OREGON COASTAL WATERSHED HEALTH INDICATORS AND CRITERIA

Aquatic

Indicator	Definition	Criteria
Water temperature	Changes in water temperature patterns that affect aquatic life.	**Limiting**: > 64 deg. F **Moderate**: 62 - 64 deg. F **Adequate**: 42 - 62 deg. F **Insufficient Information**:
Water quality	Changes in water quality, both harmful to fish and public health. Evaluated based on the extent to which parameters meet or exceed DEQ standards.	**Limiting**: Does not attain DEQ water quality criteria. Greater than 10% of the samples exceed the appropriate criteria. Moderate: Intermediate in severity or extent of water quality criteria violations. **Adequate**: Attains DEQ water quality criteria. Greater than 90% of the samples meet the appropriate criteria. **Insufficient Information**:
Water quantity	Inadequate summer stream flows that limit fish production and increase water temperatures. Elevated winter peak flow magnitudes that increase scour, bank erosion, and/or otherwise degrade channel function and fish habitat.	Measurement: Significant departure from normal stream flow regime. **LOW FLOWS** **Limiting**: Stream flow restoration priorities categories 3 (high) and 4 (highest) See example at this link **Example**. **Moderate**: Category 2 (moderate) Adequate: Category 1 (low) **Insufficient Information**: **PEAK FLOWS** **Limiting/Moderate/Adequate**: Can be estimated if watershed analysis or other studies have information that addresses peak flows; otherwise the rating will be **Insufficient Information**:
Spawning gravel quantity	Sufficient spawning gravel available to produce enough fry to seed the rearing habitat given adequate adult escapement, as defined by ODFW habitat benchmarks for percent of riffle area covered with gravel.	Measurement: Spawning gravel quantity (as measured by percent riffle area covered in gravels): **Limiting**: <15% **Moderate**: 15% - 35% **Adequate**: >35% **Insufficient Information**:
Spawning gravel quality	The quality of spawning gravel as measured by the degree of embeddedness in comparison to reference conditions for the stream type and geology, as defined by ODFW benchmarks for percent of riffle area covered with fine sediments.	Measurement: Spawning Gravel Quality as indicated by substrate embeddedness (percent riffle area in silt, sand, and organics). **Limiting**: Volcanic parent material: >15%; Sedimentary parent material: >20%; Channel gradient <1.5%: >25% **Moderate:** Volcanic parent material: 8% - 15% ; Sedimentary parent material: 10% - 20%; Channel gradient <1.5%: 12% - 25% **Adequate**: Volcanic parent material: <8%; Sedimentary parent material: <10% ; Channel gradient <1.5%: <12% **Insufficient Information**:
Stream complexity: winter rearing habitat	From Coho Conservation Plan (2006): "Stream complexity and high quality over-winter rearing habitat refer to the same thing." Present only in areas where the stream is fairly low gradient (less than 2%) and there are broad valley areas near the stream. Usually recognizable by one or	**Limiting**: A simple channel containing a fairly uniform flow and few of the high quality habitat types. **Moderate**: An unconfined stream network that contains few of the high quality habitat types.

	more of the following features: large wood, pools, connected off-channel alcoves, beaver ponds, lakes, and connected floodplains and wetlands.	**Adequate**: A meandering stream network with complex channels containing a mixture of the high quality habitat types that provide areas with different velocity and depth for use at different fish life stages. **Insufficient Information**:
Stream complexity: summer rearing habitat	Complex summer rearing habitat includes the components above with an emphasis on appropriate water temperatures, accessible areas of cold water refugia, and abundant complex pools with adequate depth, structure, and hiding cover.	**Limiting**: A simple channel containing a fairly uniform flow and few of the high quality habitat types. **Moderate**: low-moderate percent of summer stream surface area is pools; or pools lack the complexity of large wood, or low overhanging riparian vegetation. **Adequate**: Much of stream surface area is in pools, with considerable woody structure in the pools for cover (submerged large wood, and/or riparian vegetation extending low over or into pools). Adequate habitat also includes beaver ponds and lakes. **Insufficient Information**:
Large wood	Large in-channel wood (usually conifer) that forms pools and/or provides complex structure and hiding cover, as defined by ODFW benchmarks for number of pieces and/or volume.	Measurement: Large wood volume (m^3/100m stream length) and number of pieces (per 100 m stream length): **Limiting**: Pieces: >10; Volume: >20 **Moderate**: Pieces: 10 - 20 ; Volume: 20 - 30 **Adequate**: Pieces: >20 ; Volume: >30 **Insufficient Information**:
Barriers	Fragmented aquatic habitats that affect the dispersal of aquatic life and reduce access to key habitats. This includes structures blocking fish passage and unscreened water diversions. For example, reduced access to spawning/rearing habitat in tributaries from a culvert that is a barrier to fish passage.	Assessment based on the percent of habitat blocked by barriers or degree of blockage. **Limiting**: Complete blockage to fish movement into high quality spawning and/or rearing habitat; or significant quantities of high quality habitat inaccessible due to barriers. **Moderate**: Barriers limit (partial blockage) fish movement into high quality spawning and/or rearing habitat. **Adequate**: There are no barriers. **Insufficient Informatio**n:
Channel modification	A stream channel that is altered from its normal channel movement, particularly providing an abundance of low velocity habitats. Typical channel modifications include gravel extraction, channel straightening, bank armoring and channel relocation. These actions reduce key habitat features such as pools, gravel bars, lateral scour pools, side channels and habitat complexity.	Qualitative assessment: **Limiting**: The stream channel network has been impacted by extensive instream or riparian work (e.g., riparian area roads that confine the stream, or channelization). The stream channel network has been channelized or relocated, particularly in areas with potentially high habitat quality (low gradient streams that would be unconfined without the impact). **Moderate**: Some portions of the stream channel network have been impacted by channelization or other measures. **Adequate**: Natural channel; no human impacts. **Insufficient Information**:
Invasive species	Non-native animal and plant species that affect the aquatic environment. Includes exotic fish species that compete with, prey on, or displace native fish species.	Qualitative assessment incorporating both severity of impacts and spatial extent: **Limiting**: Abundant exotic fish species that impact coho production; key limiting factor for coho populations according to Coho Conservation Plan (i.e., primary lake systems: Siltcoos, Tahkenitch, and Tenmile); non-native plant species that affect aquatic productivity and/or water quality. **Moderate**: Exotic species are limited in spatial extent or moderate overall impact on aquatic productivity and/or water quality. **Adequate**: There are minimal or no non-native species present. **Insufficient Information**:
Hatchery impacts	Impacts to wild anadromous fish populations from improper hatchery management, including the following possible risk factors: genetic (inbreeding, unintentional natural selection, etc), ecological (competition, carrying capacity, etc.), behavioral, diseases, and other factors.	Qualitative assessment: **Limiting**: Substantial hatchery impacts to fish populations; key limiting factor for coho populations according to Coho Conservation Plan (i.e., Salmon Watershed). **Moderate**: Some hatchery impacts to fish populations. **Adequate**: There are no or minimal hatchery impacts. **Insufficient Information**:

Riparian

Indicator	Definition	Criteria
Riparian stand condition	Riparian stand conditions that affect normal succession to native vegetation (for example, blackberry areas) or influence the recruitment of large wood to the aquatic system (for example, an alder stand where there would normally be conifers).	Measurement: Stand composition, size and structure (within 150 feet of stream). **Limiting** : Current stand conditions do not provide reference functions; composition, size or structure are below reference condition. May include stands that are recently planted, and areas heavily impacted from invasive species or other factors that affect normal successional processes. **Moderate**: Stand composition is similar to reference condition for site; however stand size is too small to provide reference functions and/or stand composition is below reference conditions (e.g., confifer plantations with large tree size but lacking multi-storied structure). **Adequate**: Stand composition, size and structure are similar to reference condition for the given location. **Insufficient Information :**
Riparian roads	Roads prevent establishment of native streamside vegetation, deliver sediment, interrupt ground water flow, and provide a pathway for non-native exotic species.	Measurement: Lineal miles of road within the riparian area per mile of stream. **Limiting**: > 0.1 mile of road per mile of stream **Moderate**: > 0.1 but < 0.04 mile of road per mile of stream **Adequate**: < 0.04 mile of road per mile of stream **Insufficient Information:**
Invasive species	Non-native plants and animals that modify riparian habitats and displace native species.	Qualitative assessment: **Limiting**: Abundant invasive species are impacting riparian vegetation or normal successional processes. **Moderate**: Invasive species are limited in spatial extent or minimal overall impact on riparian function. **Adequate**: There are no or minimal invasive species present. Insufficient Information :

Freshwater Wetlands

Indicator	Definition	Criteria
Wetland habitat loss	Loss of wetlands due to drainage, dredging, deposition of dredged material, levees, diking, tiling, development, and other means. Loss of wetlands impacts water quality, water storage, flood abatement, and wildlife habitat.	Qualitative assessment: **Limiting**: Wetlands have been impacted by extensive ditching, draining, filling, tiling, development, and other human-caused destruction. **Moderate**: Some wetlands have been impacted by draining, filling and other measures. **Adequate**: Naturally occurring wetlands present, no human impacts. **Insufficient Information:**
Wetland habitat function	Alterations to existing wetlands that reduce wetland functions - water filtering, flood storage, and wildlife habitat.	**Limiting**: <30% functional **Moderate**: 30-50% functional **Adequate**: >50% functional **Insufficient Information**:
Wetland connectivity	Loss and/or degradation of the physical connection between surface water sources and wetlands. In the context of this assessment wetland connectivity relates primarily to the loss of access by juvenile salmonids to off-channel wetland habitats.	Qualitative assessment: **Limiting**: Widespread wetland connectivity loss due to diking, impassible barriers, channel downcutting, or other physical barriers that restrict juvenile access to wetland habitats. **Moderate**: Some wetland connectivity loss, however opportunities for off -channel wetland use remain. **Adequate**: Naturally occurring wetland connectivity is present. **Insufficient Information**:

Uplands

Indicator	Definition	Criteria
Hydro modification	Roads, impervious surfaces, and land uses that affect water runoff timing, magnitude of peak and low flows, and storage.	Measurement: Percent of watershed area in urban or agricultural use: **Limiting**: > 30% **Moderate**: 5%-30% **Adequate**: < 5% **Insufficient Information:**
Fine sediment sources	Increased sediment delivery to the aquatic system from changes in land use patterns and management. For example, road practices or other land use management that increase soil erosion rates and delivery to stream channels.	Qualitative assessment: **Limiting**: Roads or other land management activities are delivering significant quantities of sediment to the stream network. **Moderate**: Roads or other land management activities are delivering some quantities of sediment to the stream network; or sediment impacts are limited in spatial extent. **Adequate**: Minimal sediment contributions to the stream network from upland land movement activities. **Insufficient Information**:
Invasive species	Non-native plants and animals that modify terrestrial habitats and displace native species.	Qualitative assessment: **Limiting**: Abundant invasive species are impacting terrestrial habitat or normal successional processes. **Moderate**: Invasive species are limited in spatial extent or minimal overall impact on terrestrial habitat function. **Adequate**: There are no or minimal invasive species present. **Insufficient Information**:
Habitat Fragmentation	Fragmented terrestrial habitats that affect wildlife/plant dispersal and connectivity across the landscape. Human-caused forest fragmentation is one metric that can be used to evaluate the extent of habitat fragementation in the Oregon Coast Range.	Measurement: Mean human-caused forest fragmentation rating (scale of 1-100): **Limiting**: Mean fragmentation rating greater than of 27 **Moderate**: Mean fragmentation rating of 8-27 **Adequate**: Mean fragmentation rating less than 8 **Insufficient Information**:
Upland Large Wood Recruitment	NOTE: 8/17/2007 WPN IS INVESTIGATING THE UTILITY OF USING GIS LAYERS TO CALCULATE AN INDICATOR FOR THIS FACTOR.	**Limiting**: INTENTIONALLY BLANK **Moderate**: **Adequate**: **Insufficient Information**:

Tidal Wetlands

Indicator	Definition	Criteria
Hydro-modification	Man-made alterations that restrict tidal flow, hydrologic alterations can reduce or greatly alter nearly all tidal wetland functions, and in some cases completely eliminate those functions.	Extent of wetlands altered by restricted flow. **Limiting**: > 40% of historic wetland area modified **Moderate**: 20-40% of historic wetland area modified **Adequate**: <20% of historic wetland area modified **Insufficient Information:**
Sediment regime	Increased or reduced sediment delivery to the tidal wetlands from changes in land use patterns and management.	Qualitative assessment of the alteration of the sediment regime - both increased and decreased sediment delivery. **Limiting**: > 40% of wetlands affected by major change in sediment regime **Moderate**: 20 - 40% of wetlands affected by major change in sediment regime **Adequate**: < 20% of wetlands affected by major change in sediment regime **Insufficient Information:**
Water quality	Changes in water quality, both harmful to fish and public health. Evaluated based on the extent to which parameters meet or exceed DEQ standards.	**Limiting**: Does not attain DEQ water quality criteria. Greater than 10% of the samples exceed the appropriate criteria. **Moderate**: Intermediate in severity or extent of water quality criteria violations. **Adequate**: Attains DEQ water quality criteria. Greater than 90% of the samples meet the appropriate criteria. **Insufficient Information:**
Vegetation modification	Change or reduction of wetland vegetation through agricultural or other management practices. Tillage, grazing and logging compact soils, contribute to soil erosion of channel banks, and reduce vegetation diversity and wildlife habitat.	Qualitative assessment of the percent of vegetation in existing wetlands modified by land management practices. **Limiting**: > 40% of wetland vegetation modified by land management practices **Moderate**: 20 - 40% of wetland vegetation modified by land management practices **Adequate**: < 20% of wetland vegetation modified by land management practices **Insufficient Information:**
Invasive species	Non-native species that displace native species and alter the tidal wetland ecosystem. These species are characteristically adaptable, aggressive, and have a high reproductive capacity.	**Limiting**: Invasive species are having a significant effect on tidal wetland functions. **Moderate**: Invasive species are limited in spatial extent or moderate overall impact on tidal wetland functions. **Adequate**: There are no/minimal invasive species or they are exhibiting no measurable effect on tidal wetland function. **Insufficient Information:**
Wetland loss (Complete)	Wetland loss occurs with complete fill and conversion to developed uses, or other irreversible changes. In contrast to hydro-modification, this refers to historic conversion to cities, developments, etc. with no opportunity for restoration.	Rough measure of long term-direct impacts of human development of the coastal zone. **Limiting**: > 40 % complete fill or conversion **Moderate**: 20-40% complete fill or conversion **Adequate**: < 20% complete fill or conversion **Insufficient Information:**

Tidal Flats

Indicator	Definition	Criteria
Hydro-modification	Man-made alterations that restrict tidal flow.	Extent of tidal flats altered by restricted flow. **Limiting**: > 40% of historic tidal flat area modified **Moderate**: 20-40% of historic tidal flat area modified **Adequate**: <20% of historic tidal flat area modified **Insufficient Information:**
Sediment regime	Increased or reduced sediment delivery to the tidal flats from changes in land use patterns and management.	Qualitative assessment of the alteration of the sediment regime - both increased and decreased sediment delivery. **Limiting**: > 40% of tidal flats affected by major change in sediment regime **Moderate**: 20 - 40% of tidal flats affected by major change in sediment regime **Adequate**: < 20% of tidal flats affected by major change in sediment regime **Insufficient Information**:
Water quality	Changes in water quality, both harmful to fish and public health. Evaluated based on the extent to which parameters meet or exceed DEQ standards.	**Limiting**: Does not attain DEQ water quality criteria. Greater than 10% of the samples exceed the appropriate criteria. **Moderate**: Intermediate in severity or extent of water quality criteria violations. **Adequate**: Attains DEQ water quality criteria. Greater than 90% of the samples meet the appropriate criteria. **Insufficient Information:**
Invasive species	Non-native species that displace native species and alter the tidal flat ecosystem. These species are characteristically adaptable, aggressive, and have a high reproductive capacity.	Invasive species can have variable effects on tidal flats. **Limiting**: Invasive species are having a significant effect on tidal flat functions. **Moderate**: Invasive species are limited in spatial extent or moderate overall impact on tidal flat functions. **Adequate**: There are no/minimal invasive species or they are exhibiting no measurable effect on tidal flat function. **Insufficient Information:**
Tidal flat loss (Complete)	Tidal flat loss occurs with complete fill and conversion to developed uses, or other irreversible changes. In contrast to hydro-modification, this refers to historic conversion to cities, developments, etc. with no opportunity for restoration.	Rough measure of long term-direct impacts of human development of the coastal zone. **Limiting**: > 40 % complete fill or conversion **Moderate**: 20-40% complete fill or conversion **Adequate**: < 20% complete fill or conversion **Insufficient Information:**

Sub-Tidal Zone

Indicator	Definition	Criteria
Hydro-modification	Man-made alterations that restrict tidal flow.	Extent of wetlands altered by restricted flow. **Limiting**: > 40% of historic wetland area modified **Moderate**: 20-40% of historic wetland area modified **Adequate**: <20% of historic wetland area modified **Insufficient Information:**
Sediment regime	Increased or reduced sediment delivery to the sub-tidal zone from changes in land use patterns and management.	**Limiting**: > 40% of sub-tidal zone affected by major change in sediment regime **Moderate**: 20 - 40% of sub-tital zone affected by major change in sediment regime **Adequate**: < 20% of sub-tidal zone affected by major change in sediment regime **Insufficient Information:**
Water quality	Changes in water quality, both harmful to fish and public health. Evaluated based on the extent to which parameters meet or exceed DEQ standards.	**Limiting**: Does not attain DEQ water quality criteria. Greater than 10% of the samples exceed the appropriate criteria. **Moderate**: Intermediate in severity or extent of water quality criteria violations. **Adequate**: Attains DEQ water quality criteria. Greater than 90% of the samples meet the appropriate criteria. **Insufficient Information**:
Invasive species	Non-native species that displace native species and alter the sub-tidal zone ecosystem. These species are characteristically adaptable, aggressive, and have a high reproductive capacity.	Invasive species can have variable effects on sub-tidal zone. **Limiting**: Invasive species are having a significant effect on sub-tidal zone functions. **Moderate**: Invasive species are limited in spatial extent or moderate overall impact on sub-tidal zone functions. **Adequate**: There are no/minimal invasive species or they are exhibiting no measurable effect on sub-tidal zone function. **Insufficient Information:**
Sub-tidal zone loss (Complete)	Sub-tidal wetland loss occurs with complete fill and conversion to developed uses, or other irreversible changes. In contrast to hydro-modification, this refers to historic conversion to cities, developments, etc. with no opportunity for restoration.	Rough measure of long term-direct impacts of human development of the coastal zone. **Limiting**: > 40 % complete fill or conversion **Moderate**: 20-40% complete fill or conversion **Adequate**: < 20% complete fill or conversion **Insufficient Information:**