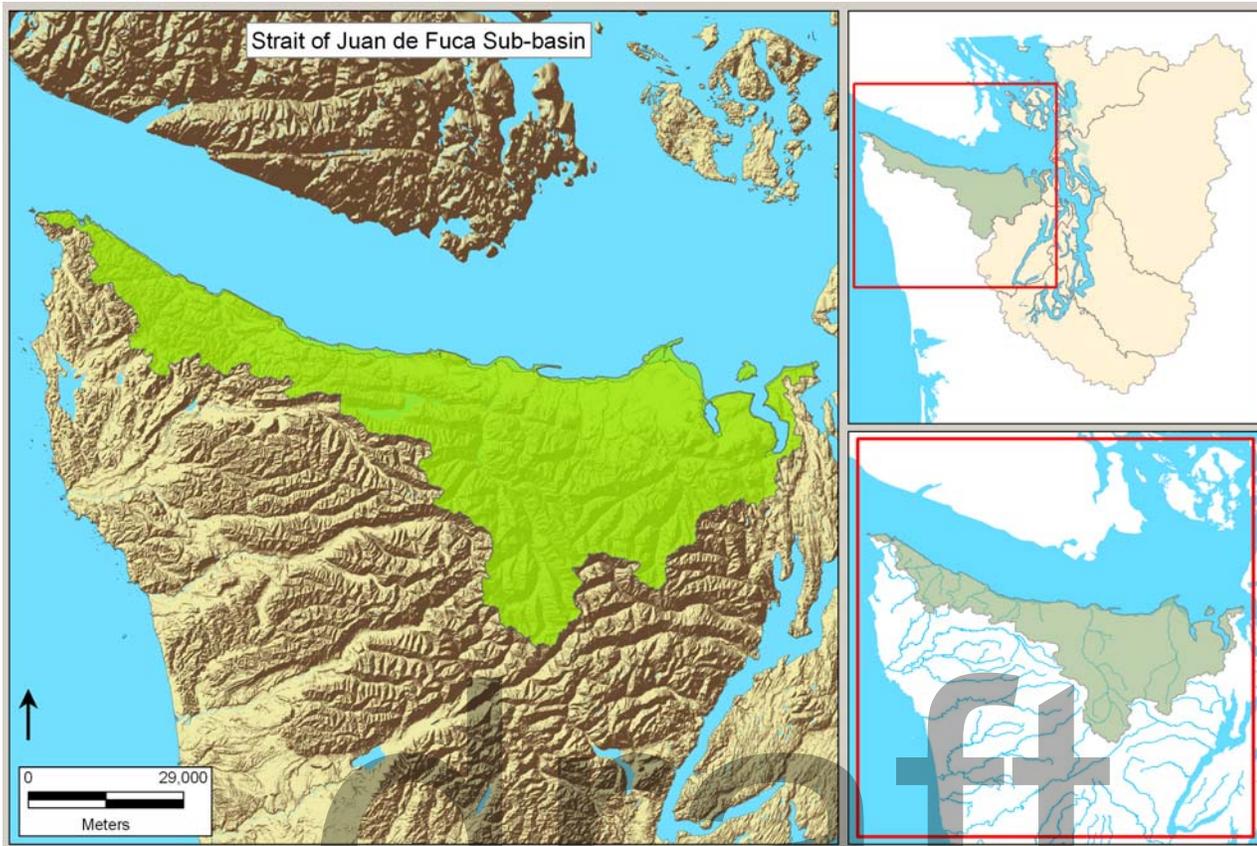


Sub-basin: Strait of Juan de Fuca



Summary Statistics

Tier 1 Shoreform Composition: Shoreform Count

| <u>Process Unit Features</u> | |
|--------------------------------------|-------------------------|
| Drainage Area | 3,230.5 km ² |
| Nearshore Zone Area | 181.4 km ² |
| Shoreline Length | 329.2 km |
| Stream Confluences | 259 |
| <u>Drift Cell Summary (%)</u> | |
| Convergence Zone | 2.5 |
| Divergence Zone | 5.4 |
| No Appreciable Drift | 30.9 |
| Transport Zone, Left to Right | 16.0 |
| Transport Zone, Right to Left | 45.2 |

| <u>Shoreform</u> | <u>Historic</u> | <u>Current</u> |
|--------------------------|------------------------|-----------------------|
| Bluff-Backed Beach | 43 | 44 |
| Barrier Beach | 51 | 50 |
| Delta | 2 | 2 |
| Barrier Estuary | 15 | 12 |
| Barrier Lagoon | 9 | 8 |
| Closed Lagoon/Marsh | 12 | 13 |
| Open Coastal Inlet | 3 | 3 |
| Plunging Rocky Shoreline | 13 | 23 |
| Rocky Platform | 53 | 66 |
| Pocket Beach | 17 | 17 |
| Artificial | 2 | 14 |

Please see the accompanying PSNERP Tabulation Reports Legend for an explanation of all calculations.

Sub-basin: Strait of Juan de Fuca

Tier 1: Shoreform Composition

| Shoreform Composition | Historic Shoreform Length (km) | Current Shoreform Length (km) | % of Historic Shoreline Length | % of Current Shoreline Length | %Gain or Loss from Historic based on Historic Shoreform |
|--------------------------|--------------------------------|-------------------------------|--------------------------------|-------------------------------|---|
| Bluff-Backed Beach | 116.76 | 111.82 | 33.03 | 33.97 | -4.2 |
| Barrier Beach | 63.83 | 62.30 | 18.06 | 18.93 | -2.4 |
| Delta | 29.10 | 15.56 | 8.23 | 4.73 | -46.5 |
| Barrier Estuary | 25.73 | 20.41 | 7.28 | 6.20 | -20.7 |
| Barrier Lagoon | 12.47 | 9.63 | 3.53 | 2.92 | -22.8 |
| Closed Lagoon/Marsh | 9.10 | 9.86 | 2.57 | 3.00 | 8.4 |
| Open Coastal Inlet | 8.64 | 4.79 | 2.44 | 1.45 | -44.6 |
| Plunging Rocky Shoreline | 4.35 | 5.61 | 1.23 | 1.71 | 29.0 |
| Rocky Platform | 70.88 | 74.27 | 20.05 | 22.56 | 4.8 |
| Pocket Beach | 8.91 | 7.85 | 2.52 | 2.38 | -11.9 |
| Artificial | 3.72 | 18.71 | 1.05 | 5.68 | 403.1 |

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Sub-basin: Strait of Juan de Fuca

Tier 1: Shoreform Composition: Transition Matrix

| Shoreform Transition | Current -----> | | | | | | | | | | | | |
|--------------------------|--------------------|---------------|-------|-----------------|----------------|----------------------|--------------------|--------------------------|----------------|--------------|------------|------------------|-------|
| | Bluff-Backed Beach | Barrier Beach | Delta | Barrier Estuary | Barrier Lagoon | Closed Lagoon/ Marsh | Open Coastal Inlet | Plunging Rocky Shoreline | Rocky Platform | Pocket Beach | Artificial | Shoreform Absent | Total |
| Historic | | | | | | | | | | | | | |
| Bluff-Backed Beach | 0 | | | | | | | | | | 7 | | 7 |
| Barrier Beach | | 0 | | | 1 | | | | | | 5 | | 6 |
| Delta | | | 0 | | | | | | | | | | 0 |
| Barrier Estuary | | | | 0 | | | | | | | | 3 | 3 |
| Barrier Lagoon | | | | | 0 | 2 | | | | | | | 2 |
| Closed Lagoon/Marsh | | | | | | 0 | | | | | 2 | 1 | 3 |
| Open Coastal Inlet | | | | 1 | | | 0 | | | | 1 | | 2 |
| Plunging Rocky Shoreline | | | | | | | | 0 | | | | | 0 |
| Rocky Platform | | | | | | | | | 0 | | 3 | | 3 |
| Pocket Beach | | | | | | | | | | 0 | | | 0 |
| Artificial | | 1 | | | | | | | | | 0 | | 1 |
| Shoreform Absent | | | | | | 2 | | 10 | 11 | | 2 | 0 | 25 |
| Total | 0 | 1 | 0 | 1 | 1 | 4 | 0 | 10 | 11 | 0 | 20 | 4 | 52 |

Sub-basin: Strait of Juan de Fuca

Tier 2: Shoreline Modifications

| Intertidal Classes | Historic Area (km²) | Current Area (km²) | Gain or Loss from Historic (%) |
|---------------------------|---------------------------------------|--------------------------------------|---------------------------------------|
| Tidal freshwater | 0.7 | 0.6 | -18.0 |
| Oligohaline transition | 0.3 | 0.1 | -46.2 |
| Estuarine mixing | 3.7 | 3.7 | FHF |
| Euryhaline unvegetated | 6.5 | 6.4 | -1.7 |

| Shoreline Feature | % Shoreline Length |
|--------------------------|---------------------------|
| Tidal Barriers | 3.7 |
| Roads | 6.8 |
| Abandoned Railroads | 4.0 |
| Active Railroads | 0.0 |
| Armoring | 16.1 |

| Shoreline Feature | Area or Length |
|--------------------------|-----------------------|
| Breakwater/Jetty Length | 4.70 km |
| Marina Area | 0.23 km ² |
| Nearshore Fill Area | 1.58 km ² |
| Overwater Structure Area | 0.20 km ² |

| Shoreline Feature | Count |
|---|--------------|
| Breakwater/Jetties | 12 |
| Marinas | 4 |
| Waterfront Parcels (number per 10,000 m of waterfront parcel length): | 64.0 |

Tiers 3 and 4: Nearshore Zone and Drainage Area Modifications

| Modifications | Count in Nearshore Zone Area | Count in Drainage Area |
|-----------------------|-------------------------------------|-------------------------------|
| Dams | -- | 17 |
| Stream Crossings | 220 | 4,989 |
| Fish Passage Barriers | 35 | 272 |

| Modifications | % of Nearshore Zone Area | % of Drainage Area |
|--------------------------------|---------------------------------|---------------------------|
| Watershed Impounded Above Dams | -- | 26.39 |
| Stream Crossings Area | 0.04 | 0.02 |
| Roads | 1.83 | 1.97 |
| Railroads, Abandoned | 0.51 | 0.08 |
| Railroads, Active | 0.00 | 0.00 |
| Developed Land Cover | 22.4 | 7.4 |
| Natural Land Cover | 77.6 | 92.6 |
| Impervious Surface (0-10%) | 84.2 | 96.2 |
| Impervious Surface (10-30%) | 7.8 | 1.8 |
| Impervious Surface (30-50%) | 3.9 | 1.0 |
| Impervious Surface (50-100%) | 4.1 | 1.0 |
| Historical Watershed Area | -- | -- |
| Public Lands | 6.6 | 63.6 |
| Private Lands | 88.2 | 35.0 |
| Tribal Lands | 1.9 | 1.2 |
| Protected Lands | 4.2 | 47.8 |

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LEGEND
April 2009

Geographic Scale Units (GSUs) Summary

Process Unit Features

Watershed Area: Area summed over the entire process unit, reported in both square kilometers (km²) and square miles (mi²).

Nearshore Zone Area: In Shoreline Process Units, the Nearshore Zone is the area in the nearshore between 200 meters (m) landward of the ShoreZone shoreline out to the 10 m bathymetric contour, reported in both km² and mi². In Delta Process Units, the Nearshore Zone is the area in the nearshore between 200 m landward of the intertidal wetlands out to the 10 m bathymetric contour, reported in both km² and mi².

Shoreline Length: Total length of current shoreline, reported in both km and mil.

Stream Confluence: Count of stream mouths intersecting the ShoreZone shoreline.

Drift Cell Summary

This table shows the percentage of each type of drift cell component calculated as the sum of the length of each type as a percentage of total drift cell length for each process unit.

Change Analysis Tiers Summary

There are four tiers of change that are measured. Tier 1 is shoreform composition. Information in this tier is based on a comparison of historic (late 1800's) and current (circa 2000) shoreform distributions using the Shipman (2008) shoreform classification system. Tier 2 is an accounting of anthropogenic modifications along the shoreline. Tier 3 is an accounting of anthropogenic modifications in the Nearshore Zone. Tier 4 is an accounting of anthropogenic modifications throughout the contributing watershed. An explanation of the information provided in the tabulation reports for each tier is explained below.

Artificial shoreforms are defined by the extent of obvious modification. This extent can be determined by use of ancillary layers showing fill, or by areas where the shape and location of the shoreline has changed significantly. These shoreforms were typically categorized where multiple anthropogenic modifications such as artificial fill, dredging, and shoreline armoring were identifiable, making classification as one of the other shoreform types difficult within the shoreform change analysis methodology.

Tier 1 Shoreform Count

Shoreform Count (provided in sub-basin-wide tabulations only): Count of the number of each shoreform type present in historic and current shoreform delineations.

Tier 1 Shoreform Composition

Historic Shoreline Length: Sum of the length of each type of historic shoreform.

Current Shoreline Length: Sum of the length of each type of current shoreform.

% of Historic Shoreline Length: Sum of the length of each type of historic shoreform as a percent of the total historic shoreform length.

% of Current Shoreline Length: Sum of the length of each type of current shoreform (shoreline and embayment) as a percent of the total current shoreform length.

% Gain or Loss from Historic based on Historic Shoreline: This calculation is the difference between the sum of the length of the current shoreform (not relative to any shoreline) and the sum of the length of the historic shoreform as a percentage of the historic shoreline. Specifically, for each shoreform type:

$$(\sum[\text{current shoreform length}] - \sum[\text{historic shoreform length}]) / (\sum[\text{historic shoreform length}])$$

A gain in current shoreform length relative to historic is positive; a loss is negative. If the historic shoreform length was 0, then the default % Gain or Loss value was 100%. If the current shoreform length was 0, then the % Gain or Loss default value was -100%.

Because percent change was calculated for each shoreform using actual length totals rather than the rounded length totals shown in this table, percent change calculated using these lengths may not match the percent change shown.

Tier 1 Shoreform Transition

Count of the number of shoreform transitions. Historic shoreforms shown along y-axis and current shoreform shown along x-axis. Table does not represent all occurrences of a shoreform.

Tier 2 Intertidal Classes

Four classes of intertidal areas were delineated using current and historic data sources: tidal freshwater (TF), oligohaline transition (OT), euryhaline unvegetated (EU), and estuarine mixing (EM). Table 1 presents the intertidal and wetland categories in the data sources that were binned into the four classes used in the change analysis. For the euryhaline unvegetated class, areas and percent change are reflect only those areas of EU found in the Delta Process Units.

Historic Area: Total historic intertidal area summed by class, reported in both km² and mi².

Current Area: Total current intertidal area summed by class, reported in both km² and mi².

Gain or Loss from Historic (%): This calculation is the difference between the sum of the area of the current intertidal area and the sum of the area of the historic intertidal area, by class, as a percentage of the historic area. A gain in the current intertidal area is positive; a loss is negative. If the historic intertidal area was 0, then the default % Gain or Loss value was 100%. If the current intertidal area was 0, then the % Gain or Loss default value was -100%.

Because percent change was calculated for each wetland class using actual area totals rather than the rounded area totals shown in this table, percent change calculated using these areas may not match the percent change shown.

Table 1
Intertidal/Wetland Categories Contributing to the Change Analysis Intertidal Classes

| | Change Analysis Intertidal Classes | | | |
|---|---|---|--|--|
| | Tidal Freshwater | Oligohaline Transition | Euryhaline Unvegetated | Estuarine Mixing |
| Intertidal/Wetland Categories in Contributing Data Sources | <ul style="list-style-type: none"> Tidal-fresh channel Riverine-tidal emergent wetland Riverine-tidal forested wetland Riverine-tidal scrub-shrub wetland | <ul style="list-style-type: none"> Channel (in areas where appropriate) Estuarine scrub-shrub wetland | <ul style="list-style-type: none"> Areas labeled "Intertidal" Sub-tidal channel Cobblestone, below low-water Cobblestone, below shoreline Gravel Gravel, below low-water Gravel, below shoreline Mud, below shoreline Reef Sand Sand, below low-water | <ul style="list-style-type: none"> Estuarine emergent wetland channel Estuarine emergent wetland Submerged estuarine emergent wetland Closed lagoon enclosed by estuarine emergent wetland Open lagoon enclosed by estuarine emergent wetland Closed lagoon Open lagoon |

Tier 2 Shoreline Modifications

Shoreline Features as a % of Shoreline Length: The sum of the length of nearshore tidal barriers, roads, railroads (abandoned and active), and armoring are reported as a percent of the sum of the shoreline length. Roads and railroads are limited to be only those within 150 m of the ShoreZone shoreline.

Shoreline Features, Total Area or Length: The total sum of the length of breakwaters and jetties in the process unit is reported in both km and mi. The total sum of the areas of marinas, nearshore fill, and overwater structures are reported in both km² and mi².

Shoreline Features as Count: Sum of the unique marinas and breakwaters/jetties within each process unit.

Tier 3 Nearshore Zone Modifications

Modifications Reported as Counts: The number of dams, stream crossings, and fish passage barriers were summed within the Nearshore Zone.

Stream crossings are locations where roads, railroads, and other land and water transportation routes cross stream courses. Fish passage barriers are road-based stream crossing structures, dams, and miscellaneous in-stream structures identified from several fish passage barrier inventory efforts. Identified fish passage barriers may also be included in the counts of stream crossings and vice versa.

Modifications Reported as % of Nearshore Zone: The area of the following metrics was summed over Nearshore Zone, and then divided by the total area of the Nearshore Zone: Stream Crossing Area; Roads; Railroads (abandoned and active); Land Cover (categorized by developed and natural) (see Table 2); Impervious Surface bin; Land Ownership (public, private, tribal); Protected Lands. Waterfront Parcels were counted within the Nearshore Zone, then the total was normalized per 10,000 m of waterfront length (example: if 100 parcels were present in a process unit, and the waterfront length was 5,000 m, then the Waterfront Parcel metric value would be 200).

Table 2
Land Cover Category Assignments

| | Change Analysis Land Cover Categories | |
|--|--|----------------|
| | Developed | Natural |

| | | |
|---|--|--|
| Intertidal/Wetland Categories in Contributing Data Sources | <ul style="list-style-type: none"> • Developed, High Intensity • Developed, Medium Intensity • Developed, Low Intensity • Developed, Open Space • Cultivated Crops • Hay/Pasture | <ul style="list-style-type: none"> • Barren Land • Deciduous Forest • Emergent Herbaceous Wetlands • Evergreen Forest • Herbaceous • Mixed Forest • Open Water • Perennial Snow/Ice • Shrub/Scrub • Woody Wetlands |
|---|--|--|

Tier 4 Drainage Area Modifications

Modifications Reported as Counts: The number of dams, stream crossings, and fish passage barriers are counted within the entire process unit area.

Modifications Reported as % of Drainage Area: The area of the following metrics was summed and then divided by the total area of the process unit: Watershed Impounded Above Dams; Stream Crossing Area; Roads; Railroads (abandoned and active); Land Cover (categorized by developed and natural); Impervious Surface bin; Historical Watershed Area (only in DPUs), and Land Ownership (public, private, tribal); Protected Lands.

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