WAC 173-183-410 Marine and estuarine habitat vulnerability. (1) The purpose of this section is to provide a marine and estuarine habitat vulnerability ranking. The marine and estuarine habitats present in the state are:

(a) Classified into thirty-seven types based on substrate type, energy regime and depth of occurrence; and

(b) Relatively ranked and scored for vulnerability to oil spills on a 1 to 5 scale, where a habitat vulnerability score (hv) of 5 represents the greatest vulnerability and an hv of 1 represents the least vulnerability.

(2) Marine and estuarine habitat vulnerability scores (hv) are based on the following:

(a) Presence of living public resources at risk, where living public resources include only those not otherwise incorporated into the compensation schedule in the marine fish, shellfish, salmon, marine mammal or marine bird vulnerability rankings of WAC 173-183-420 through 173-183-460; and

(b) Predicted sensitivity to the acute toxicity, mechanical injury and persistence effects of oil based on energy regime of the habitat and propensity to entrain oil.

(3) For purposes of RCW 90.48.366, marine and estuarine habitats of the state are classified into the following thirty-seven habitat types:

(a) Marine intertidal habitats.

(i) Exposed and semiexposed rocky shores. Bedrock and boulder habitats exposed to the full range of wave energies of the Pacific (i.e., on the outer coast), or to extensive wave fetch along the Strait of Juan de Fuca. Rocky areas on the coast partly protected behind sea stacks or islands also fall into this category.

(ii) Sand-scoured rocky shores. Rocky headlands or sea stacks directly adjacent to high energy sandy beaches such that there is much suspended sand in the water, which scours the rock. Unique plants and animals are found here.

(iii) Protected rocky shores. Bedrock and boulder habitats lacking oceanic swell and extensive wave fetch; e.g., inside waters of the San Juan Islands, headlands in bays off the Strait of Juan de Fuca or well protected behind islands on the outer coast.

(iv) Semiexposed cobble and mixed-coarse beaches. Beaches exposed to moderate wave action composed of cobble overlying sand, or to somewhat less wave action, with a mix of cobble, gravel, and sand where no one component occupies more than seventy percent of the surface. Algae may grow on larger cobbles, and animals live both on the surface and in the sediment. Species vary dramatically with degree of wave exposure and composition of the sediment. Found inside the San Juan Islands, outside of Whidbey Island, at semiprotected sites along the Strait, and behind island and sea stacks on the coast.

(v) Semiexposed gravel beaches. Unstable beaches, containing some sand in more protected areas. Many sites along the Strait of Juan de Fuca.

(vi) Exposed sandy beaches. Pure marine sands found in moderate to high-energy areas, e.g., on the outer coast and along the Strait of Juan de Fuca. Mouths of bays with some wave action also fall into this category.

(vii) Semiprotected mixed-fine beaches. Mixed sand and silt habitats, found in bays and inlets with some wave action so they are not dominated by the finer sediments (muds). Patches of gravel may be present high on the shore.

(viii) Protected mud flats. Areas of little to no wave energy, where fine sediments settle and accumulate organic matter. Found in calm bays and inlets with little freshwater influx (i.e., not estuaries).

(b) Marine subtidal.

(i) Shallow subtidal rock and boulders. Areas less than 15 m depth with some currents so that sediments do not totally cover bedrock. Kelp beds are found in these habitats, which are widespread in the state.

(ii) Deep subtidal rock and boulders. Areas deeper than 15 m and thus lacking in significant algal cover, but still with enough currents to keep the substrate exposed. Common in the San Juans and the Strait.

(iii) Deep subtidal cobble and mixed-coarse areas. "Scoured" areas in channels or passes with high currents, composed entirely of cobbles or with gravel and sand mixed in.

(iv) Shallow subtidal mixed-coarse to mixed-fine areas (low energy). Areas ranging from cobbles lying over a matrix of sand and gravel to mixed sand and silt, in waters less than 15 m. Bays and inlets commonly have this range of substrate types. Plants and animals exist both on the cobbles and in the sediment.

(v) Shallow subtidal gravel or mixed-fine areas (high energy). Areas just offshore of sand or gravel beaches, where swells or wave action keep fine sediments from accumulating. Substrates range from pure gravel to gravel mixed with sand and shells. Common in the Strait.

(vi) Deep subtidal sand. Areas deeper than 15 m in the Strait or on the coast where swells keep the substratum fairly coarse.

(vii) Deep subtidal mixed-fine areas. Areas of sand, shells, and pebbles with some currents removing finer particles.

(viii) Deep subtidal muddy areas. Areas with no swell and few currents, where fine silts settle out and accumulate organic matter.

(ix) Open water. Areas deeper than 20 m.

(c) Estuarine intertidal.

(i) Open rocky shores. Rocky intertidal areas (including hardpan and riprap) in areas exposed to moderate waves or currents, e.g., on headlands in Puget Sound.

(ii) Open mixed-coarse beaches. One of the most common beach types in Puget Sound, composed of a mix of cobble, gravel, and sand in areas with some wave action that keeps finer silts suspended. Sparse salt marsh vegetation may occur at the tops of these beaches, especially in quieter areas.

(iii) Open gravel beaches. Areas of gravel or pebbles, often overlying sand, in areas of moderate wave action.

(iv) Open sandy beaches. Common habitats of gently sloping beaches but moderate wave action. May have gravel on the upper shore. Found in Puget Sound and in some areas of other estuaries, including Grays Harbor.

(v) Sandy low marshes. Found on spits, berms, and deltas where sand collects. Areas of different salinities are dominated by different marsh plant communities. Widespread (although disturbed) throughout the Puget Trough.

(vi) Mixed-fine beaches and low marshes. Found in backwaters or deltas away from large channels, where the substrate is mixed sand and mud, sometimes with patches of gravel or peat. Substrate is stable and organic-rich. Marsh communities vary with salinity.

(vii) Saline lagoons. Areas where water-borne sediments are deposited into a spit closing off an embayment, which is flushed regularly or irregularly. Salinities vary with evaporation and runoff but are generally high.

(viii) Low-salinity lagoons. Lagoons that are nearly separated from tidal/salt influence by a berm, and where there is a source of freshwater. Substrate is usually soft silt. This habitat is rare in the state.

(ix) Mud flats. Areas lacking in gravel or significant amounts of sand due to limited wave action, usually found in the heads of bays and inlets. Includes undisturbed channels and sloughs which drain slowly through a tidal cycle, and which may contain some sand.

(x) High salt marshes. Areas above normal high water but salt influenced, with organic/peat substrata. Salinities vary, and plant communities with them.

(xi) Transition zone wetland. Areas transitional between salt marshes and uplands, where salt water only rarely inundates. Substrata are peat or fine silts.

(d) Estuarine subtidal.

(i) Shallow subtidal rock and boulders. Areas less than 15 m deep with moderate currents or wave action that remove silt. Kelp beds develop here.

(ii) Deep subtidal rock and boulders. Areas in narrow channels or around headlands where currents remove sediment that otherwise would settle in these deeper areas. These habitats are essentially marine, since freshwater tends to stay layered in shallow water.

(iii) Shallow subtidal cobble and mixed-coarse areas. Mixed cobble, gravel, and sand remain in shallow areas fairly open to wave action or currents.

(iv) Deep subtidal cobble and mixed-coarse areas. Tidal currents running through deep channels in Puget Sound keep fine silts from settling and create areas of mixed cobbles, sand, and gravel.

(v) Shallow subtidal sandy or mixed-fine areas. High-current areas with little debris and some gravel, or less current-swept with more debris. Both are common outside of enclosed bays in Puget Sound.

(vi) Deep subtidal sandy or mixed-fine areas. Current-swept areas below 15 m. Organic debris and gravel tend to accumulate deeper (below 30 m), leading to different assemblages there.

(vii) Shallow subtidal muddy bays. Common habitats in open to partly enclosed bays in Puget Sound, where limited water movement allows fine sediments to accumulate. Organic enrichment is high, especially in more enclosed bays.

(viii) Deep subtidal muddy bays. Habitats in the heads and centers of inlets in Puget Sound where there is little motion and the substrate is soft mud and sand. Assemblages vary with depth and amount of organic debris accumulated.

(ix) Open water. Areas deeper than twenty meters.

(4) For purposes of RCW 90.48.366, marine and estuarine habitat vulnerability scores (hv) for each of the habitat types classified in subsection (3) of this section shall be as follows:

TABLE 2. Habitat Vulnerability for a Single Habitat Type and Oil Effect (hv)

HABITAT TYPE	HABITAT VULNERABILITY (hv)		
	ACUTE (hv_{AT})	MECH (hv_{MI})	PERS (hv_{PER})
MARINE INTERTIDAL			

HABITAT TYPE	HABITAT VULNERABILITY (hv) ACUTE (hv_{AT})	MECH (hv_{MI})	PERS (hv_{PER})
Exposed and semiexposed rock shores	3.7	4.3	3.1
Sand-scoured rocky shores	3.3	3.8	2.7
Protected rocky shores	3.0	3.5	3.0
Semiexposed cobble and mixed-coarse beaches	3.2	3.2	3.2
Semiexposed gravel beaches	3.2	1.4	2.0
Exposed sandy beaches	2.9	1.3	1.8
Semiprotected mixed-fine beaches	3.2	2.6	3.7
Protected mud flats	3.8	2.7	4.3
MARINE SUBTIDAL			
Shallow subtidal rock and boulders	3.7	3.7	3.1
Deep subtidal rock and boulders	2.7	2.7	3.3
Deep subtidal cobble and mixed coarse	1.5	2.2	2.2
Shallow subtidal mixed-coarse to mixed-fine	3.6	3.6	3.6
Shallow subtidal gravel or mixed-fine	2.8	1.6	2.3
Deep subtidal sand	1.6	2.0	1.6
Deep subtidal mixed-fine	1.5	2.6	3.1
Deep subtidal muddy	2.0	2.0	3.2
Open water	5.0	3.2	2.2
ESTUARINE INTERTIDAL			
Open rocky shores	3.0	3.5	3.0
Open mixed-coarse beaches and low marsh	3.7	3.2	3.2
Open gravel beaches	3.4	1.5	2.2
Open sandy beaches	3.3	2.8	2.3
Sandy low marshes	3.5	3.0	3.0
Mixed-fine beaches and low marshes	4.3	4.3	4.3
Saline lagoons	3.7	3.7	4.1
Low-salinity lagoons	3.0	3.5	3.9
Mud flats	3.7	2.6	4.1
High salt marshes	3.0	3.5	3.9
Transition zone wetlands	3.0	3.5	3.9
ESTUARINE SUBTIDAL			
Shallow subtidal rock and boulders	3.2	3.2	2.6
Deep subtidal rock and boulders	2.3	2.3	2.8
Shallow subtidal cobble and mixed-coarse	2.6	3.2	3.2
Deep subtidal cobble and mixed-coarse	1.5	2.2	2.2
Shallow subtidal sandy or mixed-fine	3.2	3.2	3.2
Deep subtidal sandy or mixed-fine	2.0	2.4	2.8
Shallow subtidal muddy bays	3.0	2.4	3.9
Deep subtidal muddy bays	1.8	1.8	2.9
Open water	5.0	3.2	2.2

(5) When seagrass or kelp are present in a particular habitat type, the portion of the habitat type with seagrass or kelp shall be treated as a separate habitat type. The habitat vulnerability for a particular habitat type and oil effect (hv) shall be multiplied by a factor of 1.5 for habitat types with seagrass or kelp present. The RDA committee shall be responsible for determining whether seagrass or

kelp are present in a habitat type, and the portion of a habitat type containing seagrass or kelp.

(6) In general, several of the habitat types classified in this section may be affected by a particular spill. The habitat vulnerability score for a particular spill and oil effect (HVSi) is composite of the habitat vulnerability scores for each of the habitat types affected by the spill which takes into consideration the percent coverage of each habitat type in the area of spill impact.

(7) The habitat vulnerability score for a particular spill and oil effect (HVS) shall be determined as follows:

(a) For spills of 1,000 gallons or more. Sum the weighted habitat vulnerability scores for each habitat type exposed to the spill as described by the formula provided in (c) of this subsection, where weighting is defined by percent coverage of each habitat type within the area of spill exposure.

(b) For spills of less than 1,000 gallons. Sum the weighted habitat vulnerability scores for each habitat type present in the subregion(s) exposed to the spill as described by the formula provided in (c) of this subsection, where weighting is defined by percent coverage of each habitat type present in the subregion(s) exposed to the spill.

(c) The formula to calculate the raw habitat vulnerability score for a particular spill and oil effect (HVSi) is as follows:

$$HVS_i = |^{n}_{j=1} (hv_{ij} \times PC_j)$$

where PC_j = Percent-coverage of habitat-type j expressed as a decimal;

hv_{ij} = habitat vulnerability for a particular habitat type & oil effect;

j = habitat type;

i = acute toxicity (AT), mechanical injury (MI) and persistence (PER); and

n = number of habitats to be considered as determined under (a) and (b) of this subsection.

(d) The final HVS_{AT}, HVS_{MI}, and HVS_{PER} scores are found by rounding the raw scores calculated from the formula in (c) of this subsection to the nearest 0.01 as follows: Decimals less than 0.005 shall be rounded down and decimals equal to or greater than 0.005 shall be rounded up.

[Statutory Authority: Chapter 90.48 RCW. WSR 92-10-005 (Order 91-13), § 173-183-410, filed 4/23/92, effective 5/24/92.]