



# Washington ShoreZone Inventory Data Dictionary

## [Nearshore Habitat Program](#)

Washington State Department of Natural Resources

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This data dictionary summarizes the Washington State ShoreZone Inventory in the following sections:

- [Layer Description](#) .....2
- [Spatial File Names](#) .....3
- [Spatial File Fields - Summary](#) .....4
- [Spatial File Fields - Detailed Description](#) .....7
- [Tabular File Names](#) .....25
- [Tabular File Fields - Summary](#) .....26
- [Tabular File Fields - Detailed Description](#) .....28
- [ShoreZone Themes](#) .....41
- [Appendix A](#) .....46
  - [Rationale for bc class shore types](#) .....47
  - [Exposure Matrix Used for Estimating Calculated Exposure \(exp calc\)](#) .....50
  - [Calculated ORI classes - Defined by shore type and exposure](#) .....50
  - [Habitat and Bio-Exposure Classification<sup>1,2</sup>](#) .....52
  - [Detailed Bio-band Code Descriptions](#) .....54
  - [Protocol for Bio-Mapping of Units](#) .....56
  - [Differences between the Washington State ShoreZone Inventory and the British Columbia Standard](#) .....57
  - [Translations to Other Classification Systems](#) .....58
  - [Dethier Classes](#) .....59
  - [NRDA Classes](#) .....62

## LAYER DESCRIPTION

<b>Layer:</b>	Washington State ShoreZone Inventory
<b>General source:</b>	Aerial videography collected at low tide, georeferenced by GPS
<b>Cover Type:</b>	Spatial line, polygon and point shape files
<b>Data Type:</b>	Primary data
<b>Data set description:</b>	An inventory of Washington State's saltwater shorelines using the ShoreZone Mapping System. Physical and biological resources are described, along with information on the inventory data collection. The majority of the spatial data is line data, with some polygons and points. The inventory divides the shoreline into homogenous physical segments, the average linear segment length is 0.5 miles. Each spatial unit record has many corresponding tabular across-shore component records that describe the unit in more detail.
<b>Database location:</b>	CD-ROM
<b>File type:</b>	Arc Shape Files and associated .dbf tabular files
<b>Spatial object type:</b>	Line, polygon, point
<b>Tiling system:</b>	n/a
<b>Projection name:</b>	Lambert conformal conic
<b>Projection spheroid:</b>	Clarke 1866
<b>Coordinate system:</b>	WA State Plane South (Zone 5626)
<b>Coordinate precision:</b>	single
<b>Horizontal datum:</b>	NAD27
<b>Resolution of data:</b>	approximately 0.5 mile
<b>Positional accuracy:</b>	+/- 40 feet
<b>Geographic area:</b>	Washington State's saltwater shoreline
<b>Geographic exclusion area:</b>	n/a
<b>Data steward organization:</b>	Washington State Department Natural Resources, Business Systems Support Division
<b>Data steward contact:</b>	Nearshore Habitat Program
<b>Maint. &amp; update frequency:</b>	n/a

<b>Processing Procedures:</b>	Main information source is low-tide, aerial imagery collected during minus tides (below MLLW) in June of the year. Survey data was collected by a marine ecologist, coastal geomorphologist, and a navigator who fly in a helicopter at flight speeds of 60 knots and about 300 feet in altitude. A geomorphologist interpreted the survey data: he defined delineated homogenous units on the DNR orthophotos, and described the units and components in tabular data. A marine ecologist then added tabular data on biological resources. Spatial data is based on the WA State Dept of Natural Resources digital shoreline (water level line).
<b>Processing Tolerances:</b>	fuzzy = 0.001 ft., dangle = 0.001 ft., edit = 20.0 ft., weed = 20.0 ft., grain = 5.0 ft., snap nodes = 20 ft. (first).
<b>Mapping System Documentation:</b>	Howes, D.E., J.R. Harper and E.H. Owens 1994. British Columbia physical shore-zone mapping system. The Coastal Task Force of the Resource Inventory Committee (RIC), RIC Secretariat. Victoria, B.C. 71p.  Searing, G.F. and H.R. Frith 1995. British Columbia biological shore-zone mapping system. Contract Report by LGL Ltd., Sidney, BC for Land-Use Coordination Office, BC Ministry of Environment, Victoria, BC. 46p.
<b>Source name:</b>	Washington State Department of Natural Resources, WTRLEVLN
<b>Source scale:</b>	1:24,000
<b>Date of source materials:</b>	1994-2000
<b>Completion Date:</b>	2001
<b>History of changes to data:</b>	None, this is the first release.

### SPATIAL FILE NAMES

NAME	DESCRIPTION
szline	Washington ShoreZone Inventory linear unit features.
szpoly	Washington ShoreZone Inventory polygon unit features.
szpt	Washington ShoreZone Inventory point unit features.
szlnend	Washington ShoreZone Inventory point features locating the boundary between line units.

## SPATIAL FILE FIELDS - SUMMARY

for the following layers (szline, szpoly, szpt)

FIELD NAME	DESCRIPTION
shape	Arc identifier for line, point or polygon attribute.
length	GIS software generated length, measured in feet.
area	GIS software generated area, measured in square feet.
perimeter	GIS software generated perimeter length, measured in feet.
unit_id	Unique identifier for unit records.
phy_ident	Unique alphanumeric identifier for unit records, primarily used in data creation.
unit_type	Description of unit type (L=Line, P=Point, A=Polygon, B= line and polygon)
bc_class	Number code for the British Columbia 'coastal class' or 'shoreline type'.
deth_class	Number code for the shoreline type as defined by Dethier (1990) classification system.
nrda_class	Number code for the NRDA shoreline classification system.
geo_mapper	Last name of the geology mapper.
geo_editor	Last name of the geology data editor.
geo_map_dt	Date the survey data was interpreted by the geology mapper.
geo_source	Data source for the geologic interpretations.
bio_mapper	Last name of the biologist that provided the biological interpretation of the imagery.
bio_editor	Last name of the biology data editor.
bio_map_dt	Date of the bio mapping in yyyyymmdd.
bio_source	Data sources for the biological interpretation.
bio_slide	Slide number for the biology.
scale	Scale of the base map used to code the map original data.
video_tape	Videotape identifier code(s).
video_date	Year that video was collected.
video_time	Time stamp on videotape.
base_map	Township and Range map numbers for unit.
chart	NOAA chart number(s) for the unit.
exp_calc	Calculated exposure from fetch measurements.
exp_obser	Estimate of the wave exposure as observed by geomorphologist during mapping.
exp_bio	Estimate of wave exposure by the biologist, based on shore-zone biota assemblages.
exp_class	Numeric code for best exposure estimate.
ori	Code indicating the potential oil residence index.
sed_source	Code indicating the estimated sediment source for the unit.

sed_abund	Code indicating the relative sediment abundance within the shore-unit.
sed_dir	One of the compass direction indicating the dominant sediment transport direction.
chnng_type	Code indicating the stability of the shore unit.
hab_calc	Predicted intertidal biotic assemblage.
shorename	Name of a prominent geographic feature near the unit; used to facilitate searches.
sm_tot_pct	Total percentage of shoreline modified.
sm1_type	<i>Primary</i> type of shoreline modification occurring within the unit.
sm1_pct	Estimated percent occurrence of the <i>primary</i> shoreline modification type in tenths.
sm1_ft	Calculated length in feet of the <i>primary</i> shoreline modification type.
sm2_type	<i>Secondary</i> type of shoreline modification occurring within the unit.
sm2_pct	Estimated percent occurrence of the <i>secondary</i> shoreline modification type in tenths .
sm2_ft	Calculated length in feet of the <i>secondary</i> shoreline modification type.
sm3_type	<i>Tertiary</i> type of shoreline modification occurring within the unit.
sm3_pct	Estimated percent occurrence of the <i>tertiary</i> shoreline modification type in tenths.
sm3_ft	Calculated length in feet of the <i>tertiary</i> shoreline modification type.
ramp	Number of boat ramps that occur in the unit.
pierdock	Number of piers or wharves that occur within the unit.
slip_small	Estimated number of recreational (or small) slips .
slip_large	Estimated number of slips for ocean-going vessels (~>100').
railroad	Railbed in contact with shorezone.
ripar_pct	Estimated percent of unit with vegetation overhanging the intertidal zone.
ripar_ft	Estimated length of riparian vegetation overhanging the intertidal zone.
itz_width	Intertidal zone width.
zonecomp	List of zones and components for the unit in the associated XSHR table.
ver_unit	Bio-band for <i>VERrucaria</i> in supratidal splash zone
gra_unit	Bio-band code for dune GRAsses.
sed_unit	Bio-band for SEDge of brackish wetland/stream mouth.
tri_unit	Bio-band for natural salt-tolerant assemblage of <i>TRIgloch</i> / <i>Salicornia</i> / <i>Deschampsia</i> .
sal_unit	Bio-band for <i>SALicornia</i> -dominated lower saltmarsh.
spa_unit	Bio-band for bright green <i>SPArtina</i> -invaded saltmarsh.
fuc_unit	Bio-band for <i>FUCus</i> -barnacle of upper intertidal.
bar_unit	Bio-band for continuous BARNacle ( <i>Balanus glandula</i> ) .
bmu_unit	Bio-band for blue mussels ( <i>Mytilus trossulus</i> ).
ulv_unit	Bio-band for mixed <i>ULVa</i> -type green algae band.
gca_unit	Bio-band for red algae <i>Gracilaria</i> or <i>Sa codiotheca</i> .

oys_unit	Bands of <i>OYSters (Crassostrea)</i> , both commercial and non-commercial.
mus_unit	Bio-band for MUSsel/barnacle complex of California mussel/ <i>Semibalanus cariosus</i> barnacles.
red_unit	Bio-band for mixed RED algae.
cal_unit	Bio-band for burrowing shrimp (ghost shrimp and mud shrimp).
sbr_unit	Bio-band for the 'Soft-Brown' kelps (primarily <i>Laminaria</i> spp.).
sar_unit	Bio-band for <i>SARgassum</i> .
chb_unit	Bio-band for 'Chocolate Brown' kelps (e.g. <i>Hedophyllum</i> sp., <i>Lessoniopsis</i> sp.).
sur_unit	Bio-band for green SURfgrass ( <i>Phyllospadix</i> spp.).
den_unit	Bio-band for <i>DENdraster</i> sand-dollars usually on sand beaches.
zos_unit	Bio-band for <i>ZOStera</i> spp. (eelgrass).
ner_unit	Bio-band for nearshore subtidal <i>NEReocystis</i> bull kelp.
mac_unit	Bio-band for nearshore subtidal <i>MACrocystis</i> kelp.
bio_unit	Summary field that combines all bio-band codes for the unit.
biounittxt	Text translation of all bio-band codes for the unit.
shorenorm	Direction of the unit shore-normal in degrees.
fet_norm	Distance in kilometers of the shore normal fetch.
right_45	Distance in kilometers of the fetch at 45° to the right of the shore normal.
left_45	Distance in kilometers of the fetch at 45° to the left of the shore normal.
max_fet_di	Direction of the maximum fetch distance in degrees.
max_fet	Distance in kilometers of the maximum fetch.
eff_fet	Modified effective fetch.
tide_rng	Mean tidal range, in meters.
a1_fmtxt	Text summary of A1 across-shore component form and material, if applicable.
a2_fmtxt	Text summary of A2 across-shore component form and material, if applicable.
a3_fmtxt	Text summary of A3 across-shore component form and material, if applicable.
a4_fmtxt	Text summary of A4 across-shore component form and material, if applicable.
b1_fmtxt	Text summary of B1 across-shore component form and material, if applicable.
b2_fmtxt	Text summary of B2 across-shore component form and material, if applicable.
b3_fmtxt	Text summary of B3 across-shore component form and material, if applicable.
b4_fmtxt	Text summary of B4 across-shore component form and material, if applicable.
b5_fmtxt	Text summary of B5 across-shore component form and material, if applicable.
c1_fmtxt	Text summary of C1 across-shore component form and material, if applicable.
comments	Field for comments by geomorphologist.

## **SPATIAL FILE FIELDS - DETAILED DESCRIPTION**

for the spatial layers szline, szpoly, szpt

### **length (12,12,N,3)**

**description:** Length in feet of line features. Generated by GIS software. This field included in szline, not present in szpoly or szpt.

### **area (12,12,N,3)**

**description:** Area in square feet of polygon features. Generated by GIS software. This field included in szlpoly, not present in szline or szpt.

### **perimeter (12,12,N,3)**

**description:** Perimeter in feet of polygon features. Generated by GIS software. This field included in szlpoly, not present in szline or szpt.

### **unit\_id (6,6,I)**

**description:** Unique identifier number for each unit record.

### **phy\_ident (12,12,C)**

**description:** Physical unit number, a unique Physical Identifier number for the unit, a combination of region, area, unit, and sub-unit. This field was used primarily during data creation. The multiple fields reflect data processing blocks. In most cases, the unit\_id field is the preferred unique identifier. Phy\_ident is included for compatibility with data covering British Columbia.

### **unit\_type (1,1,C)**

**description:** A description of unit type. The preferred type of unit is lines. See protocol for Unit delineation (below).

#### **codes:**

**B** Both Polygon & Line

**L** Line

**A** Polygon

**P** Point

## Protocol for Unit Type Delineation

The primary goal of the mapping program is to catalog shore-zone features that may be of interest in resource management. As such, the mapping should capture the key ecological features of the shore-zone. Units may be delineated as either points, lines, or polygons within the spatial framework. This protocol provides criteria for assigning the most appropriate spatial characteristics to a unit.

1. The Washington ShoreZone mapping system is primarily a lineal system (length, but not width) so that *a line segment representation is the preferred unit type*. These units are coded as **L** in the 'type' field.
2. Point and polygon features should be used in certain cases to *provide a clear characterization of the physical and biological characteristics of the unit as well as the process that affect the unit*. These cases are outlined below.
  - **Points** are used to identify features that are of interest to resource managers, but too small (in terms of alongshore length) to be represented by a line segment. The following features are represented by points: stream mouths, public boat ramps, and other small features within a unit with ecological or management significance such as wetlands. Public boat ramps are identified from DNR records whereas ecological features such as stream mouths or marshes are normally identified from the aerial video imagery. These units are coded as **P** in the 'type' field.
  - **Polygons** are used when a feature has unique spatial characteristics that are not captured by a single line segment representation. Examples of possible polygons include: a wetland where the shape of the wetland does not allow a reasonable approximation of area by a length and width estimate, and an intertidal ebb-tidal delta where controlling processes (tidal currents) differ substantially from surrounding units, or a very wide mudflat backed by a gravelly sand beach. The minimum area for a polygon is 1cm<sup>2</sup> at a 1:12,000 mapping scale or 15,000ft<sup>2</sup>.

Two types of polygons are represented:

- A polygon that incorporates features that span the entire "shore-zone" from supratidal to subtidal, and therefore have an associated alongshore length of the DNR shoreline. A large wetland area with associated fringing mudflat is an example of this type of polygon. When a polygon has both an area and an alongshore length (where it intersects the DNR shoreline), the feature type is coded as both and both. This type of unit is coded with a **B** in the 'type' field and both area and length measurements are added to the database.
- A polygon that describes only a portion of the shore-zone (equivalent to an across-shore component).



**bc\_class (2,2,I)**

**description:** a number indicating the British Columbia (BC) 'coastal class' or 'shoreline type'. Summarizes shoreline characteristics based on sediment type and slope.

**codes:** see below or refer to the [Appendix A - Rationale for bc\\_class shore types.](#)

<b>BC_CLASS Code Table</b>	
<b>BC_CLASS CODE</b>	<b>DESCRIPTION</b>
0	Undefined
1	Rock ramp, wide
2	Rock platform, wide
3	Rock cliff
4	Rock ramp, narrow
5	Ramp with gravel beach, wide
6	Platform with gravel beach, wide
7	Platform with gravel beach, wide
8	Cliff with gravel beach
9	Ramp with gravel beach
10	Platform with gravel beach
11	Ramp with gravel and sand beach, wide
12	Platform with gravel and sand beach, wide
13	Cliff with gravel and sand beach
14	Ramp with gravel and sand beach
15	Platform with gravel and sand beach
16	Ramp with sand beach, wide
17	Platform with sand beach, wide
18	Cliff with sand beach
19	Ramp with sand beach, narrow
20	Platform with sand beach, narrow
21	Gravel flat, wide
22	Gravel beach, narrow
23	Gravel flat or fan
24	Sand and gravel flat or fan
25	Sand and gravel beach, narrow
26	Sand and gravel flat or fan
27	Sand beach
28	Sand flat
29	Mud flat
30	Sand beach
31	Organics/fines

32	Man-made, permeable
33	Man-made, impermeable
34	Channel

**deth\_class (6,6,I)**

**description:** a number code for shoreline type according to A Marine and Estuarine Classification System for Washington State (Dethier 1990).

**codes:** see Appendix A - [Translations to Other Classification Systems](#) and [Dethier Classes](#)

**nrda\_class(6,6,I)**

**description:** a number code for the Natural Resource Damage Assessment (NRDA) shoreline classification system.

**codes:** see Appendix A - [Translations to Other Classification Systems](#) and [NRDA Classes](#)

**geo\_mapper (20,20,C)**

**description:** last name of the geologic mapper.

**geo\_editor (20,20,C)**

**description:** last name of the individual that either checked or updated original mapping data.

**geo\_map\_dt (8,8,I)**

**description:** date of geologic analysis in the office of videotapes and mapping in yyyymmdd.

**geo\_source (10,10,C)**

**description:** the date source for the interpretations. Ordered in terms of importance to interpretation.

**codes:** (C)harts, (O)ther, (P)hoto-aerial or orthophoto, (S) slides, (T)opo maps, (V)ideotape, (X) no data source. (source.dbf)

**bio\_mapper (20,20,C)**

**description:** the last name of the biologist that provided the biological interpretation of the imagery.

**bio\_editor (20,20,C)**

**description:** the last name of the biologist that checked the biological interpretation of the imagery.

**bio\_map\_dt (8,8,I)**

**description:** the date of the biological analysis of the video data in the office and mapping in yyyyymmdd.

**bio\_source (10,10,C)**

**description:** the source that was used to interpret shore-zone biota, (C)hart, (I)nferred, (S)lide, (V)ideotape, (X) no data source. Abbreviations are ordered in terms of importance to interpretation.

**bio\_slide (40,40,C)**

**description:** number of 35mm slide.

**scale (11,11,C)**

**description:** scale of the base map used to code the map original data. 1:12,000

**video\_tape (15,15,C)**

**description:** videotape identifier code(s); "X" is used where no videotape is available

**video\_date (8,8,I)**

**description:** the year that the video imagery was collected.

**video\_time (15,15,C)**

**description:** the "burned-in" tape time from the GPS that appears on the video image; "X" indicates no screen time was available.

**base\_map (25,25,C)**

**description:** the Township and Range of the orthophoto map used (in quarter townships).

**chart (20,20,C)**

**description:**the NOAA chart number(s) for the unit.

**exp\_calc (3,3,C)**

**description:** the calculated exposure, based on fetch measurements. [See Appendix A - Exposure Matrix .](#)

**codes:**

**E** Exposed  
**P** Protected  
**SE** Semi-exposed  
**SP** Semi-protected  
**VE** Very Exposed  
**VP** Very Protected  
**X** Could not determine

**exp\_obser (3,3,C)**

**description:** an estimate of the wave exposure as observed by geomorphologist during mapping. [See Appendix A - Exposure Matrix.](#)

**codes:**

**E** Exposed  
**P** Protected  
**SE** Semi-exposed  
**SP** Semi-protected  
**VE** Very Exposed  
**VP** Very Protected  
**X** Could not determine

**exp\_bio (3,3,C)**

**description:** an estimate of wave exposure by the biologist, based on shore-zone biota assemblages. **x** = unit reviewed but insufficient information was available to classify exposure.

**codes:**

**E** Exposed  
**P** Protected  
**SE** Semi-exposed  
**SP** Semi-protected  
**VE** Very Exposed  
**VP** Very Protected  
**X** Could not determine

### exp\_class (3,3,C)

**description:** a numeric code for best exposure estimate. Selected from the first field with a valid value: exp\_bio, exp\_obs, exp\_calc.

**codes:**

- E** Exposed
- P** Protected
- SE** Semi-exposed
- SP** Semi-protected
- VE** Very Exposed
- VP** Very Protected
- X** Could not determine

### ori (6,6,I)

**description:** a code indicating the potential oil residence index. See Oil Residence Index Code Table below and [Appendix A - Calculated ORI classes Table](#).

Oil Residence Index Code Table		
Oil Residence Index	Persistence	Estimated Persistence
1	short	days to weeks
2	.	<b>weeks</b> to months
3	.	weeks to <b>months</b>
4	.	<b>months</b> to years
5	long	months to <b>years</b>

### sed\_source (4,4,C)

**description:** a code indicating the estimated sediment source for the unit. (**B**)ackshore, (**A**)longshore, (**F**)luvial, (**O**)ffshore.

### sed\_abund (1,1,C)

**description:** code indicating a qualitative estimate of sediment abundance within the shore-unit, (**A**)bundant (usually areas with accretional landforms and highly mobile sediments), (**M**)oderate (some mobile sediment but not likely to rapidly move), (**S**)carce (usually areas of bare rock or rock with cobble/boulder veneer)

### sed\_dir (3,3,C)

**description:** one of the eight cardinal points of the compass indicating dominant sediment transport direction. “X” indicates transport direction could not be estimated from morphology or textural information within the unit.

**chnng\_type (1,1,C)**

**description:** a code indicating the stability of the shore unit, (**A**)ccretional, (**E**)rosional, (**S**)table. Estimate reflects “measurable change” so a bare rock cliff would be classified as *stable* because it will not show any measurable change over a 1-2 year period.

**hab\_calc (6,6,I)**

**description:** the predicted intertidal biotic assemblage, derived from the mapped bc\_class and the exp\_calc (derivation criteria are shown in table below). The hab\_calc field was designed primarily to extrapolate biota data to areas where biota was not mapped. Since biota was mapped throughout Washington, the hab\_calc field is not used for its primary purpose. It is useful, however, to examine actual associations of physical characteristics and biota (as opposed to predicted associations). See [Appendix A - Habitat and Bio-Exposure Classification Table](#).

**shorename (40,40,C)**

**description:** the name of a prominent geographic feature near the unit; used to facilitate searches.

**sm\_tot\_pct (3,3,I)**

**description:** the total percent of shoreline in the unit with anthropogenic shoreline modification, estimated in tenths.

**sm1\_type (2,2,C)**

**description:** the *primary* type of shoreline modification occurring within the unit. **BR**= boat ramp, **CB**= concrete bulkhead, **LF**= landfill, **SP**= sheet pile, **RR**= rip rap, **WB**= wooden bulkhead.

**sm1\_pct (3,3,I)**

**description:** the estimated percent occurrence of the *primary* type of shoreline modification, estimated in tenths.

**sm1\_ft (11,11,N,2)**

**description:** the calculated length in feet of the *primary* type of shoreline modification.

**sm2\_type (2,2,C)**

**description:** the *secondary* type of shoreline modification occurring within the unit. **BR**= boat ramp, **CB**= concrete bulkhead, **LF**= landfill, **SP**= sheet pile, **RR**= rip rap, **WB**= wooden bulkhead.

**sm2\_pct (3,3,I)**

**description:** the estimated percent occurrence of the *secondary* type of shoreline modification, estimated in tenths

**sm2\_ft (11,11,N,2)**

**description:** the calculated length in feet of the *secondary* type of shoreline modification.

**sm3\_type (5,5,C)**

**description:** the *tertiary* type of shoreline modification occurring within the unit. **BR**= boat ramp, **CB**= concrete bulkhead, **LF**= landfill, **SP**= sheet pile, **RR**= rip rap, **WB**= wooden bulkhead.

**sm3\_pct (3,3,I)**

**description:** the estimated percent occurrence of the *tertiary* type of shoreline modification, estimated in tenths

**sm3\_ft (11,11,N,2)**

**description:** the calculated length in feet of the *tertiary* seawall type.

**ramp (3,3,I)**

**description:** the number of boat ramps that occur within the shore zone of the unit or subunit. Ramps must impact some portion of the shore-zone and generally be constructed of concrete, wood or aggregate. Public boat ramps are shown as point features.

**pierdock (3,3,I)**

**description:** the number of piers or wharves that occur within the unit. Piers or docks must extend at least 10m into the shore zone. Category does not include anchored floats.

**slip\_small (6,6,I)**

**description:** the estimated number of recreational (or small) slips associated with the piers/docks of the unit based on small boat length (~<50').

**slip\_large (6,6,I)**

**description:** the estimated number of slips for ocean-going vessels (~>100').

**railroad (1,1,C)**

**description:** railbed in contact with shorezone. Yes or No field.

**ripar\_pct (11,11,I)**

**description:** the estimated percent of unit with vegetation that hangs over into the intertidal zone. Riparian was only estimated for unconsolidated (gravel, pebble, sand, mud, etc) shorelines.

**ripar\_ft (11,11,I)**

**description:** the estimated length of riparian vegetation overhanging the intertidal zone.

**intwidth (6,6,I)**

**description:** intertidal zone width, measured in feet.

**zonecomp (35,35,C)**

**description:** a list of all of the associated zones and components that are described for this unit in the related XSHR table. For example, "A1 B1 B2 C1" means that a unit has the following corresponding across shore component records: 1 record for the supratidal (A1), 2 records for the intertidal (B1, B2), and one record for the subtidal (C1). Note: the subtidal is defined to begin a 0 ft elevation, Mean Lower Low Water.

**ver\_unit (3,3,C)**

**description:** bio-band for *VERrucaria* in supratidal splash zone. See [Appendix A - Detailed 'Bio-band' Code Descriptions](#) for complete list of biological codes. Abundance codes below.

**codes:**

P Patchy  
C Continuous  
Null Absent



### **gra\_unit (3,3,C)**

**description:** bio-band code for dune GRAsses of supratidal. See [Appendix A - Detailed 'Bio-band' Code Descriptions](#) for complete list of biological codes. Abundance codes below.

**codes:**

P Patchy  
C Continuous  
Null Absent

### **tri\_unit (3,3,C)**

**description:** bio-band for natural salt-tolerant assemblage of *TRIGloch*/*Salicornia/Deschampsia*. See [Appendix A - Detailed 'Bio-band' Code Descriptions](#) for complete list of biological codes. Abundance codes below.

**codes:**

P Patchy  
C Continuous  
Null Absent

### **sal\_unit (3,3,C)**

**description:** bio-band for *SALicornia*-dominated lower saltmarsh vegetation. See [Appendix A - Detailed 'Bio-band' Code Descriptions](#) for complete list of biological codes. Abundance codes below.

**codes:**

P Patchy  
C Continuous  
Null Absent

### **spa\_unit (3,3,C)**

**description:** bio-band for bright green *SPArtina*-invaded saltmarsh. See [Appendix A - Detailed 'Bio-band' Code Descriptions](#) for complete list of biological codes. Abundance codes below.

**codes:**

P Patchy  
C Continuous  
Null Absent

### **fuc\_unit (3,3,C)**

**description:** bio-band for *FUCus*-barnacle of upper intertidal. See [Appendix A - Detailed 'Bio-band' Code Descriptions](#) for complete list of biological codes. Abundance codes below.

**codes:**

**P** Patchy  
**C** Continuous  
**Null** Absent

### **bar\_unit (3,3,C)**

**description:** bio-band for BARnacle (*Balanus glandula*) in upper intertidal. See [Appendix A - Detailed 'Bio-band' Code Descriptions](#) for complete list of biological codes. Abundance codes below.

**codes:**

**P** Patchy  
**C** Continuous  
**Null** Absent

### **bmu\_unit (3,3,C)**

**description:** bio-band for blue mussels (*Mytilus trossulus*) of mid-intertidal, protected areas. See [Appendix A - Detailed 'Bio-band' Code Descriptions](#) for complete list of biological codes. Abundance codes below.

**codes:**

**P** Patchy  
**C** Continuous  
**Null** Absent

### **ulv\_unit (3,3,C)**

**description:** bio-band for mixed *ULVa*-type green algae band, mid intertidal. See [Appendix A - Detailed 'Bio-band' Code Descriptions](#) for complete list of biological codes. Abundance codes below.

**codes:**

**P** Patchy  
**C** Continuous  
**Null** Absent

### **gca\_unit (3,3,C)**

**description:** bio-band for red algae *Gracilaria* or *Sarcodiotheca* usually present as patches in the mid-intertidal on sandy or muddy tidal flats. See [Appendix A - Detailed 'Bio-band' Code Descriptions](#) for complete list of biological codes. Abundance codes below.

**codes:**

**P** Patchy  
**C** Continuous  
**Null** Absent

### **oys\_unit (3,3,C)**

**description:** bands of OYSters (*Crassostrea*), both commercial and non-commercial; generally in the lower portion of the intertidal. See [Appendix A - Detailed 'Bio-band' Code Descriptions](#) for complete list of biological codes. Abundance codes below.

**codes:**

**P** Patchy  
**C** Continuous  
**Null** Absent

### **mus\_unit (3,3,C)**

**description:** bio-band for MUSsel/barnacle complex of California mussel/*Semibalanus cariosus* of mid-intertidal, wave exposed areas. See [Appendix A - Detailed 'Bio-band' Code Descriptions](#) for complete list of biological codes. Abundance codes below.

**codes:**

**P** Patchy  
**C** Continuous  
**Null** Absent

### **red\_unit (3,3,C)**

**description:** bio-band for mixed RED algae of lower intertidal. See [Appendix A - Detailed 'Bio-band' Code Descriptions](#) for complete list of biological codes. Abundance codes below.

**codes:**

**P** Patchy  
**C** Continuous  
**Null** Absent

### cal\_unit (3,3,C)

**description:** bio-band for *CALLianassa* (now *Neotrypaea*), and *Upogebia* (ghost and mud shrimps) in the mid-intertidal. See [Appendix A - Detailed 'Bio-band' Code Descriptions](#) for complete list of biological codes. Abundance codes below.

**codes:**

**P** Patchy  
**C** Continuous  
**Null** Absent

### sbr\_unit (3,3,C)

**description:** bio-band for the 'Soft-Brown' lower intertidal layer of primarily *Laminaria* spp. (small stiped blade-browns). See [Appendix A - Detailed 'Bio-band' Code Descriptions](#) for complete list of biological codes. Abundance codes below.

**codes:**

**P** Patchy  
**C** Continuous  
**Null** Absent

### sar\_unit (3,3,C)

**description:** bio-band for *SARgassum*; lower intertidal and subtidal. See [Appendix A - Detailed 'Bio-band' Code Descriptions](#) for complete list of biological codes. Abundance codes below.

**codes:**

**P** Patchy  
**C** Continuous  
**Null** Absent

### chb\_unit (3,3,C)

**description:** bio-band for 'Chocolate Brown' coloured kelps of lower intertidal higher energy shores, e.g. *Hedophyllum*, *Lessoniopsis*. See [Appendix A - Detailed 'Bio-band' Code Descriptions](#) for complete list of biological codes. Abundance codes below.

**codes:**

**P** Patchy  
**C** Continuous  
**Null** Absent

**sur\_unit (3,3,C)**

**description:** bio-band for green SURfgrass (*Phyllospadix spp.*) of lower intertidal. See [Appendix A - Detailed 'Bio-band' Code Descriptions](#) for complete list of biological codes. Abundance codes below.

**codes:**

**P** Patchy  
**C** Continuous  
**Null** Absent

**den\_unit (3,3,C)**

**description:** bio-band for *DENdraster* (sand-dollars) usually on sand beaches; lower intertidal. See [Appendix A - Detailed 'Bio-band' Code Descriptions](#) for complete list of biological codes. Abundance codes below.

**codes:**

**P** Patchy  
**C** Continuous  
**Null** Absent

**zos\_unit (3,3,C)**

**description:** bio-band for *ZOStera spp.* (eelgrass) of sheltered areas, lower intertidal and subtidal. See [Appendix A - Detailed 'Bio-band' Code Descriptions](#) for complete list of biological codes. Abundance codes below.

**codes:**

**P** Patchy  
**C** Continuous  
**Null** Absent

**ner\_unit (3,3,C)**

**description:** bio-band for nearshore subtidal *NEReocystis* bull kelp. See [Appendix A - Detailed 'Bio-band' Code Descriptions](#) for complete list of biological codes. Abundance codes below.

**codes:**

**P** Patchy  
**C** Continuous  
**Null** Absent

**mac\_unit (3,3,C)**

**description:** bio-band for nearshore subtidal *MACrocystis* kelp. See [Appendix A - Detailed 'Bio-band' Code Descriptions](#) for complete list of biological codes. Abundance codes below.

**codes:**

- P** Patchy
- C** Continuous
- Null** Absent

**bio\_unit (140,140,C)**

**description:** a summary list of the biological assemblages seen in the unit. This field includes the bio-band codes. Individual fields also exist for each bio-band.

**codes:** Bio-band codes shown below.

Abundance codes: **P** = Patchy, **C** = Continuous, Null = Absent

Bio-Codes and Descriptions		
Bio-Band Code	Bio-Band Name	Description
<b>BAR</b>	upper barnacle	band of <i>Balanus glandula</i> , upper intertidal.
<b>BMU</b>	blue mussel	dominated by <i>Mytilus trossulus</i> on either rock or cobble-pebble beaches.
<b>CAL</b>	<i>Callianassa</i>	<i>Callianassa</i> (now <i>Neotrypaea</i> ), <i>californiensis</i> , and <i>Upogebia pugettensis</i> .
<b>CHB</b>	chocolate browns	exposed- water Laminarians: shiny, leathery dark brown <i>Laminaria setchellii</i> , <i>Eisenia</i> and/or <i>Pterygophora</i> , <i>Hedophyllum</i> , includes <i>Egregia</i> which has softer texture. <i>Lessoniopsis</i> occurs in exposed habitats.
<b>DEN</b>	sand-dollars	<i>Dendraster</i> or sand-dollars usually on sand beaches; usually in the lower intertidal.
<b>FUC</b>	<i>Fucus</i>	dominated by <i>Fucus spp.</i> , includes <i>B. glandula</i> . In high SE (semi-exposed habitats), this band includes <i>Pelvetiopsis</i> , same colour.
<b>GCA</b>	<i>Gracilaria</i>	red algae <i>Gracilaria</i> usually present as patches in the mid-intertidal on sandy or muddy tidal flats.
<b>GRA</b>	dune grasses	salt-tolerant grasses, in dunes and long-line sand berms, dominated by <i>Leymus mollis</i> .
<b>MAC</b>	<i>Macrocystis</i> <sup>2</sup>	leafy, soft kelp beds, usually indicator of fully-marine waters, not found very far east in Strait of Juan de Fuca.
<b>MUS</b>	mussel-barnacle	dominated by <i>Mytilus californianus</i> - <i>Semibalanus carious</i> , with scattered <i>Pollicipes</i> at higher SE.
<b>NER</b>	<i>Nereocystis</i>	bull kelp beds, floating blades and fronds in nearshore.
<b>OYS</b>	oysters	bands of oysters ( <i>Crassostrea</i> ), both commercial and non-commercial; generally in the lower portion of the intertidal.
<b>RED</b>	mixed filamentous & blade reds	algal-rich band of lower intertidal, complex of small red algae, includes <i>Gigartina</i> - <i>Odonthalia</i> - <i>Prionitis</i> - <i>Polysiphonia</i> and others.

<b>SAL</b>	<i>Salicornia</i>	like the TRI band but lower marsh, dominated by <i>Salicornia</i> , mostly lacking grasses and other herbs.
<b>SAR</b>	<i>Sargassum</i>	<i>Sargassum</i> in the lower intertidal and nearshore subtidal.
<b>SBR</b>	soft browns	large bladed <i>Laminaria spp.</i> - the unstalked blade browns, which are seen in the lower intertidal and nearshore subtidal.
<b>SED</b>	sedges	brackish/ freshwater wetlands assemblages found at freshwater streams and river mouths.
<b>SPA</b>	introduced saltmarsh	<i>Spartina</i> -invaded and <i>Spartina</i> -dominated saltmarsh and mudflats, in mid- and upper B zone.
<b>SUR</b>	surfgrass	cover of <i>Phyllospadix spp.</i> , attaches to coarse sediment or bedrock substrates.
<b>TRI</b>	native high saltmarsh	<i>Triglochin/Salicornia/Deschampsia/Distichylus</i> salt-tolerant assemblage of the high saltmarsh, in upper B zone.
<b>ULV</b>	<i>Ulva</i>	<i>Ulva</i> -type blade greens and <i>Enteromorpha</i> -type filamentous greens. May appear as thick patches or as green haze of small plants.
<b>VER</b>	<i>Verrucaria</i>	splash zone: marked by black encrusting lichen & blue-green algae. Generally occurs on bedrock shoreline.
<b>ZOS</b>	<i>Zostera</i>	eelgrass, ( <i>Zostera marina</i> and introduced <i>Z. japonica</i> ) fine sediment, may extend slightly upslope into intertidal. At times encrusted with epiphytic blade red algae.
<sup>2</sup> not a 'true' band but is an indicator species in the subtidal.		

### biounittxt (254,254,C)

**description:** a summary text list of the biological assemblages in the unit. This field is a translation and simplification of all of the bio-band codes for unit.

### shorenorm (3,3,I)

**description:** Direction of the unit shore-normal in degrees.

### fet\_norm (8,8,N,1)

**description:** Distance in kilometers of the shore normal fetch.

### right\_45 (8,8,N,1)

**description:** Distance in kilometers of the fetch at 45° to the right of the shore normal.

### left\_45 (8,8,N,1)

**description:** Distance in kilometers of the fetch at 45° to the left of the shore normal.

### max\_fet\_di (3,3,I)

**description:** Direction of the maximum fetch distance in degrees.

**max\_fet (8,8,N,1)**

**description:** Distance in kilometers of the maximum fetch.

**eff\_fet (8,8,N,1)**

**description:** Modified effective fetch.

**tide\_rng (8,8,N,1)**

**description:** Mean tidal range, in meters.

**a1\_fmtxt (254,254,C,1)**

**description:** Text summary of A1 across-shore component form and material, if applicable. A1 denotes the first component in the supratidal zone. If there is no A1 component for the unit, then the field is blank.

**a2\_fmtxt (254,254,C,1)**

**description:** Text summary of A2 across-shore component form and material, if applicable. A2 denotes the second component in the supratidal zone. If there is no A2 component for the unit, then the field is blank.

**a3\_fmtxt (254,254,C,1)**

**description:** Text summary of A3 across-shore component form and material, if applicable. A3 denotes the third component in the supratidal zone. If there is no A3 component for the unit, then the field is blank.

**a4\_fmtxt (254,254,C,1)**

**description:** Text summary of A4 across-shore component form and material, if applicable. A1 denotes the fourth component in the supratidal zone. If there is no A4 component for the unit, then the field is blank.

**b1\_fmtxt (254,254,C,1)**

**description:** Text summary of B1 across-shore component form and material, if applicable. B1 denotes the first component in the intertidal zone. If there is no B1 component for the unit, then the field is blank.

**b2\_fmtxt (254,254,C,1)**

**description:** Text summary of B2 across-shore component form and material, if applicable. B1 denotes the second component in the intertidal zone. If there is no B2 component for the unit, then the field is blank.



**b3\_fmtxt (254,254,C,1)**

**description:** Text summary of B3 across-shore component form and material, if applicable. B3 denotes the third component in the intertidal zone. If there is no B3 component for the unit, then the field is blank.

**b4\_fmtxt (254,254,C,1)**

**description:** Text summary of B4 across-shore component form and material, if applicable. B4 denotes the fourth component in the intertidal zone. If there is no B4 component for the unit, then the field is blank.

**b5\_fmtxt (254,254,C,1)**

**description:** Text summary of B5 across-shore component form and material, if applicable. B5 denotes the fifth component in the intertidal zone. If there is no B5 component for the unit, then the field is blank.

**c1\_fmtxt (254,254,C,1)**

**description:** Text summary of C1 across-shore component form and material, if applicable. C1 denotes the first component in the subtidal zone (the subtidal zone begins at 0 ft elevation, Mean Lower Low Water). If there is no C1 component for the unit, then the field is blank. Since this area is usually under water, the form and material are hard to see from a helicopter. Therefore, the form and material are usually blank.

**comments (200,200,C)**

**description:** comment field.

**TABULAR FILE NAMES**

<b>NAME</b>	<b>DESCRIPTION</b>
xshrlne	Across-shore component information for linear unit features.
xshrply	Across-shore component information for polygon unit features.
Xshrpt	Across-shore component information for point unit features.

## TABULAR FILE FIELDS - SUMMARY

FIELD NAME	DESCRIPTION
xshr_id	Unique sequential record identifier for across-shore records.
unit_id	Identifier for corresponding unit record.
cross_link	Unique identifier related to phy_ident.
phy_ident	Identifier for corresponding unit record.
zone	Portion of shore-zone: supratidal, intertidal, subtidal.
component	Number of component.
zonecomp	The combined zone and component.
form	Descriptor of morphology of component.
material	Descriptor of sediment of component.
xshr_fmtxt	Text summary and translation of the form and material in the component.
fm1	The first form and material associated in the component.
fm1_fmtxt	Text summary of the first form and material in the component.
fm2	The first form and material associated in the component.
fm2_fmtxt	Text summary of the second form and material in the component.
fm3	The third form and material associated in the component.
fm3_fmtxt	Text summary of the third form and material in the component.
fm4	The fourth form and material associated in the component.
fm4_fmtxt	Text summary of the fourth form and material in the component.
fm5	The fifth form and material associated in the component.
fm5_fmtxt	Text summary of the fifth form and material in the component.
width	Width of component, measured in feet.
slope	Estimated slope of component, measured in degrees.
process	Dominant coastal process modifying component.
ver	Bio-band for <i>VERrucaria</i> in supratidal splash zone.
gra	Bio-band code for dune GRAsses of supratidal.
sed	Bio-band for SEDge of brackish wetland/stream mouth.
tri	Bio-band for natural salt-tolerant assemblage of <i>TRIGloch</i> / <i>Salicornia</i> / <i>Deschampsia</i> .
sal	Bio-band for <i>SALicornia</i> -dominated lower saltmarsh.
spa	Bio-band for bright green <i>SPArtina</i> -invaded saltmarsh.
fuc	Bio-band for FUCus barnacle of upper intertidal.
bar	Bio-band for BARNacles ( <i>Balanus glandula</i> ) in upper intertidal.

bmu	Bio-band for blue mussels ( <i>Mytilus trossulus</i> ) of mid-intertidal, protected areas.
ulv	Bio-band for mixed ULVa-type green algae band, mid intertidal.
gca	Bio-band for red algae <i>Gracilaria</i> or <i>Sarcodiotheca</i> .
oys	Bands of OYSTers ( <i>Crassostrea</i> ), both commercial and non-commercial.
mus	Bio-band for MUSsel/barnacle complex of California mussel/ <i>Semibalanus cariosus</i> barnacles.
red	Bio-band for mixed RED algae of lower intertidal.
cal	Bio-band for burrowing shrimp (ghost shrimp and mud shrimp).
sbr	Bio-band for the 'Soft-Brown' kelps (primarily <i>Laminaria</i> spp.).
sar	Bio-band for continuous <i>Sargassum</i> .
chb	Bio-band for 'Chocolate Brown' kelps (e.g. <i>Hedophyllum</i> sp., <i>Lessoniopsis</i> sp.).
sur	Bio-band for green SURfgrass ( <i>Phyllospadix</i> spp.) of lower intertidal.
den	Bio-band for <i>Dendraster</i> sand-dollars usually on sand beaches.
zos	Bio-band for <i>ZOSTera</i> spp. (eelgrass) of sheltered areas.
ner	Bio-band for nearshore subtidal NEReocystis bull kelp.
mac	Bio-band for nearshore subtidal MACrocystis kelp.
bio_xshr	Summary field that combines all bio-band codes.
bio_comment	Field for comments by the biologist.

## **TABULAR FILE FIELDS - DETAILED DESCRIPTION**

for the tabular files xshrine, xshrpoly, xshrszpt

### **xshr\_id (6,6,I)**

**description:** Unique identifier.

### **unit\_id (6,6,I)**

**description:** Identifier for related unit information.

### **cross\_link (14,14,C)**

**description:** Miscellaneous field for cross-linking between XSHR and BIO databases.

### **phy\_ident (12,12,C)**

**description:** Unique physical ident code used in BC. Links across-shore component data for each unit to the Unit database.

### **zone (1,1,C)**

**description:** Text code indicating the across-shore position of the component: (A) supratidal, (B) intertidal or (C) subtidal zone.

### **component (1,1,C)**

**description:** Further subdivision of Zones, numbered from highest elevation in across-shore profile within Zone to lowest.

### **zonecomp (2,2,C)**

**description:** Combined zone and component fields.

### **form (20,20,C)**

**description:** Describes primary and secondary physical Form within each across-shore component, see table below.

**'Form' Codes (after Howes *et al.* 1994)**

<p><b>A = Anthropogenic</b></p>	<p>a dolphin b breakwater c log dump d derelict shipwreck f float h shell midden i cable/pipeline j jetty k dyke m marina n ferry terminal o log booms p port facility q aquaculture r boat ramp s seawall t landfill, tailings w wharf x outfall or intake y intake</p>	<p><b>B = Beach</b></p>	<p>b berm c washover channel f face i inclined (no berm) m multiple bars &amp; troughs n relic ridges, raised p plain r ridge (single intertidal bar) s storm ridge t low tide terrace w washover fan v veneer (modifier)</p>	<p><b>C = Cliff</b></p> <p>a eroding p passive c cave f fan, apron g surge channel t terraced r ramp</p> <p><i>slope</i> i inclined (20-35°) s steep (&gt; 35°)</p> <p><i>height</i> l low (&lt; 5m) m moderate (5-10m) h high (&gt;10m)</p>
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<p><b>D = Delta</b></p>	<p>b bars f fan l levee m multiple channels p plain (no delta, &lt; 5 degrees) s single channel</p>	<p><b>E = Dune</b></p>	<p>b blowouts i irregular n relic o ponds r ridge/swale p parabolic v veneer w vegetated</p>	<p><b>F = Reef</b></p> <p>f horizontal i irregular r ramp s smooth</p>
<p><b>L = Lagoon</b></p>	<p>o open c closed</p>	<p><b>M = Marsh</b></p>	<p>h high l mid to low (discontinuous) c tidal creek e levee o pond s brackish- supratidal</p>	<p><b>O = Offshore Island</b></p> <p>b barrier c chain of islets t table shaped p pillar/stack w whaleback</p> <p><i>elevation</i> l low (&lt;5m) m moderate (5-10m) h high (&gt;10m)</p>
<p><b>P = Platform</b></p>	<p>f horizontal g surge channel h high tide platform i irregular l low tide platform r ramp t terraced s smooth p tidepool</p>	<p><b>R = River Channel</b></p>	<p>a perennial t intermittent m multiple channels s single channel</p>	<p><b>T = Tidal Flat</b></p> <p>b bar, ridge c tidal channel e ebb tidal delta f flood tidal delta l levee s multiple tidal channels t flats p tidepool</p>

[The form code describes the physical 'form' of a component, using a primary form descriptor, with or without a secondary form modifier (e.g. Ap, BXfbu). Use of one primary form description indicates that it comprises up to 75% of component. If two descriptors shown (separated by a semi-colon), then the second form is > 10% of the component.]

**material (20,20,C)**

**description:** Describes primary and secondary substrate Materials within each component. See table below for codes.

<b>'Material' Code Table (after Howes <i>et al.</i> 1994)</b>			
<b>A = Anthropogenic</b>	a metal (structural) c concrete (loose blocks) d debris (man-made) f fill, undifferentiated mixed o concrete (solid cement blocks) r rubble, riprap t logs (cut trees) w wood (structural)	<b>B = Biogenic</b>	c coarse shell f fine shell hash g grass on dunes l trees, fallen not cut, dead o organic litter p peat t trees (alive)
<b>C = Clastic</b>	a blocks (angular, >25cm) b boulders (round, subround, > 25cm) c cobbles d diamicton (poorly sorted sediment containing a range of particles in a mud matrix-till) f fines or mud (mix of silt, clay) g gravel (mix pebble, cobble, boulder > 2mm) g gravel (mix pebble, cobble, boulder > 2mm) k clay p pebbles r rubble (boulders > 1m) s sand \$ silt x angular fragments (mix block & rubble) v sediment veneer	<b>R = Bedrock</b>	<i>rock type:</i> i igneous m metamorphic s sedimentary v volcanic  <i>rock structure:</i> 1 bedding 2 jointing 3 massive
<b>U = Undefined</b>	.	.	.
Description of Substrate Simplified from Wentworth scale			
<b>GRAVELS</b>	boulders cobble pebble granule	> 25cm 6 to 25 cm 5 mm to 6 cm 2 mm to 5 mm	
<b>SAND</b>	from very coarse to very fine: all between 0.5mm to 2mm		
<b>FINES (MUD)</b>	from silt to clay: smaller than 0.5mm		
[The 'material' descriptor consists of one primary term code and associated modifiers (e.g. Cskb,Ad). Up to three descriptors may be written in order of importance to describe each layer. If only one descriptor is used, indicated material comprises 75% of the volume of the layer (e.g. Cs), if more than one descriptor, they are ranked in order of volume. A surface layer can be described by prefix 'v' for veneer (e.g. vCsk).			

When more than one 'form' is coded for a component, the 'material' code is matched to the correct 'form' by retaining the order used in the 'form' coding. (e.g. form = Bi;Ph, material = At/Cps;Rs indicates log material over pebble and sand beach berm, with platform of sedimentary rock).

**xshr\_fmtxt (254,254,C)**

**description:** Text summary and translation of the form and material in the component. This translation is a simplification of the form and material codes, for a complete translation use the code lists.

**fm1 (100,100,C)**

**description:** The first form and material associated in the component. Form is listed first, followed by the corresponding material in parentheses. The number of forms and materials in a record varies, this field may be blank.

**fm1\_fmtxt (254,254,C)**

**description:** Text summary and translation of the first form and material (fm1) in the component. This translation is a simplification of the form and material codes, for a complete translation use the code lists.

**fm2 (100,100,C)**

**description:** The second form and material associated in the component. Form is listed first, followed by the corresponding material in parentheses. The number of forms and materials in a record varies, this field may be blank.

**fm2\_fmtxt (254,254,C)**

**description:** Text summary and translation of the second form and material (fm2) in the component. This translation is a simplification of the form and material codes, for a complete translation use the code lists.

**fm3 (100,100,C)**

**description:** The third form and material associated in the component. Form is listed first, followed by the corresponding material in parentheses. The number of forms and materials in a record varies, this field may be blank.

**fm3\_fmtxt (254,254,C)**

**description:** Text summary and translation of the first form and material (fm3) in the component. This translation is a simplification of the form and material codes, for a complete translation use the code lists.

**fm4 (100,100,C)**

**description:** The fourth form and material associated in the component. Form is listed first, followed by the corresponding material in parentheses. The number of forms and materials in a record varies, this field may be blank.

**fm4\_fmtxt (254,254,C)**

**description:** Text summary and translation of the first form and material (fm4) in the component. This translation is a simplification of the form and material codes, for a complete translation use the code lists.

**fm5 (100,100,C)**

**description:** The fifth form and material associated in the component. Form is listed first, followed by the corresponding material in parentheses. The number of forms and materials in a record varies, this field may be blank.

**fm5\_fmtxt (254,254,C)**

**description:** Text summary and translation of the first form and material (fm5) in the component. This translation is a simplification of the form and material codes, for a complete translation use the code lists.

**width (6,6,I)**

**description:** the mean across-shore width of the component, estimated in feet.

**slope (6,6,I)**

**description:** the estimated across-shore slope of the component in degrees; not coded in Carr Inlet.

**process (4,4,C)**

**description:** the dominant coastal process affecting the morphology of the component (F)luvial, (M)asswasting, (W)aves, (C)urrents, (O)ther, (E)olean.



**bio\_xshr (140,140,C)**

**description:** a summary of the biological assemblages seen in the across-shore component. Codes are defined below. Individual fields also exist for each bio-band.

**codes:** "Bio-band code" - "abundance code". Bio-band codes shown below.

Abundance codes: P = Patchy, C = Continuous, Null = Absent

See [Appendix A - Detailed 'Bio-band' Code Descriptions](#) for complete list of biological codes.

Bio-Codes and Descriptions		
Bio-Band Code	Bio-Band Name	Description
BAR	upper barnacle	band of <i>Balanus glandula</i> , upper intertidal.
BMU	blue mussel	dominated by <i>Mytilus trossulus</i> on either rock or cobble-pebble beaches.
CAL	<i>Callianassa</i>	<i>Callianassa</i> (now <i>Neotrypaea</i> ), <i>californiensis</i> , and <i>Upogebia pugettensis</i> .
CHB	chocolate browns	exposed- water Laminarians: shiny, leathery dark brown <i>Laminaria setchellii</i> , <i>Eisenia</i> and/or <i>Pterygophora</i> , <i>Hedophyllum</i> , includes <i>Egregia</i> which has softer texture. <i>Lessoniopsis</i> occurs in exposed habitats.
DEN	sand-dollars	<i>Dendraster</i> or sand-dollars usually on sand beaches; usually in the lower intertidal.
FUC	<i>Fucus</i>	dominated by <i>Fucus spp.</i> , includes <i>B. glandula</i> . In high SE (semi-exposed habitats), this band includes <i>Pelvetiopsis</i> , same colour.
GCA	<i>Gracilaria</i>	red algae <i>Gracilaria</i> usually present as patches in the mid-intertidal on sandy or muddy tidal flats.
GRA	dune grasses	salt-tolerant grasses, in dunes and long-line sand berms, dominated by <i>Leymus mollis</i> .
MAC	<i>Macrocystis</i> <sup>2</sup>	leafy, soft kelp beds, usually indicator of fully-marine waters, not found very far east in Strait of Juan de Fuca.
MUS	mussel-barnacle	dominated by <i>Mytilus californianus</i> - <i>Semibalanus carious</i> , with scattered <i>Pollicipes</i> at higher SE.
NER	<i>Nereocystis</i>	bull kelp beds, floating blades and fronds in nearshore.
OYS	oysters	bands of oysters ( <i>Crassostrea</i> ), both commercial and non-commercial; generally in the lower portion of the intertidal.
RED	mixed filamentous & blade reds	algal-rich band of lower intertidal, complex of small red algae, includes <i>Gigartina</i> - <i>Odonthalia</i> - <i>Prionitis</i> - <i>Polysiphonia</i> and others.
SAL	<i>Salicornia</i>	like the TRI band but lower marsh, dominated by <i>Salicornia</i> , mostly lacking grasses and other herbs.
SAR	<i>Sargassum</i>	<i>Sargassum</i> in the lower intertidal and nearshore subtidal.
SBR	soft browns	large bladed <i>Laminaria spp.</i> - the unstalked blade browns, which are seen in the lower intertidal and nearshore subtidal.
SED	sedges	brackish/ freshwater wetlands assemblages found at freshwater streams and river mouths.

<b>SPA</b>	introduced saltmarsh	<i>Spartina</i> -invaded and <i>Spartina</i> -dominated saltmarsh and mudflats, in mid- and upper B zone.
<b>SUR</b>	surfgrass	cover of <i>Phyllospadix spp.</i> , attaches to coarse sediment or bedrock substrates.
<b>TRI</b>	native high saltmarsh	<i>Triglochin/Salicornia/Deschampsia/Distichylus</i> salt-tolerant assemblage of the high saltmarsh, in upper B zone.
<b>ULV</b>	<i>Ulva</i>	<i>Ulva</i> -type blade greens and <i>Enteromorpha</i> -type filamentous greens. May appear as thick patches or as green haze of small plants.
<b>VER</b>	<i>Verrucaria</i>	splash zone: marked by black encrusting lichen & blue-green algae. Generally occurs on bedrock shoreline.
<b>ZOS</b>	<i>Zostera</i>	eelgrass, ( <i>Zostera marina</i> and introduced <i>Z. japonica</i> ) fine sediment, may extend slightly upslope into intertidal. At times encrusted with epiphytic blade red algae.
<sup>2</sup> not a 'true' band but is an indicator species in the subtidal.		

### ver (3,3,C)

**description:** bio-band for *VERrucaria* in supratidal splash zone. See [Appendix A - Detailed 'Bio-band' Code Descriptions](#) for complete list of biological codes. Abundance codes below.

**codes:**

**P** Patchy  
**C** Continuous  
**Null** Absent

### gra (3,3,C)

**description:** bio-band code for dune GRAsses of supratidal. See [Appendix A - Detailed 'Bio-band' Code Descriptions](#) for complete list of biological codes. Abundance codes below.

**codes:**

**P** Patchy  
**C** Continuous  
**Null** Absent

**sed (3,3,C)**

**description:** bio-band for SEDge of brackish wetland/stream mouth. See [Appendix A - Detailed 'Bio-band' Code Descriptions](#) for complete list of biological codes. Abundance codes below.

**codes:**

**P** Patchy  
**C** Continuous  
**Null** Absent

**tri (3,3,C)**

**description:** bio-band for natural salt-tolerant assemblage of *TR*igloch<sup>i</sup>n/*Salicornia*/*Deschampsia*. See [Appendix A - Detailed 'Bio-band' Code Descriptions](#) for complete list of biological codes. Abundance codes below.

**codes:**

**P** Patchy  
**C** Continuous  
**Null** Absent

**sal (3,3,C)**

**description:** bio-band for *SALicornia*-dominated lower saltmarsh vegetation. See [Appendix A - Detailed 'Bio-band' Code Descriptions](#) for complete list of biological codes. Abundance codes below.

**codes:**

**P** Patchy  
**C** Continuous  
**Null** Absent

**spa (3,3,C)**

**description:** bio-band for bright green *SPArtina*-invaded saltmarsh. See [Appendix A - Detailed 'Bio-band' Code Descriptions](#) for complete list of biological codes. Abundance codes below.

**codes:**

**P** Patchy  
**C** Continuous  
**Null** Absent

### **fuc (3,3,C)**

**description:** bio-band for *FUCus*-barnacle of upper intertidal. See [Appendix A - Detailed 'Bio-band' Code Descriptions](#) for complete list of biological codes. Abundance codes below.

**codes:**

**P** Patchy  
**C** Continuous  
**Null** Absent

### **bar (3,3,C)**

**description:** bio-band for BARnacle *Balanus glandula* in upper intertidal. See [Appendix A - Detailed 'Bio-band' Code Descriptions](#) for complete list of biological codes. Abundance codes below.

**codes:**

**P** Patchy  
**C** Continuous  
**Null** Absent

### **bmu (3,3,C)**

**description:** bio-band for blue mussels (*Mytilus trossulus*) of mid-intertidal, protected areas. See [Appendix A - Detailed 'Bio-band' Code Descriptions](#) for complete list of biological codes. Abundance codes below.

**codes:**

**P** Patchy  
**C** Continuous  
**Null** Absent

### **ulv (3,3,C)**

**description:** bio-band for mixed *ULVa*-type green algae band, mid intertidal. See [Appendix A - Detailed 'Bio-band' Code Descriptions](#) for complete list of biological codes. Abundance codes below.

**codes:**

**P** Patchy  
**C** Continuous  
**Null** Absent

### gca (3,3,C)

**description:** bio-band for red algae *Gracilaria* or *Sarcodiotheca* usually present as patches in the mid-intertidal on sandy or muddy tidal flats. See [Appendix A - Detailed 'Bio-band' Code Descriptions](#) for complete list of biological codes. Abundance codes below.

**codes:**

**P** Patchy

**C** Continuous

**Null** Absent

### oys (3,3,C)

**description:** bands of OYSTers (*Crassostrea*), both commercial and non-commercial; generally in the lower portion of the intertidal. See [Appendix A - Detailed 'Bio-band' Code Descriptions](#) for complete list of biological codes. Abundance codes below.

**codes:**

**P** Patchy

**C** Continuous

**Null** Absent

### mus (3,3,C)

**description:** bio-band for MUSsel/barnacle complex of California mussel/*Semibalanus cariosus* of mid-intertidal, wave exposed areas. See [Appendix A - Detailed 'Bio-band' Code Descriptions](#) for complete list of biological codes. Abundance codes below.

**codes:**

**P** Patchy

**C** Continuous

**Null** Absent

### red (3,3,C)

**description:** bio-band for mixed RED algae of lower intertidal. See [Appendix A - Detailed 'Bio-band' Code Descriptions](#) for complete list of biological codes. Abundance codes below.

**codes:**

**P** Patchy

**C** Continuous

**Null** Absent

### cal (3,3,C)

**description:** bio-band for *CALlianassa* (now *Neotrypaea*), and *Upogebia* (ghost and mud shrimps) in the mid-intertidal. See [Appendix A - Detailed 'Bio-band' Code Descriptions](#) for complete list of biological codes. Abundance codes below.

**codes:**

**P** Patchy  
**C** Continuous  
**Null** Absent

### sbr (3,3,C)

**description:** bio-band for the 'Soft-Brown' lower intertidal layer of primarily *Laminaria spp.* (small stiped blade-browns). See [Appendix A - Detailed 'Bio-band' Code Descriptions](#) for complete list of biological codes. Abundance codes below.

**codes:**

**P** Patchy  
**C** Continuous  
**Null** Absent

### sar (3,3,C)

**description:** bio-band for *Sargassum*; lower intertidal and subtidal. See [Appendix A - Detailed 'Bio-band' Code Descriptions](#) for complete list of biological codes. Abundance codes below.

**codes:**

**P** Patchy  
**C** Continuous  
**Null** Absent

### chb (3,3,C)

**description:** bio-band for 'Chocolate Brown' coloured kelps of lower intertidal higher energy shores, e.g. *Hedophyllum*, *Lessoniopsis*. See [Appendix A - Detailed 'Bio-band' Code Descriptions](#) for complete list of biological codes. Abundance codes below.

**codes:**

**P** Patchy  
**C** Continuous  
**Null** Absent

**sur (3,3,C)**

**description:** bio-band for green SURfgrass (*Phyllospadix spp.*) of lower intertidal. See [Appendix A - Detailed 'Bio-band' Code Descriptions](#) for complete list of biological codes. Abundance codes below.

**codes:**

**P** Patchy  
**C** Continuous  
**Null** Absent

**den (3,3,C)**

**description:** bio-band for *DENdraster*, (sand-dollars) usually on sand beaches; lower intertidal. See [Appendix A - Detailed 'Bio-band' Code Descriptions](#) for complete list of biological codes. Abundance codes below.

**codes:**

**P** Patchy  
**C** Continuous  
**Null** Absent

**zos (3,3,C)**

**description:** bio-band for *ZOStera spp.* (eelgrass) of sheltered areas, lower intertidal and subtidal. See [Appendix A - Detailed 'Bio-band' Code Descriptions](#) for complete list of biological codes. Abundance codes below.

**codes:**

**P** Patchy  
**C** Continuous  
**Null** Absent

**ner (3,3,C)**

**description:** bio-band for nearshore subtidal *NEReocystis* bull kelp. See [Appendix A - Detailed 'Bio-band' Code Descriptions](#) for complete list of biological codes. Abundance codes below.

**codes:**

**P** Patchy  
**C** Continuous  
**Null** Absent

**mac (3,3,C)**

**description:** bio-band for nearshore subtidal *MACrocystis* kelp. See [Appendix A - Detailed 'Bio-band' Code Descriptions](#) for complete list of biological codes. Abundance codes below.

**codes:**

**P** Patchy

**C** Continuous

**Null** Absent

**bio\_xshr (140,140,C)**

**description:** summary field that combines all bio-band information.

**bio\_comment (200,200,C)**

**description:** comment field



## ShoreZone Themes Detailed Documentation

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### ShoreZone Themes

A series of themes were created from the ShoreZone Inventory to address frequently requested information. The theme and shapefile names are listed below (in alphabetical order), followed by a description of the themes, how they were derived, and the fields.

**Theme names:**Eelgrass (line units with *Zostera spp.*), Eelgrass (polygon units with *Zostera spp.*)  
**Shapefile name:** EELLINE.SHP, EELPOLY.SHP

**Description:** shows line and polygon units where eelgrass (*Zostera marina* and/or *Zostera japonica*) is continuous, patchy, or absent. Created from szline and szpoly. Created an EELGRASS field from ZOS\_UNIT and populated it with a value of C, P or Null. Field values were then replaced as follows: C=continuous,P=patchy, Null=Absent.

**Fields:** SHAPE,LENGTH, (or AREA), UNIT\_ID, EELGRASS.

**Theme name :**Floating Kelp (line units)

**Shapefile name:** FKELPLIN.SHP

**Description:** shows line units where canopy-forming kelp (*Macrocystis integrifolia*. and *Nereocystis leutkeana*) is continuous, patchy, or absent. Derived from the szline fields MAC\_UNIT and NER\_UNIT. Created a CANOPYKELP field and populated it with a value of C, P or Null, in order of preference. In addition, the following fields were retained as additional attributes and renamed: MAC\_UNIT became GIANTKELP and NER\_UNIT became BULLKELP. Field values were then replaced as follows: C=continuous, P=patchy, Null=absent. No polygon coverage was made because no polygon units have floating kelp.

**Fields:** SHAPE, LENGTH, UNIT\_ID, FLOATKELP, GIANTKELP, BULLKELP

**Theme name :** Dune Grass (line units with *Leymus mollis*), Dune Grass (polygon units with *Leymus mollis*)

**Shapefile name:** GRALINE.SHP, GRAPOLY.SHP

**Description:** shows line units where dune grass (*Leymus mollis*) is continuous, patchy, or absent. Derived from the szline field GRA\_UNIT. Created a DUNEGRASS field and populated it with a value of C, P or Null. Field values were then replaced as follows: C=continuous, P=patchy, Null=Absent.

**Fields:** SHAPE, LENGTH, (or AREA), UNIT\_ID, GRA\_UNIT, DUNEGRASS

**Theme name :**All Kelp (line units)

**Shapefile name:** KELPLINE.SHP

**Description:** shows line units where kelp (both floating and non-floating species) is continuous, patchy, or absent. Created from the szline fields MAC\_UNIT, NER\_UNIT, SBR\_UNIT, and CBR\_UNIT. Created a CANOPYKELP field and populated it with a value of C, P or Null, in order of preference. The following fields were then retained as additional attributes and renamed: MAC\_UNIT became GIANTKELP, NER\_UNIT became BULLKELP, SBR\_UNIT became SOFTBROWN, and CHB\_UNIT became CHOCHBROWN. Field values were then replaced as follows: C=continuous, P=patchy, Null=absent. No polygon coverage was made because only 4 polygon units have kelp (it is soft brown kelp).

**Fields:** SHAPE, LENGTH, UNIT\_ID, ALLKELP, FLOATKELP, NFLOATKELP, GIANTKELP, BULLKELP, CHOCHBROWN, SOFTBROWN

**Theme name :** Non-Floating Kelp (line units)

**Shapefile name:** NKELPLIN.SHP

**Description:** shows line and polygon units where a wide range of non-canopy-forming kelp (*Laminaria spp.*, *Hedophyllum*, *Egregia menziesii*, etc.) is continuous, patchy, or absent. Derived from the szline fields SBR\_UNIT and CHB\_UNIT. Created an OTHERKELP field and populated it with a value of C, P or Null, in order of preference. The following fields were then retained as additional attributes and renamed: SBR\_UNIT became SOFTBROWN and CHB\_UNIT became CHOCHBROWN. Field values were then replaced as follows: C=continuous, P=patchy, Null=absent. No polygon coverage was made because only 4 polygon units have soft brown kelp (sbr).

**Fields:** SHAPE, LENGTH, UNIT\_ID, NFLOATKELP, CHOCHBROWN, SOFTBROWN

**Theme name :** Salt Marsh (line units), Salt Marsh (polygon units)

**Shapefile name:** SALTLINE.SHP, SALTPOLY.SHP

**Description:** shows line and polygon units where salt tolerant vascular plants (such as *Salicornia virginica*, *Triglochin maritima*, *Carex sp.*, *Spartina spp.*) are continuous, patchy, or absent. Derived from the szline and szpoly fields SAL\_UNIT, TRI\_UNIT, SED\_UNIT and SPA\_UNIT. Created a SALTMARSH field and populated it with a value of C, P or Null, in order of preference. The following fields were then retained as additional attributes and renamed: fields SAL\_UNIT became LOWMARSH, TRI\_UNIT became MIXMARSH, SED\_UNIT became SEDGE, and SPA\_UNIT became SPARTINA. Field values were then replaced as follows: C=continuous, P=patchy, Null=absent.

**Fields:** SHAPE, LENGTH, (or AREA), UNIT\_ID, SALTMARSH, SEDGE, MIXMARSH, LOWMARSH, SPARTINA

**Theme name :**Sargassum (line units w/ *Sargassum muticum*), Sargassum (polygon units w/ *Sargassum muticum*)

**Shapefile name:** SARGLINE.SHP, SARGPOLY.SHP

**Description:** shows line units where the non-indigenous brown algae *Sargassum muticum* is continuous, patchy, or absent. Created from the szline and szpoly. SARGASSUM field is based on SAR\_UNIT, populated with a value of C, P or Null. Field values were then replaced as follows: C=continuous, P=patchy, Null=Absent.

**Fields:** SHAPE, LENGTH, (or AREA), UNIT\_ID, SEAGRASS, EELGRASS, SURFGRASS

**Theme name :**Seagrass(line units w/ *Zostera spp.* and *Phyllospadix spp.*)

**Shapefile name:** SEAGLINE.SHP

**Description:** shows line and polygon units where seagrass (*Zostera sp.* and *Phyllospadix spp.*) is continuous, patchy, or absent. Created from the szline and szpoly fields ZOS\_UNIT and SUR\_UNIT. Created a SEAGRASS field and populated it with a value of C, P or Null, in order of preference. The following fields were then retained as additional attributes and renamed: ZOS\_UNIT became EELGRASS and SUR\_UNIT became SURFGRASS. Field values were then replaced as follows: C=continuous, P=patchy, Null=Absent.

**Fields:** SHAPE,LENGTH, UNIT\_ID, SEAGRASS, EELGRASS, SURFGRASS

**Theme name :** Shoreline Modification (% of line units)

**Shapefile name:** SHOREMOD.SHP

**Description:** Shows the percentage of anthropogenic shoreline modification in each line unit. Information on other human features are also included in the attribute table, such as the number of docks, ramps, piers, and slips. Created from szline.

**Fields:** SHAPE, LENGTH, UNIT\_ID, SM\_TOT\_PCT, SM1\_TYPE, SM1\_PCT, SM1\_FT, SM2\_TYPE, SM2\_PCT, SM2\_FT, SM3\_TYPE, SM3\_PCT, SM3\_FT, RAMP, PIERDOCK, SLIP\_SMALL, SLIP\_LARGE, RAILROAD.

**Theme name :**Substrate Summary (line units), Substrate Summary (polygon units)

**Shapefile name:** SUBLINE.SHP, SUBPOLY.SHP

**Description:** divides the shoreline into 8 shoreline types based on substrate type. This classification is a simplification of the BC Shoreline Classification.

**Fields:** SHAPE, LENGTH, (or AREA), UNIT\_ID, SUBNAME, BC\_CLASS

**Theme name :** Shoreline Type (line units), Shoreline Type (polygon units)

**Shapefile name:** SHORLINE.SHP, SHORPOLY.SHP

**Description:** divides the shoreline into 16 shoreline types based on substrate type and elevation. This classification is known as "rep type", and is a simplification of the BC Shoreline Classification. Created from szline and szpoly by simplifying BC\_CLASS to 15 shoreline types known as 'representative types' and commonly used in British Columbia. Attribute table also includes: 1) BC Shoreline classification, which divides the shoreline into 34 shoreline types based on substrate, shoreline width, and slope; 2) classification in 96 shoreline types according to Dethier's (1990) A Marine and Estuarine Classification System in Washington State; 3) classification into 16 shoreline types according to the Natural Resource Damage Assessment (NRDA) classification.

**Fields:** SHAPE, LENGTH (PERIMETER or AREA), UNIT\_ID, BC\_CLASS, BC\_NAME, REP\_CODE, REP\_NAME, DETH\_CLASS, DETH\_TXT, NRDA\_CLASS, NRDA\_TXT

**Theme name:** Surfgrass (line units with *Phyllospadix* spp.).

**Shapefile name:** SURFLINE.SHP

**Description:** shows line units where surfgrass (*Phyllospadix* spp.) is continuous, patchy, or absent. Created from the szline field SUR\_UNIT. Created a SURFGRASS field and populated it with a value of C, P or Null. Field values were then replaced as follows: C=continuous, P=patchy, Null=Absent.

**Fields:** SHAPE, LENGTH, UNIT\_ID, SURFGRASS

**Theme names:** Unit Summary (line units), Unit Summary (polygon units), Unit Summary (points)

**Shapefile name:** SZLINETH.SHP, SZPOLYTH.SHP, SZPOINTTH.SHP

**Description:** A unit-level summary of all of the physical and biological information in the ShoreZone Inventory information for lines, points and polygons. Codes have been replaced with English text. Useful for finding out everything about a particular unit. Created from szline, szpoly, and szpoint. The BC\_CLASS field was generalized into 32 shoreline types to reflect a manageable number of categories. Categories were chosen to maximize the data strengths and lump categories where differentiation was poorest.

**Fields:** SHAPE, LENGTH,(or AREA or PERIMETER), UNIT ID, UNIT TYPE, BC CLASS, DETHIER CLASS, NRDA CLASS, GEO MAPPER, GEO EDITOR, GEO MAP DATE, GEO SOURCE, BIO MAPPER, BIO EDITOR, BIO MAP DATE, BIO SOURCE, SLIDE NUMBER, SCALE, VIDEO TAPE NUMBER, VIDEO DATE, VIDEO TIME, BASEMAP TOWNSHIPRANGE, NOAA CHART NUMBER, BIOLOGY SUMMARY, EXPOSURE CALCULATED, EXPOSURE OBSERVED, EXPOSURE BASED ON BIOLOGY, EXPOSURE - FINAL, OIL RESIDENCE INDEX, SEDIMENT SOURCE, SEDIMENT ABUNDANCE, SEDIMENT DIRECTION, CHANGE TYPE, HABITAT CALCULATED TYPE, GEOGRAPHIC NAME, TOTAL SHORELINE MOD PCT, PRIMARY MODIFICATION TYPE, PRIMARY MODIFICATION PCT, SECONDARY MODIFICATION TYPE, SECONDARY MODIFICATION PCT, TERTIARY MODIFICATION TYPE,

TERTIARY MODIFICATION PCT, RAMP COUNT, PIER AND DOCK COUNT, RECREATIONAL SLIPS, DEEPSEA SLIPS, RAILROAD, OVERHANGING VEGETATION PCT, INTERTIDAL ZONE WIDTH, ZONE AND COMPONENTS IN UNIT, COMMENTS.

**Theme name:** WA State Saltwater Areas

**Shapefile name:** WABCWTR.SHP

**Description:** Washington's saltwater areas. Used the field WATER to reselect out polygons coded as 'y' for water.

**Fields:** SHAPE, AREA, PERIMETER, WATER

**Theme name:** British Columbia Land (not included in this inventory)

**Shapefile name:** BC\_LAND.SHP

**Description:** British Columbia Land which is not part of the ShoreZone Inventory. This shapefile is provided for geographic referencing. Used the field LAND to reselect out polygons that are coded as 'bc' for British Columbia.

**Fields:** SHAPE, AREA, PERIMETER, LAND

## APPENDIX A - Supplementary Classification Standards

- [Rationale for bc\\_class shore types](#)
- [Exposure Matrix Used for Estimating Calculated Exposure \(exp\\_calc\)](#)
- [Calculated ORI Classes - Defined by Shore type and exposure](#)
- [Habitat and Bio-Exposure Classification<sup>1,2</sup>](#)
- [Detailed Bio-band Code Descriptions](#)
- [Protocol for Bio-Mapping of Units](#)
- [Differences between the Washington State ShoreZone Inventory and the British Columbia Standard](#)
- [Translations to Other Classification Systems](#)
- [Dethier Classes](#)
- [NRDA Classes](#)

### Rationale for bc\_class shore types

Substrate	Sediment	Width	Slope	Shore Type Code & Description
<b>ROCK</b>	n/a	WIDE (>30m)	STEEP (>20°)	n/a
			INCLINED (5-20°)	(1) Rock Ramp, wide
			FLAT (<5°)	(2) Rock Platform, wide
		NARROW (<30m)	STEEP (>20°)	(3) Rock Cliff
			INCLINED (5-20°)	(4) Rock Ramp, narrow
			FLAT (<5°)	(5) Rock Platform, narrow
<b>ROCK + SEDIMENT</b>	GRAVEL	WIDE (>30m)	STEEP (>20°)	n/a
			INCLINED (5-20°)	(6) Ramp with gravel beach, wide.
			FLAT (<5°)	(7) Platform with gravel beach, wide.
		NARROW (<30M)	STEEP (>20°)	(8) Cliff with gravel beach
			INCLINED (5-20°)	(9) Ramp with gravel beach
			FLAT (<5°)	(10) Platform with gravel beach
	WIDE (>30m)	STEEP (>20°)	n/a	
		INCLINED (5-20°)	(11) Ramp with gravel & sand beach, wide	

	SAND & GRAVEL		FLAT (<5°)	(12) Platform with gravel & sand beach, wide
		NARROW (< 30m)	STEEP (>20°)	(13) Cliff with gravel & sand beach
			INCLINED (5-20°)	(14) Ramp with gravel & sand beach
			FLAT (<5°)	(15) Platform with gravel & sand beach
	SAND	WIDE (>30m)	STEEP (>20°)	n/a
			INCLINED (5-20°)	(16) Ramp with sand beach, wide
			FLAT (<5°)	(17) Platform with sand beach, wide.
		NARROW (<30m)	STEEP (>20°)	(18) Cliff with sand beach
			INCLINED (5-20°)	(19) Ramp with sand beach, narrow
			FLAT (<5°)	(20) Platform with sand beach, narrow
.	.	.	.	.
<b>SEDIMENT</b>	GRAVEL	WIDE (>30m)	FLAT (<5°)	(21) Gravel flat, wide
		NARROW (<30M)	STEEP (>20°)	n/a
			INCLINED (5-20°)	(22) Gravel beach, narrow
			FLAT (<5°)	(23) Gravel flat or fan
		WIDE (>30m)	STEEP (>20°)	n/a
			INCLINED (5-20°)	n/a



	SAND & GRAVEL	NARROW (<30m)	FLAT (<5°)	(24) Sand & gravel flat or fan
			STEEP (>20°)	n/a
			INCLINED (5-20°)	(25) Sand & gravel beach, narrow
			FLAT (<5°)	(26) Sand & gravel flat or fan
	SAND/MUD	WIDE (>30m)	STEEP (>20°)	n/a
			INCLINED (5-20°)	(27) Sand beach
			FLAT (<5°)	(28) Sand flat (29) Mudflat
		NARROW (<30m)	STEEP (>20°)	n/a
			INCLINED (5-20°)	(30) Sand beach
			n/a	.
ANTHROPOGENIC	ORGANICS/FINES	n/a	n/a	(31) Organics/Fines
	MAN-MADE	n/a	n/a	(32) Man-made, permeable (33) Man-made, impermeable
.	.	.	.	.
CURRENT-DOMINATED	.	.	.	(34) Channel

<b>Exposure Matrix Used for Estimating Calculated Exposure (exp_calc)</b>					
<b>Maximum Fetch (km)</b>	<b>Modified Effective Fetch (km)</b>				
	< 1	1 - 10	10 - 50	50 - 500	> 500
< 1	very protected	n/a	n/a	n/a	n/a
< 10	protected	protected	n/a	n/a	n/a
10 - 50	n/a	semi-protected	semi-protected	n/a	n/a
50 - 500	n/a	semi-exposed	semi-exposed	semi-exposed	n/a
> 500	n/a	n/a	semi-exposed	exposed	exposed
<sup>1</sup> exposure definitions are the same categories in exp_bio					
<b>Codes for exposures</b>	<b>VP</b> = very protected	<b>P</b> = protected	<b>SP</b> = semi-protected	<b>SE</b> = semi-exposed	<b>E</b> = exposed

<b>Calculated ORI Classes</b> Defined by Shore Type and Exposure						
<b>Shore Type</b>	<b>Calculated Exposure</b>					
<b>Class</b>	<b>VE</b>	<b>E</b>	<b>SE</b>	<b>SP</b>	<b>P</b>	<b>VP</b>
1	1	1	1	2	3	3
2	1	1	1	2	3	3
3	1	1	1	2	3	3
4	1	1	1	2	3	3
5	1	1	1	2	3	3
6	2	3	5	4	4	4
7	2	3	5	4	4	4
8	2	3	5	4	4	4
9	2	3	5	4	4	4
10	2	3	5	4	4	4
11	1	2	3	4	5	5
12	1	2	3	4	5	5
13	1	2	3	4	5	5
14	1	2	3	4	5	5
15	1	2	3	4	5	5
16	1	2	3	3	4	4
17	1	2	3	3	4	4
18	1	2	3	3	4	4
19	1	2	3	3	4	4
20	1	2	3	3	4	4
21	2	3	5	4	4	4
22	2	3	5	4	4	4

23	2	3	5	4	4	4
24	1	2	3	4	5	5
25	1	2	3	4	5	5
26	1	2	3	4	5	5
27	2	2	3	3	4	4
28	2	2	3	3	4	4
29	999	999	999	3	3	3
30	2	2	3	3	4	4
31	5	5	5	5	5	5
32	2	2	3	3	5	5
33	1	1	1	2	2	2
34	999	999	999	4	4	4
<b>Note:</b> 999 combination should not occur; requires operator override.						

<b>Habitat and Bio-Exposure Classifications<sup>1,2</sup></b>					
	<b>IMMOBILE SUBSTRATES</b>				
<b>HAB_CALC CODE</b> (‘habitat Calculated’)	<b>1<sup>3</sup></b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>5</b>
<b>MAJOR SUBSTRATE</b>	BEDROCK	BEDROCK/ BOULDER	BEDROCK/ BOULDER	BEDROCK/ GRAVEL	BEDROCK/ GRAVEL
<b>BC_CLASS</b> Shoreline types (see Across-Shore Component Database)	1-5	1-20	1-23, 32, 33	1-23, 33	1-23,33
<b>EXP_BIO</b> (‘Bio-exposure’) (see NRDA Shore Type table)	VE	E	SE	SP	P,VP
<b>ZONE A</b>	<i>‘Verrucaria’</i>	<i>‘Verrucaria’</i>	<i>‘Verrucaria’</i>	<i>‘Verrucaria’</i>	<i>‘Verrucaria’</i>
<b>ZONE UPPER B</b>	<i>[Balanus glandula]<sup>4</sup></i>	<i>Balanus glandula</i> <i>Pelvetiopsis limitata</i>	<i>Balanus glandula</i> <i>Fucus distichus</i>	<i>Balanus glandula</i> <i>Fucus distichus</i>	<i>Balanus glandula</i> <i>Fucus distichus</i>

ZONE MID B	<i>Pollicipes polymerus</i> <i>Mytilus californianus</i> [ <i>Semibalanus cariosus</i> ]	<i>Pollicipes polymerus</i> <i>Mytilus californianus</i> [ <i>Semibalanus cariosus</i> ] <i>Postelsia palmaeformis</i>	<i>Mytilus californianus</i> <i>Semibalanus cariosus</i>	<i>Mytilus trossulus</i> <i>Semibalanus cariosus</i> Ulva-type <i>Crassostrea gigas</i>	<i>Mytilus trossulus</i>  Ulva-type <i>Crassostrea gigas</i>
ZONE LOW B	[ <i>Alaria 'nana'</i> ] <i>Lessoniopsis littoralis</i>  [ <i>Laminaria setchellii</i> ] ' <i>Lithothamnion</i> ' <i>Bossiella/Calliarthron/ Corralina</i>	<i>Alaria 'nana'</i> <i>Lessoniopsis littoralis</i>  <i>Laminaria setchellii</i> ' <i>Lithothamnion</i> '	mixed reds <i>Alaria 'marginata'</i> <i>Hedophyllum sessile</i> <i>Egregia menziesii</i> <i>Laminaria setchellii</i> ' <i>Lithothamnion</i> ' <i>Phyllospadix scouleri</i>	mixed reds  <i>Sargassum muticum</i>	
ZONE UPPER C	<i>Nereocystis luetkeana</i>	<i>Nereocystis luetkeana</i>	<i>Laminaria spp.</i> <i>Nereocystis luetkeana</i> <i>Macrocystis integrifolia</i> <i>Eisenia arborea</i> <i>Strongylocentrotus franciscanus</i>	<i>Laminaria spp.</i> <i>Nereocystis luetkeana</i> <i>Macrocystis integrifolia</i> <i>Zostera marina/ Z. japonica</i>	<i>Laminaria spp.</i>  <i>Macrocystis integrifolia</i> <i>Zostera marina</i>

<b>Habitat and Bio-Exposure Classifications (continued)</b>					
	<b>MOBILE OR PARTIALLY MOBILE SUBSTRATES</b>				<b>CURRENT DOMINATED</b>
<b>HAB_CALC CODE ('habitat calculated')</b>	<b>6</b>	<b>7</b>	<b>8</b>	<b>9</b>	<b>10</b>
<b>MAJOR SUBSTRATE</b>	SAND & GRAVEL	SAND & GRAVEL	ESTUARIES SAND/MUD	SAND & GRAVEL	BEDROCK OR SEDIMENT
<b>BC_CLASS</b> Shoreline types (see Across-Shore Component Database)	24, 25, 26, 32	24, 25, 26, 32	27-31	21-30	34
<b>EXP_BIO</b> (Bio-exposure) (see NRDA Shore Type table)	SP	P,VP	SP,P,VP	E,SE,SP	SP,P,VP

ZONE A	grass spp.	grass spp.	<i>Carex</i> spp. <i>Triglochin maritimum</i> <i>Distichlyus</i> & other grass spp. <i>Salicornia virginica</i> <i>Spartina alterniflora</i>	<i>Leymus mollis</i> other grass spp.	
ZONE UPPER B	<i>Balanus glandula</i> <i>Fucus distichus</i>	<i>Balanus glandula</i> <i>Fucus distichus</i>	<i>Balanus glandula</i>		
ZONE MID B	<i>Mytilus trossulus</i> <i>Semibalanus cariosus</i> <i>Ulva/Ulvaria</i> spp. <i>Crassostrea gigas</i>	<i>Mytilus trossulus</i>  <i>Ulva/Ulvaria</i> spp. <i>Crassostrea gigas</i>	<i>Mytilus trossulus</i>  <i>Ulva/Ulvaria</i> spp. <i>Crassostrea gigas</i>	- no visible macrobiota on the sand beach due to sediment mobility	tidal current dominated sites often show assemblages of indicator species from a higher wave-exposure type and appear as an 'anomalous' community, usually richer than nearby low exposure, low current sites.
ZONE LOW B	mixed reds <b><i>Sargassum muticum</i></b> <i>Codium fragile</i>  <i>Dendraster excentricus</i>  <i>Zostera japonica</i>	<i>Gracilaria</i> spp. <i>Callianassa (Neotrypaea)</i>  <i>Dendraster excentricus</i>  <i>Zostera japonica</i>	<i>Gracilaria</i> spp. <i>Callianassa (Neotrypaea)</i>  <i>Zostera japonica</i>		
ZONE UPPER C	<i>Laminaria</i> spp. <i>Nereocystis luetkeana</i> <i>Macrocystis integrifolia</i> <i>Zostera marina</i>	<i>Laminaria</i> spp.  <i>Zostera marina</i>	<i>Zostera marina</i>	* in low SE, may see: <i>Eisenia arborea</i> <i>Phyllospadix scouleri</i>	

<sup>1</sup> This table explains the rationale for the Habitat classification for each physical shore unit based on the indicator species and the bio-bands observed. Certain species or species assemblages are apriori assumed to be associated with certain substrate/wave energy conditions. As such, these species assemblages are used to estimate exposure (i.e. BIO\_EXP) for each unit.

<sup>2</sup> Bolding indicates diagnostic species used to distinguish 'BIO\_EXP'. Note that the species' absence for substrate/wave exposures are as diagnostic as a species' presence.

<sup>3</sup> Habitat 1, 'VE' highest exposure bio-exposure type, does not occur on the coast of Washington.

<sup>4</sup> Brackets [] around species in Habitat Type 1 indicates species that may be present in reduced form and abundance.

Detailed 'Bio-band' Code (after Searing and Frith 1995 and Harper <i>et al</i> 1996).						
Zone	Bio-Band Name	Code	Color	Description	Exposure Category <sup>1</sup>	Confidence <sup>2</sup>
A	<i>Verrucaria</i>	VER	black or bare rock	splash zone: marked by black encrusting lichen & blue-green algae. Generally occurs on bedrock shoreline.	E,SE,SP,P	H
A	dune grasses	GRA	dusty green grasses	salt-tolerant grasses, in dunes and long-line sand berms, dominated by <i>Leymus mollis</i> .	E,SE,SP,P	M
A	sedges	SED	dark green	brackish/ freshwater wetlands assemblages found at freshwater streams and river mouths.	P	M
B upper	native high saltmarsh	TRI	green	<i>Triglochin/Salicornia/Deschampsia/Distichlyus</i> salt-tolerant assemblage of the high saltmarsh, in upper B zone.	SP,P	M
B upper	<i>Salicornia</i> <sup>3</sup>	SAL	green mat	Like the TRI band but lower marsh, dominated by <i>Salicornia</i> , mostly lacking grasses and other herbs.	SP,P	M
B upper	introduced saltmarsh	SPA	bright emerald green	<i>Spartina</i> -invaded and <i>Spartina</i> -dominated saltmarsh and mudflats, in mid- and upper B zone.	SP,P	H - L <sup>4</sup>
B upper	<i>Fucus</i>	FUC	golden brown	dominated by <i>Fucus spp.</i> , includes <i>B. glandula</i> . At high SE, this band includes <i>Pelvetiopsis</i> , same colour.	SE,SP,P	H
B upper	upper barnacle	BAR	grey-white	band of <i>B. glandula</i> , upper intertidal.	E,SE,SP,P	M
B mid	blue mussel	BMU	dark blue	dominated by <i>Mytilus trossulus</i> on either rock or cobble-pebble beaches.	SE,SP	H
B mid	<i>Ulva</i>	ULV	bright green	<i>Ulva</i> -type blade greens and <i>Enteromorpha</i> -type filamentous greens. May appear as thick patches or as green haze of small plants.	SP,P	H
B mid	<i>Gracilaria</i>	GCA	dark reddish brown	red algae <i>Gracilaria</i> usually present as patches in the mid-intertidal on sandy or muddy tidal flats.	SP,P	L
B mid	oysters	OYS	patch off-white	bands of oysters, both commercial and non-commercial; generally in the lower portion of the intertidal.	VP,P,SP	H

B lower	mussel- barnacle	MUS	grey- blue	dominated by <i>Mytilus californianus</i> - <i>Semibalanus cariosus</i> , with scattered <i>Pollicipes</i> at higher SE	E,SE	H
B lower upper	mixed filamentous & blade reds	RED	dark red- brown	algal-rich band of lower intertidal, complex of small red algae, includes <i>Gigartina</i> - <i>Odonthalia</i> - <i>Prionitis</i> - <i>Polysiphonia</i> and others.	SE,SP	M
B lower	<i>Callianassa</i>	CAL	mottling on sand; burrows	<i>Callianassa</i> (now <i>Neotrypaea</i> ), <i>californiensis</i> , and <i>Upogebia pugettensis</i> .	P,VP	M
B lower C upper	soft browns	SBR	brown	large bladed <i>Laminaria spp.</i> - the unstalked blade browns, which are seen in the lower intertidal and nearshore subtidal.	SP,P	H
B lower C upper	<i>Sargassum</i>	SAR	large fuzzy brown, not bladed	continuous <i>Sargassum</i> in the lower intertidal and nearshore subtidal and nearshore subtidal.	SP	M
B lower C upper	chocolate browns	CHB	dark brown	exposed- water kelp: shiny, leathery dark brown <i>Laminaria setchelli</i> , <i>Eisenia</i> and/or <i>Pterygophora</i> , <i>Hedophyllum</i> , includes <i>Egregia</i> which has softer texture. <i>Lessoniopsis</i> occurs in E	E,SE	H
B lower C upper	surfgrass	SUR	emerald green	continuous cover of <i>Phyllospadix</i> , attaches to coarse sediment or bedrock substrates.	SE	H
B lower C upper	sand- dollars	DEN	black speckles	<i>Dendraster</i> or sand-dollars usually on sand beaches; in the lower intertidal.	SP	L
C upper	<i>Zostera</i>	ZOS	dark green	eelgrass, ( <i>Zostera marina</i> and introduced spp. <i>Z. japonica</i> ) fine sediment, may extend slightly upslope into intertidal.	P, SP	H - M <sup>4</sup>
C	<i>Nereocystis</i>	NER	dark brown, shiny	bull kelp beds, floating blades and fronds in nearshore.	E,SE,SP, current	H
C	<i>Macrocystis</i> <sup>5</sup>	MAC	brown	leafy, soft kelp beds, usually indicator of fully-marine waters, not found very far east in Strait of Juan de Fuca.	SE,SP,P	H

<sup>1</sup> Codes for exposures: **E**= exposed; **SE**= semi-exposed; **SP** = semi-exposed; **P** = protected; **VP** = very protected

<sup>2</sup> Bio-band confidence:

**High** usually recognizable, including at low or moderate density

**Medium** mostly recognizable in moderate density, may be in combination with other bands or hard to identify in some conditions.

**Low** often hard to recognize except in high density or with ideal image quality. Low to moderate density bands could be missed.

**Overall concerns about confidence in interpretation of bio-bands**

Combinations of bands (which often happens in richer areas, in the lower intertidal in particular) lowers confidence in band interpretation or detection.

Some bands are more recognizable than others which leads to higher confidence in interpretations (i.e. SURfgrass is usually a monoculture and if present, appears as obvious patches or band; whereas RED is usually a mixture of species in the lower intertidal and also often overlaps other bands).

We noticed strong regional differences in bio-bands. In Puget Sound a few bands occurred that did not occur on the outer coast and visa versa. Also in some bands, they were made up of different species in the same genus or functional group and looked different in different areas. For example, the SPARTina band, in outer coast areas, was clearly differentiated but in Puget Sound it is primarily a different species and was much harder to distinguish from native marsh vegetation.

<sup>3</sup> The upper intertidal marsh/grass bands (GRA, SED, TRI, SAL) often overlapped or mixed. Boundaries between these types were often a gradual change not a distinct line and it is not always possible to distinguish these taxa from each other, even in pure stands.

<sup>4</sup> We had High confidence in mapping ZOSTera bands in the intertidal and less confidence (M) in the nearshore subtidal, where observations were affected by water clarity and lighting conditions.

<sup>5</sup> not a 'true' band but is an indicator species in the subtidal.

## Protocol for Bio-Mapping of Units

The biological mapping is based on review of the aerial video-imagery, the associated biological commentary and the aerial slides. There are inherent limitations of these information sources in terms of scale and biota coverage - some sparsely distributed organisms will not be seen.

### **BioBands**

In terms of completion of the bio-band data fields, the "bio-band" must be seen or described in the commentary to be recorded as a band (i.e. either C for "continuous" or P for "patchy"). That is: if a C or P is present in the data fields, then there is either imagery or commentary indicating it is present within the unit.

### **Bio Exposure**

The classification of exposure (exp\_bio field) represents a generalization for the unit and the field may be "inferred" based on biological observations of immediately adjacent units, even if no bio-band data is recorded. If the exp\_bio cannot be estimated from the indicator species (see [Habitat and Bio-Exposure Classification Code Table](#)) and it cannot be inferred from adjacent units, then an "X" is entered into the exp\_bio field to indicate that (a) an exposure estimate based on biology could not be made and (b) the unit has been reviewed. A blank field would indicate that the unit has not been evaluated. As such, a completed database will not contain any blank exp\_bio fields.



## Differences Between the Washington State ShoreZone Inventory and the British Columbia Standard

The Washington State ShoreZone Inventory is based on the British Columbia Physical ShoreZone Mapping Standard and British Columbia Biological ShoreZone Mapping Standard. The systems used in BC and the Washington State are fully compatible. However, the Washington State data format differs from the British Columbia data format in minor ways:

- In the BC data format, a single unit table describes line, polygon and point features. It is separate from the spatial data. In the Washington data format, tabular unit information was made part of the spatial data in order to minimize the number of joins required. Therefore, the unit information is part of the spatial data for each feature type.
- In the BC data format, *phy\_ident* is the primary key. This field is a character string based on a series of project-related identifiers. It is long and it can be unwieldy. Therefore, once data processing was complete, the Washington State data format created sequential numeric keys, called *unit\_id* at the unit level and *xshr\_id* at the across-shore level. The *phy\_ident* field has also been maintained.
- The BC data format maintains separate *xshr* and *bio* tables. The Washington State data set combined the two tables into a single table in order to minimize the number of links required between tables.
- The BC data format includes 3 mutually exclusive types of features: lines, polygons and points. The Washington State data format includes an additional *BOTH(B)* category, assigned to units that are represented as both lines and polygons. This data type was created based on recognition among the mappers that some features were being identified as *BOTH* in practice.
- The Washington State data format includes English text translations for the form, material and biota information. The codes were simplified during the translation in order to make them a manageable length.
- The line, polygon and point unit features share almost the same combination of descriptive fields. However, some fields are not applicable to particular feature types. For example, line features do not have an area measure. Polygons do not have a length measure. Point features have neither area nor length. Point features also do not contain information on shoreline modification, ramps, and other human uses. The *Data Dictionary* describes which fields are not applicable to a certain feature type.
- The Washington State data format includes additional fields relating to anthropogenic alteration of the shoreline, such as: shoreline modification, ramps, railroad, docks, piers. The *Data Dictionary* includes notes on which fields are unique to the Washington State inventory.

- The BC data format maintains a separate exposure table with fetch calculations. This data structure allows mappers to calculate exposure by hand for a cluster of units and then relate them back to the unit table (a one-to-many relationship). More recently, exposure has been calculated by computer for each individual unit (a one-to-one relationship). In Washington state, exposure was estimated by computer for the majority of the units, making a separate table unnecessary. Therefore, the Washington State data format does not have a separate exposure table. Fetch calculations are maintained at the unit level.
- There is no bio\_ident field in the Washington State data format because there is no linked table describing biology. All information on biology is contained at either the unit level or the across-shore level.

## **Translations to Other Classification Systems**

The Washington State ShoreZone Inventory includes translations to two other shoreline classification systems: A Marine and Estuarine Classification System for Washington State (Dethier, 1990), and the Natural Resource Damage Assessment (NRDA) habitat types. Due to the different structure of these systems, the translations are approximate.

The Dethier (1990) classification system does not have an associated mapping methodology. Also, the potential combinations of classes is not defined. So, we interpreted the classification and produced a list of 96 potential classification categories. The most significant problem is in applying only ONE of these categories to describe a unit of shoreline. A unit is commonly composed of a mixture of substrate types, so translating to only one category required generalization. For example, a stretch of shoreline can commonly have a rock platform with a pebble beach, or a gravel beach berm with sand flat, etc.

The NRDA classification is defined in Washington Administrative Code (WAC) for assessing damages due to oil spills. The classification is similar to Dethier (1990), but further simplified. So, the same issues discussed for Dethier (1990) also apply to the NRDA classification. Furthermore, four of the NRDA categories include biotic constituents (sandy low marshes, mixed fine beaches and low marshes, high salt marshes and transition zone wetlands). These categories could not be translated without further clarification, so they were not included into the classification. If indicator species were assigned, it might be possible to translate these categories using bio-band information. Unclassified units were lumped into an "unclassified" category. Approximately 6% of the units were not classified. In spite of these weaknesses, the NRDA translation should be sufficiently detailed for regional planning. We hope that actual field determinations would be used for classification in affected areas.

<b>Dethier (1990) Classes</b>	
<b>deth_class</b>	<b>deth_class description</b>
1	Marine, intertidal, bedrock, exposed, eulittoral
2	Marine, intertidal, bedrock, partially exposed, eulittoral
3	Marine, intertidal, bedrock, semi-protected, eulittoral
4	Marine, intertidal, bedrock, protected, eulittoral
5	Marine, intertidal, boulder, exposed, eulittoral
6	Marine, intertidal, boulder, partially exposed, eulittoral
7	Marine, intertidal, boulder, semi-protected, eulittoral
8	Marine, intertidal, boulder, protected, eulittoral
9	Marine, intertidal, hardpan, exposed, eulittoral
10	Marine, intertidal, hardpan, partially exposed, eulittoral
11	Marine, intertidal, hardpan, semi-protected, eulittoral
12	Marine, intertidal, hardpan, protected, eulittoral
13	Marine, intertidal, cobble, exposed, eulittoral
14	Marine, intertidal, cobble, partially exposed, eulittoral
15	Marine, intertidal, cobble, semi-protected, eulittoral
16	Marine, intertidal, cobble, protected, eulittoral
17	Marine, intertidal, mixed coarse, exposed, eulittoral
18	Marine, intertidal, mixed coarse, partially exposed, eulittoral
19	Marine, intertidal, mixed coarse, semi-protected, eulittoral
20	Marine, intertidal, mixed coarse, protected, eulittoral
21	Marine, intertidal, gravel, exposed, eulittoral
22	Marine, intertidal, gravel, partially exposed, eulittoral
23	Marine, intertidal, gravel, semi-protected, eulittoral
24	Marine, intertidal, gravel, protected, eulittoral
25	Marine, intertidal, sand, exposed, eulittoral
26	Marine, intertidal, sand, partially exposed, eulittoral

27	Marine, intertidal, sand, semi-protected, eulittoral
28	Marine, intertidal, sand, protected, eulittoral
29	Marine, intertidal, mixed fine, exposed, eulittoral
30	Marine, intertidal, mixed fine, partially exposed, eulittoral
31	Marine, intertidal, mixed fine, semi-protected, eulittoral
32	Marine, intertidal, mixed fine, protected, eulittoral
33	Marine, intertidal, mud, exposed, eulittoral
34	Marine, intertidal, mud, partially exposed, eulittoral
35	Marine, intertidal, mud, semi-protected, eulittoral
36	Marine, intertidal, mud, protected, eulittoral
37	Marine, intertidal, organic, exposed, eulittoral
38	Marine, intertidal, organic, partially exposed, eulittoral
39	Marine, intertidal, organic, semi-protected, eulittoral
40	Marine, intertidal, organic, protected, eulittoral
41	Marine, intertidal, reef, exposed, eulittoral
42	Marine, intertidal, reef, partially exposed, eulittoral
43	Marine, intertidal, reef, semi-protected, eulittoral
44	Marine, intertidal, reef, protected, eulittoral
45	Marine, intertidal, artificial, exposed, eulittoral
46	Marine, intertidal, artificial, partially exposed, eulittoral
47	Marine, intertidal, artificial, semi-protected, eulittoral
48	Marine, intertidal, artificial, protected, eulittoral
49	Estuarine, intertidal, bedrock, open, eulittoral
50	Estuarine, intertidal, bedrock, partly enclosed eulittoral
51	Estuarine, intertidal, bedrock, lagoon, eulittoral
52	Estuarine, intertidal, bedrock, channel/slough, eulittoral
53	Estuarine, intertidal, boulder, open, eulittoral
54	Estuarine, intertidal, boulder, partly enclosed, eulittoral

55	Estuarine, intertidal, boulder, lagoon, eulittoral
56	Estuarine, intertidal, boulder, channel/slough, eulittoral
57	Estuarine, intertidal, hardpan, open, eulittoral
58	Estuarine, intertidal, hardpan, partly enclosed, eulittoral
59	Estuarine, intertidal, hardpan, lagoon, eulittoral
60	Estuarine, intertidal, hardpan, channel/slough, eulittoral
61	Estuarine, intertidal, cobble, open, eulittoral
62	Estuarine, intertidal, cobble, partly enclosed, eulittoral
63	Estuarine, intertidal, cobble, lagoon, eulittoral
64	Estuarine, intertidal, cobble, channel/slough, eulittoral
65	Estuarine, intertidal, mixed coarse, open, eulittoral
66	Estuarine, intertidal, mixed coarse, partly enclosed, eulittoral
67	Estuarine, intertidal, mixed coarse, lagoon, eulittoral
68	Estuarine, intertidal, mixed coarse, channel/slough, eulittoral
69	Estuarine, intertidal, gravel, open, eulittoral
70	Estuarine, intertidal, gravel, partly enclosed, eulittoral
71	Estuarine, intertidal, gravel, lagoon, eulittoral
72	Estuarine, intertidal, gravel, channel/slough, eulittoral
73	Estuarine, intertidal, sand, open, eulittoral
74	Estuarine, intertidal, sand, partly enclosed, eulittoral
75	Estuarine, intertidal, sand, lagoon, eulittoral
76	Estuarine, intertidal, sand, channel/slough, eulittoral
77	Estuarine, intertidal, mixed fine, open, eulittoral
78	Estuarine, intertidal, mixed fine, partly enclosed, eulittoral
79	Estuarine, intertidal, mixed fine, lagoon, eulittoral
80	Estuarine, intertidal, mixed fine, channel/slough, eulittoral
81	Estuarine, intertidal, mud, open, eulittoral
82	Estuarine, intertidal, mud, partly enclosed, eulittoral

83	Estuarine, intertidal, mud, lagoon, eulittoral
84	Estuarine, intertidal, mud, channel/slough, eulittoral
85	Estuarine, intertidal, organic, open, eulittoral
86	Estuarine, intertidal, organic, partly enclosed, eulittoral
87	Estuarine, intertidal, organic, lagoon, eulittoral
88	Estuarine, intertidal, organic, channel/slough, eulittoral
89	Estuarine, intertidal, reef, open, eulittoral
90	Estuarine, intertidal, reef, partly enclosed, eulittoral
91	Estuarine, intertidal, reef, lagoon, eulittoral
92	Estuarine, intertidal, reef, channel/slough, eulittoral
93	Estuarine, intertidal, artificial, open, eulittoral
94	Estuarine, intertidal, artificial, partly enclosed, eulittoral
95	Estuarine, intertidal, artificial, lagoon, eulittoral
96	Estuarine, intertidal, artificial, channel/slough, eulittoral

<b>NRDA Classes</b>	
<b>nrda_class</b>	<b>nrda_class descriptions</b>
1	exposed and semi-exposed rock shores (marine)
2	sand-scoured rocky shores (marine)
3	protected rocky shores (marine)
4	semi-exposed cobble & mixed coarse beaches (marine)
5	semi-exposed gravel beaches (marine)
6	exposed sandy beaches (marine)
7	semi-protected mixed-fine beaches (marine)
8	protected mud flats (marine)
9	open rocky shores (estuarine)
10	open mixed coarse beaches (estuarine)
11	open sandy beaches (estuarine)
14	saline lagoons (estuarine)
15	low-salinity lagoons (estuarine)
16	mud flats (estuarine)
99	unclassified

