and outgoing tides result in flow reversals and regular periods of slack water on the South Fork. The US Geological Survey (USGS) maintains a gage that records gage height at river mile 1.1 in Myrtle Point (Figure 9). Daily fluctuation of tides are evident through the gage height measurement (Figure 10). This daily fluctuation in tides and regular periods of slack water preclude resident trout from spawning in this reach.

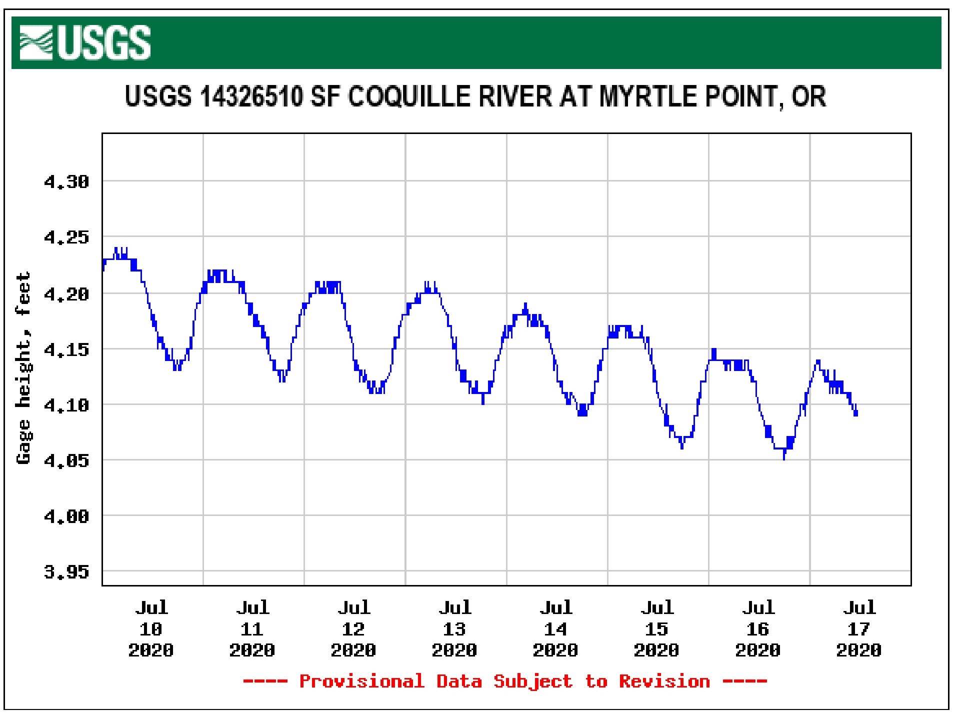


*Figure 10: Figure 11: Gage height at USGS Gage 14326510, South Fork Coquille River at Myrtle Point, OR for the period July 10 through July 17, 2020*

## North Fork Coquille River RM 0 to RM 3.1 (AU_ID OR_SR_1710030504_02_104981)

*Figure 11: North Fork Coquille River near Gravelford as taken from Preliminary Assessment of Channel Stability and Bed-Material Transport in the Coquille River Basin, Southwestern Oregon. USGS Open-File Report 2012-1064*

The North Fork of the Coquille River is tidally affected to approximately RM 3.1. This lower reach is a relatively confined channel that flows over sand and clay and between muddy banks (USGS, 2012). CMECS also classified the North Fork Coquille River as fine unconsolidated mineral substrate of sandy mud (particle size < 2 mm), from the confluence with the Coquille mainstem to a location above the point of tidal influence at RM 3.1 (Soils, 2013). Similar to the South Fork and the mainstem, it is a low-gradient reach that promotes deposition of bed and suspended loads from upstream sources. The active channel is relatively wide and extends up to 48 meters wide near the river's mouth (USGS, 2012, LiDAR 2008).

### Highest Attainable Use

The highest attainable use in the mainstem Coquille River (RM 20 to RM 35.6), South Fork Coquille River (RM 0 to RM 2.8), and North Fork Coquille River (RM 0 to RM 0.6) is juvenile trout rearing and migration, but does not include resident trout spawning. Spawning by resident trout is precluded in the tidally influenced waters of these wide main channel reaches because pool and riffle habitats are not present and velocities in tidal waters are not sufficient to aerate redds. Salmonid redds are typically bowl-shaped depressions with a deeper, more abrupt depth gradients at the leading edge (upstream), gradually tapering to shallower depths on the tail end (downstream) (Figure 13). This redd geometry facilitates intrusion of oxygenated water from the overlying flow into the redd and its gravels. Slack water or flow reversal, such as in these tidally influenced reaches of the Coquille, does not achieve the flow conditions necessary to adequately circulate the redd and intergravel water.

Johnston as cited in Johnson et al., 1999 identified that redds are primarily built in the tails of pools in streams with low stream gradient and low flows, usually less than 0.3 $m^3/s$ during the summer (Johnston 1982). The size of coastal cutthroat spawning streams is well summed up by R. Dimick, founder of Oregon State University's Department of Fisheries and Wildlife: "You can step across a cutthroat spawning stream, but you have to jump a steelhead stream" (C. Bond[3]) as cited in Johnson et al., 1999. Cutthroat trout spawning generally occurs upstream of Coho salmon and steelhead spawning zones, although some overlap may occur (Lowry 1965, Edie 1975, Johnston 1982) as cited in Johnson et al., 1999. Coastal cutthroat trout are found in streams with channel gradients that vary from low (< 2%) to moderate (2-3%) or steep (> 4%), with narrow widths (0.7 - 3.0 m) (Hartman and Gill 1968, Edie 1975, Glova 1978, Moore and Gregory 1988, Jones and Seifert 1997). They are often in small watersheds with drainage areas under 13 $km^2$ (Hartman and Gill 1968) as cited in Johnson et al., 1999.

The leaflet produced by the United State Department of Agriculture, Natural Resource Conservation Service, specified that tributaries and inlet and outlet streams containing gravels between one-half and three-inches in size are the most suitable resident trout spawning habitats. Riffle and pool tail-out habitats with well-aerated gravels free of sediment are ideal spawning habitat. Sufficient water depth and sediment-free spawning gravels are critical to ensure that water can percolate through the spaces in the gravel, bringing oxygen to the eggs and removing metabolic wastes associated with incubation and hatching (USDA NRCS, 2000).

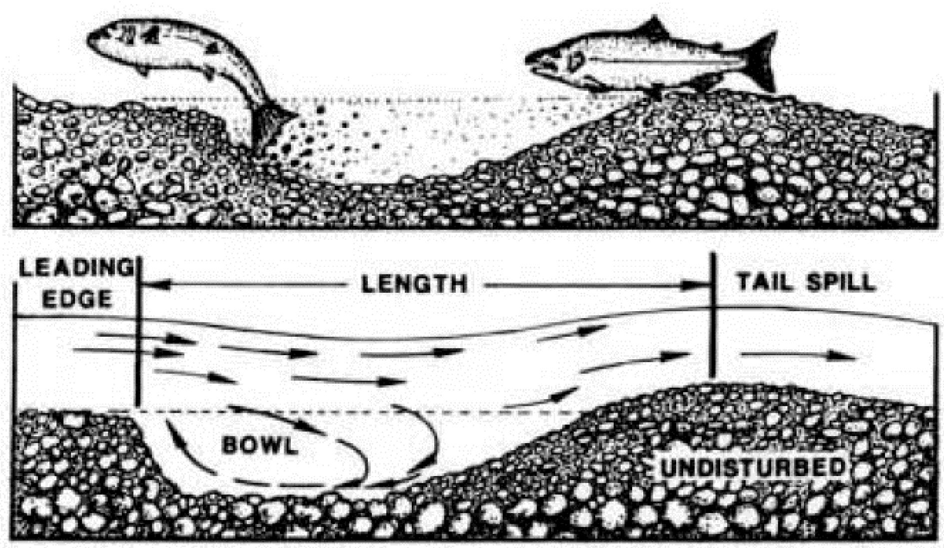


*Figure 12: From: Lorenz and Eiler 1989. Spawning habitat and redd characteristics of Sockeye Salmon in the Glacial Taku River, British Columbia and Alaska. Transactions of the American Fisheries Society, 118: 495-502*

Oregon Department of Fish and Wildlife, concurs with DEQ's determination that tidally reversing flows prevent the formation of riffles and preclude the adequate aeration of redds needed to support resident rainbow trout and coastal cutthroat spawning and egg development in the tidally influenced fresh waters of the mainstem Coquille River (RM 20 to RM 35.6), South Fork Coquille River (RM 0 to RM 2.8), and North Fork Coquille River (RM 0 to RM 3.1) (see attached letter). These areas are not active spawning areas used by resident trout, and therefore, the spawning criterion for dissolved oxygen does not apply.

[3] C. Bond, Department of Fisheries and Wildlife, Oregon State University, Corvallis, OR 97331-3803. Pers. commun. to O. Johnson. February 1994 as cited in Johnson et al., 1999.

| | Cutthroat trout | Rainbow trout | Coquille mainstem (RM 0 to RM 35.6) | South Fork (RM 0 to RM 2.8) | North Fork (RM 0 to RM 3.1) |
|---|---|---|---|---|---|
| **Spawning Season** | December through June[4] | January to July[5] | N/A | N/A | N/A |
| **Spawning habitat** | Headwater, tributary streams[4] | Tributaries and inlet and outlet streams[6] | Mainstem channel - mean wetted width 47.3 meters | 28 to 62 meters active channel[7] | ≥ 48 meters at mouth[7] |
| **Substrate** | Loose, clean gravel (gravel less than 3.35 in. in diameter)[8] | Silt-free, gravel/pebbles (1.0 to 3 inch diameter)[6] | 100% sand and fines | Unconsolidated mineral substrate, sandy mud[9] | Unconsolidated mineral substrate, sandy mud [9] |
| **Stream anatomy** | Shallow riffles[10] | Riffles, above or below pools[11] | Slow water (glides + pools) | Slow water (glides + pools)[11] | Slow water (glides + pools)[12] |
| **Water velocity** | 0.95 to 2.95 ft/sec[13] | 1.25 to 2.05 ft/sec[14] | tidally influenced* | tidally influenced* | tidally influenced* |
| **Water depth** | > 0.65 feet[15] | > 1.0 foot[16] | 7.6 feet in thalweg - August | ~ 2.5 meters | ~ 6 meters |

* USGS gage only maintains gage height since discharge is difficult to measure because of tidal influence.

*Table 3. Resident trout spawning requirements*

[4] Johnson, O.W., Ruckelshaus, M.H., Grant, W.S., Waknitz, F.W., Garrett, A.M., Bryant, G.J., Neely, K., and Hard, J.J. NOAA Technical Memorandum: Status Review of Coastal Cutthroat Trout from Washington, Oregon, and California. NOAA-NMFS-NWFSC TM-37. 1999.
[5] Raleigh, R., Hickman, T., Solomon, R.C. and Nelson, P. Habitat Suitability Information: Rainbow Trout. US Department of the Interior, U.S. Fish and Wildlife Service, 1984.
[6] United State Department of Agriculture, Natural Resource Conservation Service, Rainbow Trout (Oncorhynchus mykiss) leaflet, 2000.
[7] Jones, K.L., O'Connor, J.E., Keith, M.K., Mangano, J.F., and Wallick, JR. Preliminary Assessment of Channel Stability and Bed-Material Transport in the Coquille River Basin, Southwestern Oregon. USGS Open-File Report 2012-1064.
[8] United State Department of Agriculture, Natural Resource Conservation Service, Cutthroat Trout (Oncorhynchus clarki) leaflet. 2007.
[9] Lanier, A., T. Haddad, L. Mattison, and L. Brophy. 2014. Core CMECS GIS Processing Methods. Oregon Estuary Project of Special Merit. Page 40. Oregon Coastal Management Program, Oregon Department of Land Conservation and Management, Salem, Oregon.
[10] Crocker, John. The Life History Fundamentals of Sea-Run Cutthroat Trout. September 13, 1995. https://odfw.forestry.oregonstate.edu/conference/cuthist.html
[11] Rainbow Trout/Steelhead Life History and Habitat Requirements Southwest, Southcentral, and Western Regions, https://www.adfg.alaska.gov/anadromouspdfs/Rainbow_Steelhead.pdf
[12] Google Earth
[13] Figure 13b. Cutthroat Spawning Velocity Preference. Beecher, H., Caldwell, B. and Pacheco, J. Technical and Habitat Suitability Issues Including Fish Preference Curves. Washington Department of Fish and Wildlife and Washington Department of Ecology. Updated March 9, 2016.
[14] Figure 10b. Resident Rainbow Trout Spawning Velocity Preference. Beecher, H., Caldwell, B. and Pacheco, J. Technical and Habitat Suitability Issues Including Fish Preference Curves. Washington Department of Fish and Wildlife and Washington Department of Ecology. Updated March 9, 2016.
[15] Figure 13a. Cutthroat Trout Spawning Depth Preference. Beecher, H., Caldwell, B. and Pacheco, J. Technical and Habitat Suitability Issues Including Fish Preference Curves. Washington Department of Fish and Wildlife and Washington Department of Ecology. Updated March 9, 2016.
[16] Figure 10a. Resident Rainbow Trout Spawning Depth Preference. Beecher, H., Caldwell, B. and Pacheco, J. Technical and Habitat Suitability Issues Including Fish Preference Curves. Washington Department of Fish and Wildlife and Washington Department of Ecology. Updated March 9, 2016.

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Bottom, D.L., Howell, P.J., and Rodgers, J.D. The Effects of Stream Alterations on Salmon and Trout Habitat in Oregon, Oregon Department of Fish and Wildlife. 1985.

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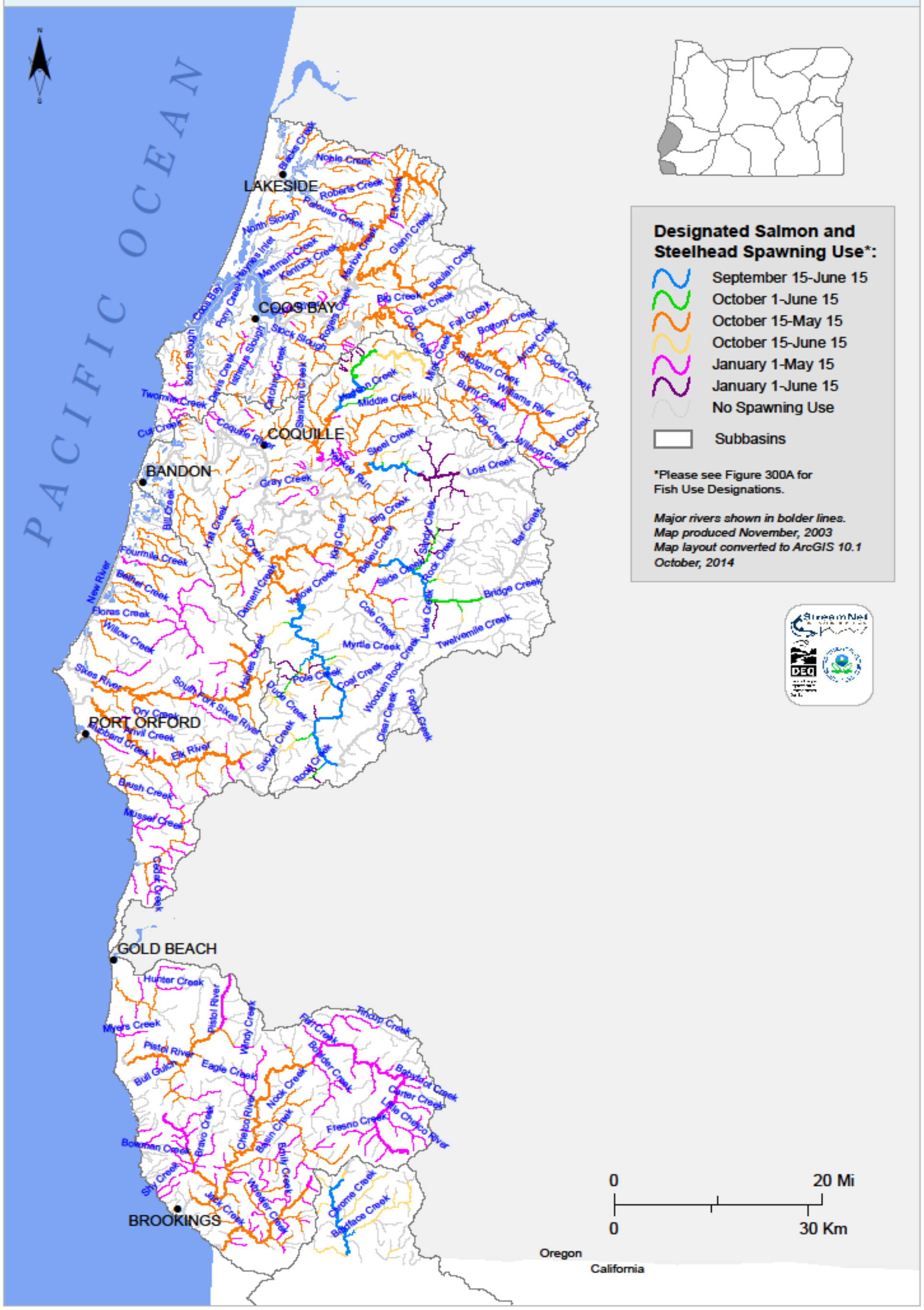
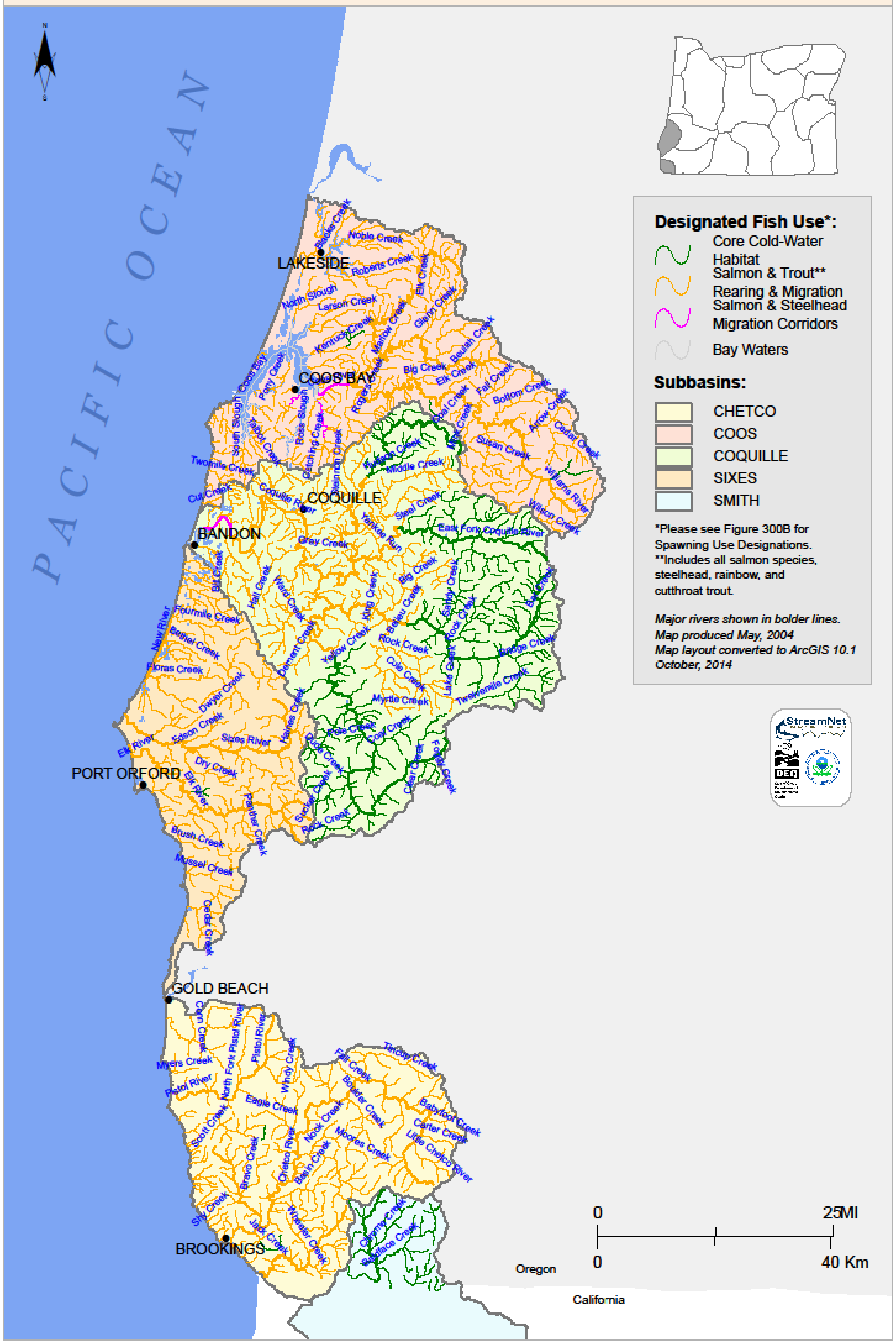
Appendix 1. Fish Use Designations for the Coquille and the South Coast
(See file:///C:/Users/dsturde/Downloads/340-041-0300%20(3).pdf to enlarge.)

*Figure 300B: Salmon and Steelhead Spawning Use Designations**
*SOUTH COAST BASIN, OREGON*



*Draft Revised Figure 300A: Fish Use Designations**
*SOUTH COAST BASIN, OREGON*



Attachment 1. Letter from ODFW dated August 24 2007.

# Oregon

Theodore R. Kulongoski, Governor

**Department of Fish and Wildlife**
Charleston District Office
63538 Boat Basin Drive
PO Box 5430
Charleston, OR 97420
(541) 888-5515
FAX (541) 888-6860

August 22, 2007

State of Oregon
Department of Environmental Quality
RECEIVED
AUG 24 2007
COOS BAY OFFICE

Pam Blake
Department of Environmental Quality
381 N Second St.
Coos Bay, OR 97420

Dear Ms. Blake,

This letter is in response to your request regarding the potential for resident trout spawning in the Coquille River mainstem from river mile 0-35.6. River mile 35.6 on the Coquille is located below the North Fork Coquille confluence. Due to the tidal nature present through this entire reach and a substrate composed primarily of silt/mud, resident trout would not be expected to spawn in this section of the river.

Resident trout are present in many of the tributaries entering the Coquille in this reach. Spawning habitat for these fish would be areas composed of gravel and cobbles generally upstream from the area of tidal influence. Eggs developing in redds require water flow through the gravel to provide oxygen and remove waste products. A consistent current fulfills this requirement better than tidal action which results in upstream and downstream currents plus periods of no current during a tidal cycle.

Feel free to contact me if you have any questions.

Sincerely,

Alan Ritchey

Alan Ritchey
Assistant District Fish Biologist

Cc: M. Gray ODFW