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New Tools to Inform Restoration

PUGET SOUND NEARSHORE PARTNERSHIP

RESTORING OUR ECOSYSTEM HEALTH

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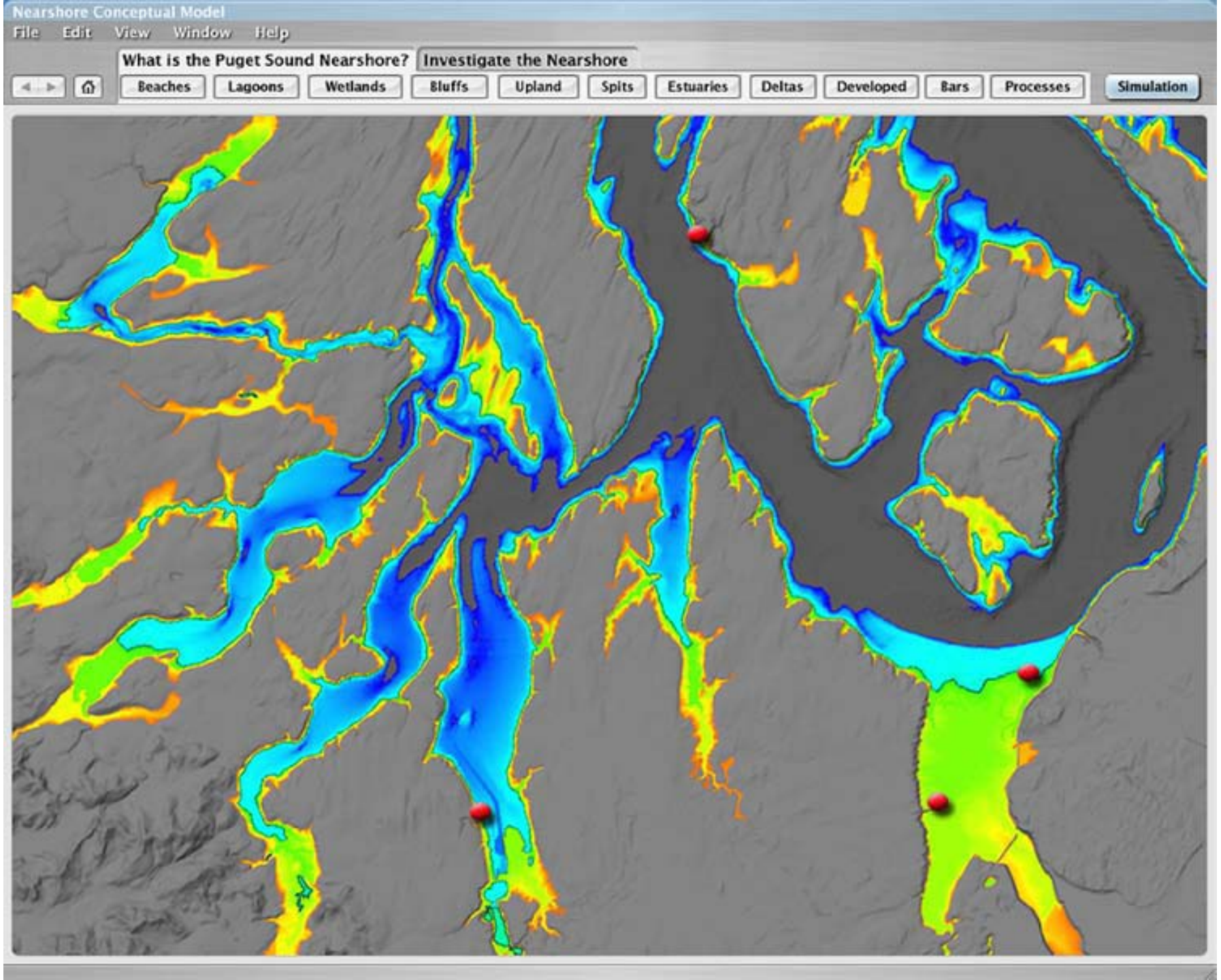
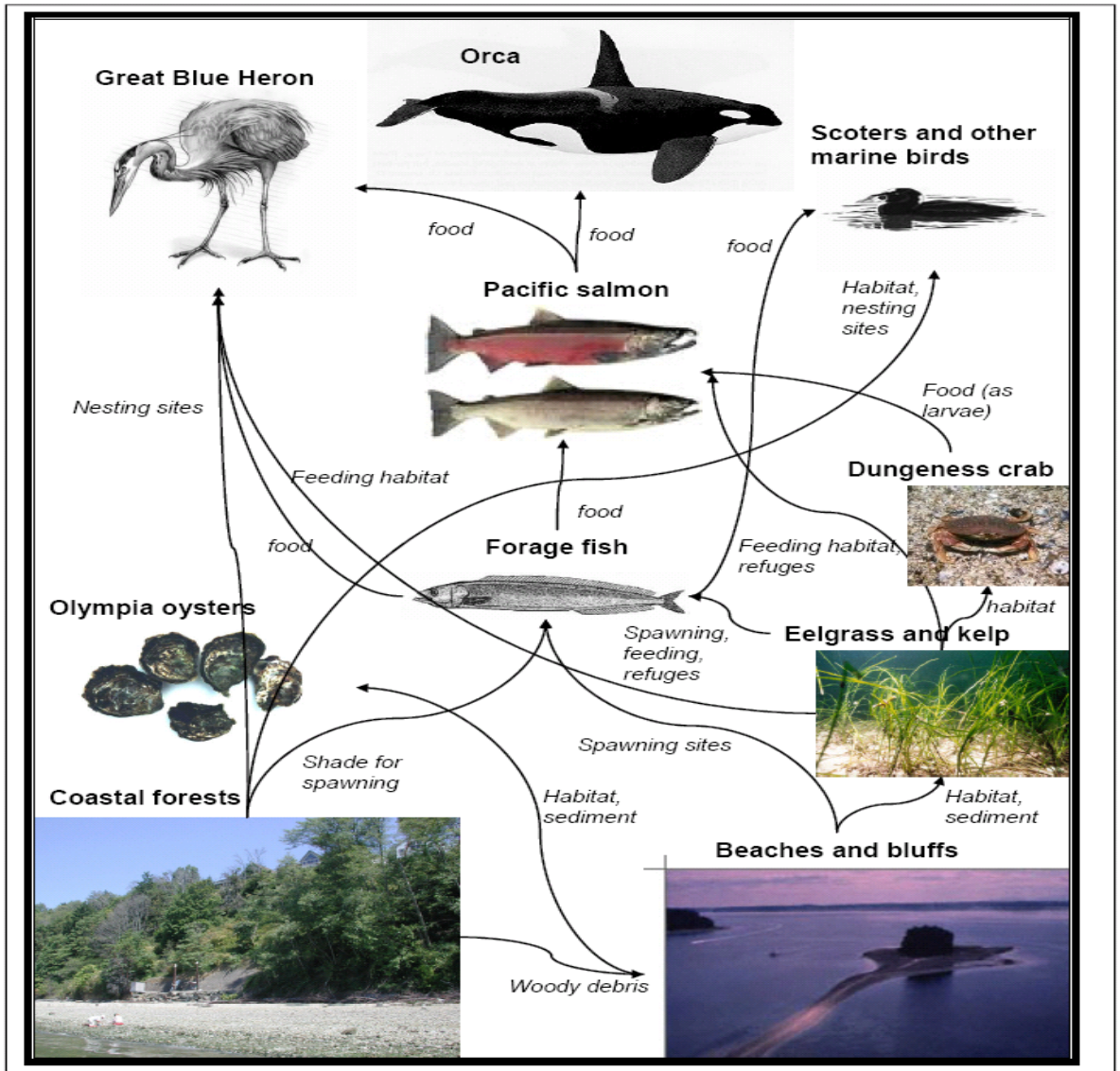

Nearshore Conceptual Model
File
Edit
View
Window
Help
What is the Puget Sound Nearshore?
Investigate the Nearshore
Beaches
Lagoons
Wetlands
Bluffs
Upland
Spits
Estuaries
Deltas
Developed
Bars
Processes
Simulation

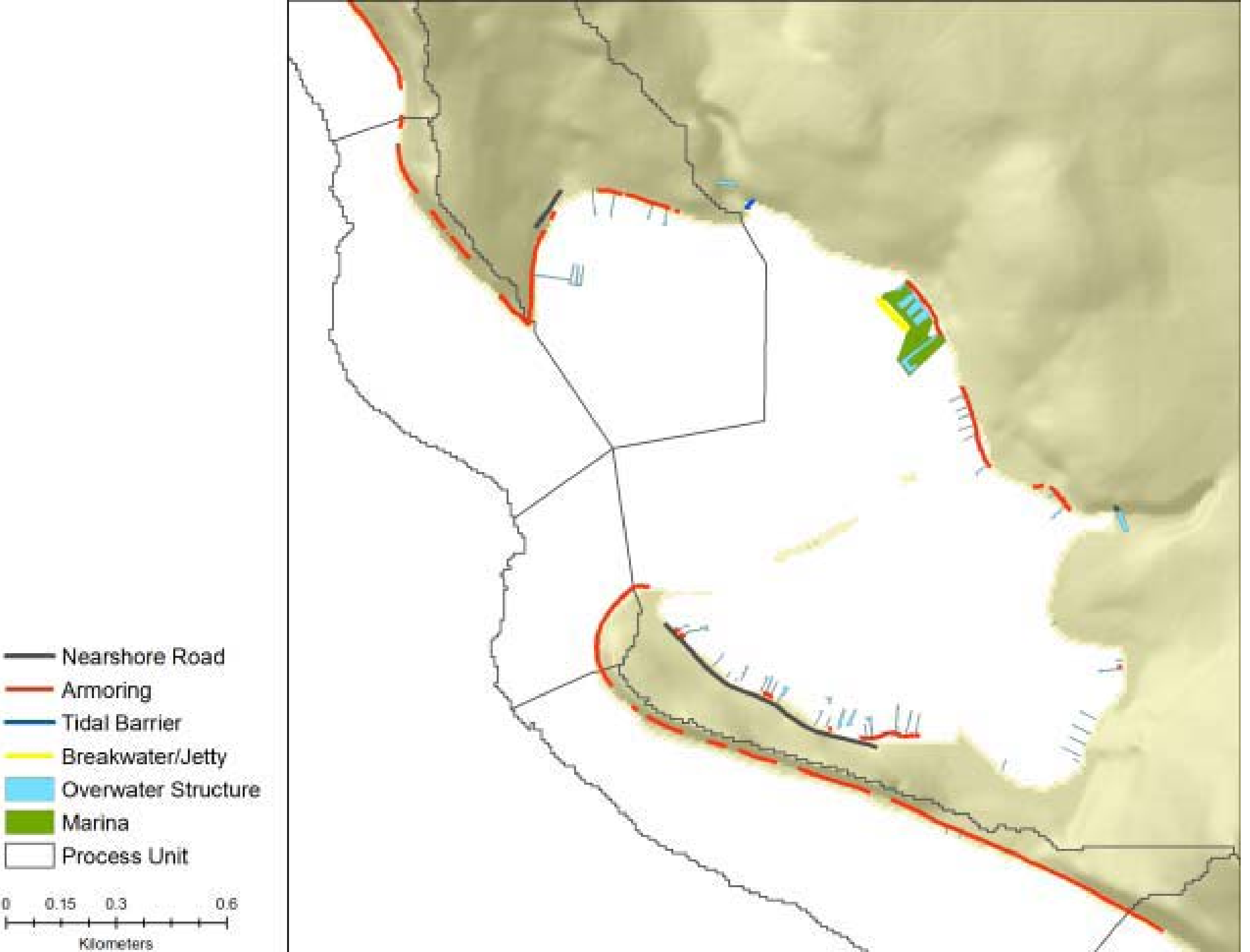
PSNERP - Strategic Needs Assessment



Nearshore Valued Ecological Components

Stressor: Shoreline Armoring

- Interrupts natural sediment flow
- Increases wave scour
- Interrupts natural drainage
- Loss of riparian vegetation
- Cumulative impact


Nearshore Road
Armoring
Tidal Barrier
Breakwater/Jetty
Overwater Structure
Marina
Process Unit
0
0.15
0.3
0.6
Kilometers

Tier 2: Shoreline Modifications

Sound-wide

Intertidal Classes	Historic Area (km^2)	Current Area (km^2)	Historic Area (mi^2)	Current Area (mi^2)	Gain or Loss from Historic (%)
Tidal freshwater	126.8	11.6	49.0	4.5	-90.9
Oligohaline transition	64.0	1.4	24.7	0.6	-97.8
Estuarine mixing	157.1	103.7	60.6	40.0	-34.0
Euryhaline unvegetated	392.9	401.9	151.6	155.1	2.3

Shoreline Feature	% Shoreline Length
Tidal Barriers	10.5
Roads	65.9
Abandoned Railroads	1.1
Active Railroads	4.3
Armoring	27.0

Shoreline Feature	Area or Length			
Breakwater/Jetty Length	37.23	km	23.12	mi
Marina Area	6.33	km^2	2.44	mi^2
Nearshore Fill Area	39.35	km^2	15.19	mi^2
Overwater Structure Area	6.53	km^2	2.52	mi^2

Shoreline Feature	Count
Breakwater/Jetties	136
Marinas	171
Waterfront Parcels (number per 10,000 m of waterfront parcel length):	146.1

Tiers 3 and 4: Nearshore Zone and Drainage Area Modifications

Modifications	Count in Nearshore Zone Area	Count in Drainage Area
Dams	--	436
Stream Crossings	2,130	64,270
Fish Passage Barriers	531	5,976

Modifications	% of Nearshore Zone Area	% of Drainage Area
Watershed Impounded Above Dams	--	35.21
Stream Crossings Area	0.02	0.02
Roads	1.81	2.48
Railroads, Abandoned	0.04	0.04
Railroads, Active	0.21	0.07
Developed Land Cover	14.6	16.0
Natural Land Cover	85.4	84.0

Sub-basin: South Puget Sound

Tier 2: Shoreline Modifications

Intertidal Classes	Historic Area (km²)	Current Area (km²)	Gain or Loss from Historic (%)
Tidal freshwater	2.4	0.4	-84.4
Oligohaline transition	0.0	0.1	680.9
Estuarine mixing	14.1	17.5	23.9
Euryhaline unvegetate	10.6	7.5	-29.4

Shoreline Feature	% Shoreline Length
Tidal Barriers	3.4
Roads	6.5
Abandoned Railroads	0.1
Active Railroads	2.6
Armoring	34.5

Shoreline Feature	Area or Length
Breakwater/Jetty Length	0.73 km
Marina Area	0.33 km²
Nearshore Fill Area	3.98 km²
Overwater Structure Area	0.52 km²

Shoreline Feature	Count
Breakwater/Jetties	8
Marinas	26
Waterfront Parcels (number per 10,000 m of waterfront parcel length):	166.3

Tiers 3 and 4: Nearshore Zone and Drainage Area Modifications

Modifications	Count in Nearshore Zone Area	Count in Drainage Area
Dams	–	57
Stream Crossings	406	13,682
Fish Passage Barriers	135	828

Modifications	% of Nearshore Zone Area	% of Drainage Area
Watershed Impounded Above Dams	--	39.69
Stream Crossings Area	0.03	0.03
Roads	3.16	3.84
Railroads, Abandoned	0.02	0.03
Railroads, Active	0.28	0.16
Developed Land Cover	25.7	21.4
Natural Land Cover	74.3	78.6

Example Data Queries

- How many times did that happen?
- Where?
- Did that change result in a shortening of the shoreline length (i.e. – complexity)
- What's the frequency distribution of this phenomenon across the 900 process units in Puget Sound? Within Whidbey Sub-basin?
- Which process units changed similarly?

Puget Sound Basin

Tier 1: Shoreform Composition

Shoreform Composition	Historic Shoreform Length (km)	Current Shoreform Length (km)	Historic Shoreform Length (mi)	Current Shoreform Length (mi)	% of Historic Shoreline Length	% of Current Shoreline Length	%Gain or Loss from Historic based on Historic Shoreform
Bluff-Backed Beach	1,656.79	1,529.20	1,028.86	949.64	34.60	38.53	-7.7
Barrier Beach	499.79	440.26	310.37	273.40	10.44	11.09	-11.9
Delta	586.48	310.19	364.20	192.63	12.25	7.82	-47.1
Barrier Estuary	337.13	190.38	209.36	118.22	7.04	4.80	-43.5
Barrier Lagoon	193.22	104.21	119.99	64.72	4.03	2.63	-46.1
Closed Lagoon/Marsh	128.92	63.88	80.06	39.67	2.69	1.61	-50.5
Open Coastal Inlet	449.03	245.73	278.85	152.60	9.38	6.19	-45.3
Plunging Rocky Shoreline	205.61	186.41	127.68	115.76	4.29	4.70	-9.3
Rocky Platform	568.71	509.56	353.17	316.43	11.88	12.84	-10.4
Pocket Beach	153.41	138.83	95.27	86.22	3.20	3.50	-9.5
Artificial	10.68	378.43	6.63	235.01	0.22	9.54	3,443.0

Table 5 Shoreform transitions (Tier 1) in Puget Sound.

Explore geodatabase

Shoreform Transition	Current ---------->												
Historic	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
Bluff-Backed Beach	0	14		2	1						124		141
Barrier Beach	10	0		1	1						82		94
Delta			0								8		8
Barrier Estuary				0	2	2					21	63	88
Barrier Lagoon					0	10					16	73	99
Closed Lagoon/Marsh					1	0					5	163	169
Open Coastal Inlet				13			0				53		66
Plunging Rocky Shoreline								0			2		2
Rocky Platform					1				0		21		22
Pocket Beach										0	5		5
Artificial		1									0		1
Shoreform Absent					7	10		10	40		29	0	96
Total	10	15	0	16	13	22	0	10	40	0	366	299	791

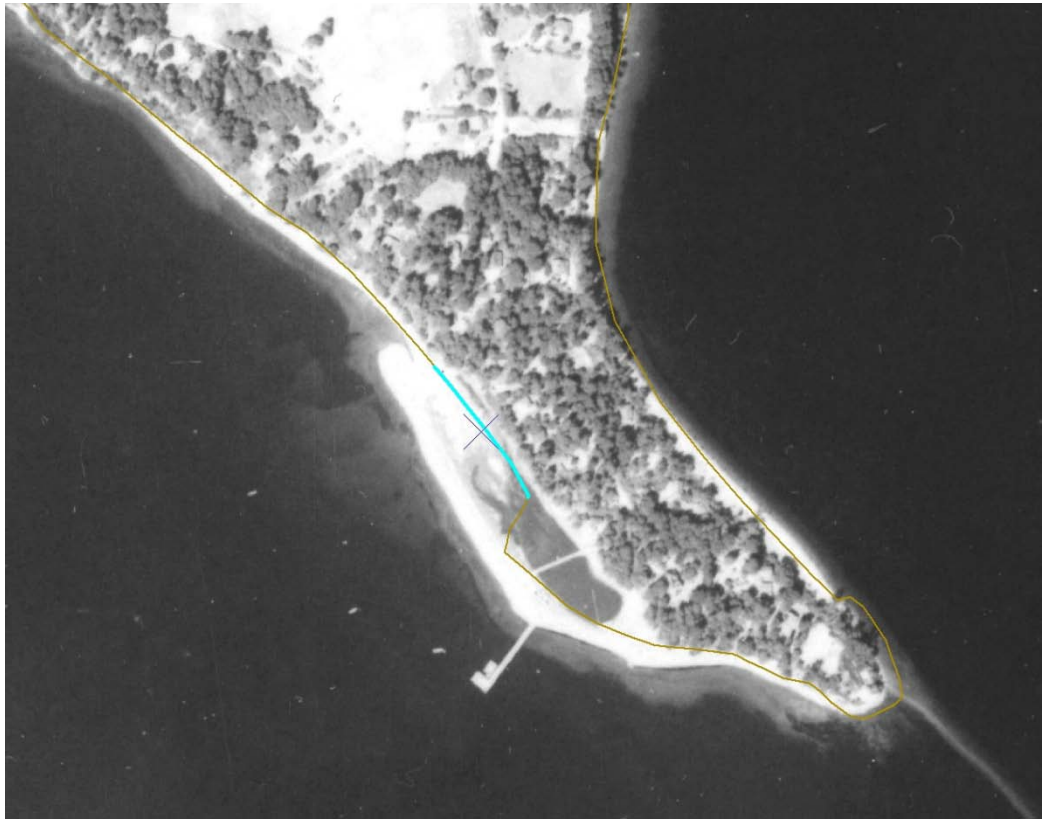
Co-occurrence, Adjacency and Thresholds – CAT Queries

Co-occurrence – Do shoreform transitions happen at the same place as stressors?

Adjacency – Do shoreform transitions happen "downdrift" or downstream of a stressor?

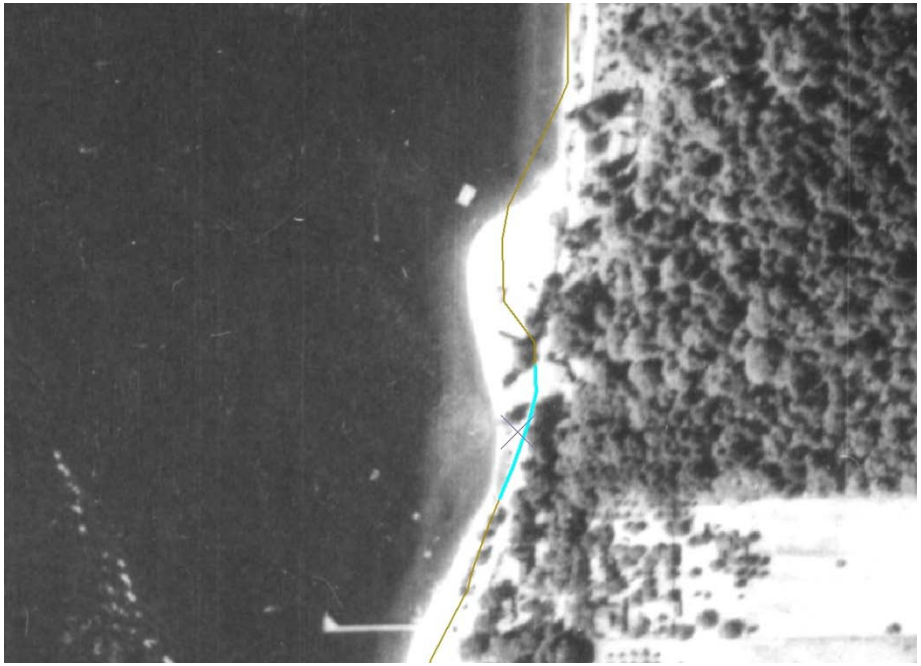
Threshold – How much of a stressor results in a downstream or downdrift transition?

SF40439 – Wing Pt, Bainbridge Is



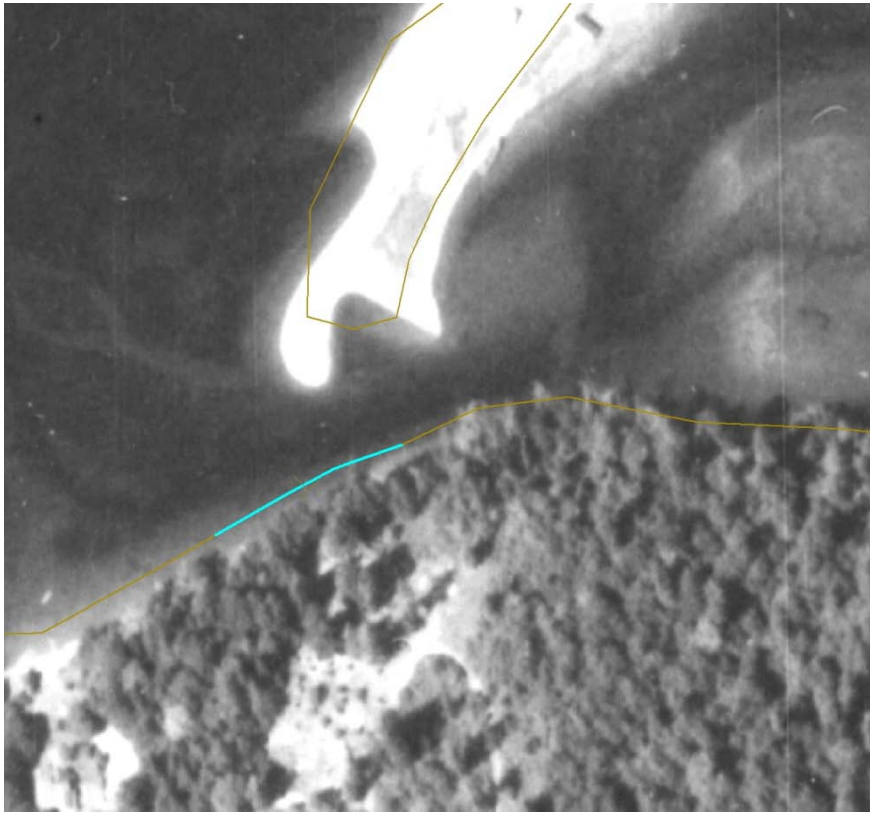
#2 – “real” transition – barrier apparent in 1945 image.

SF40419 – SE Bainbridge



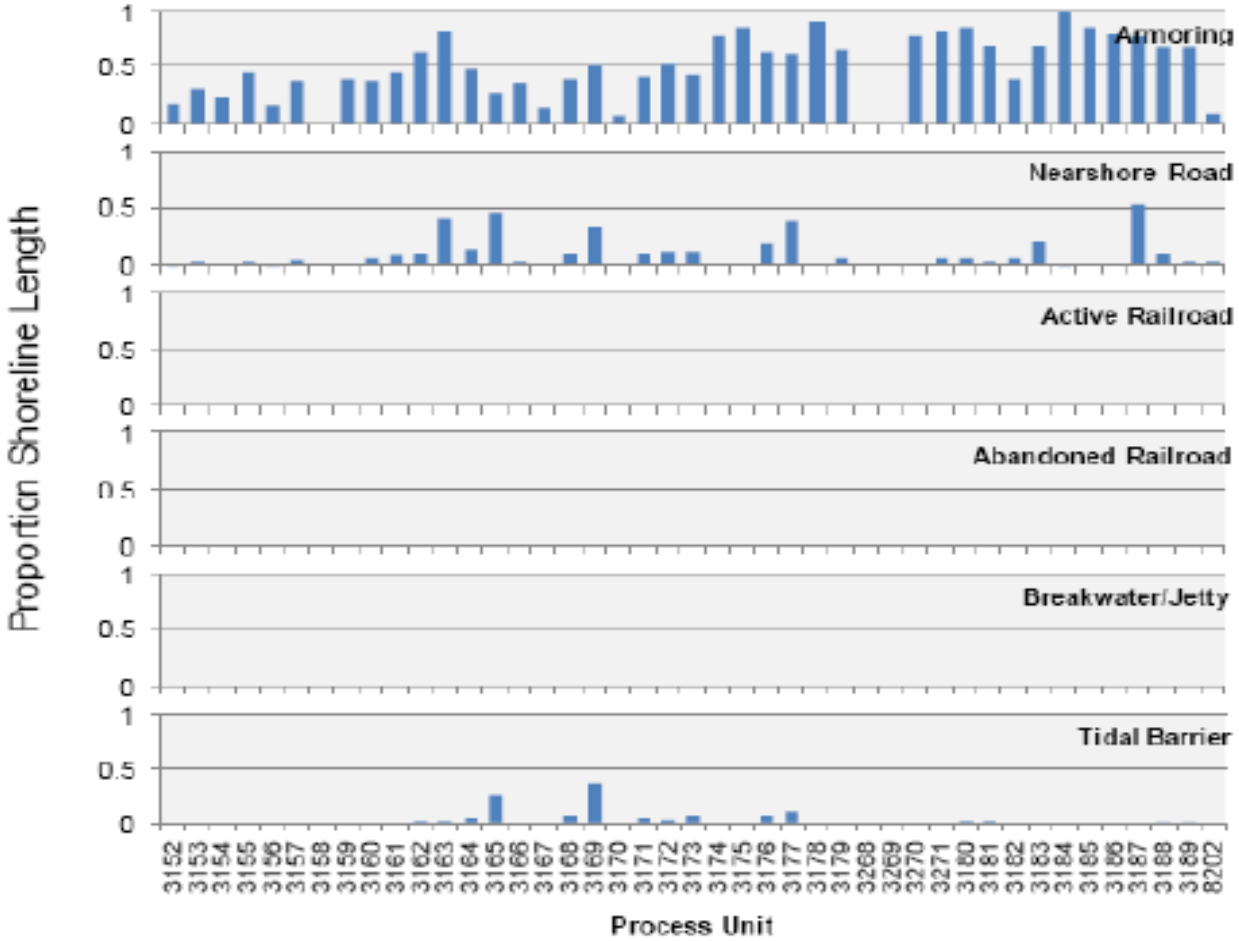
#2 – shoreform migration

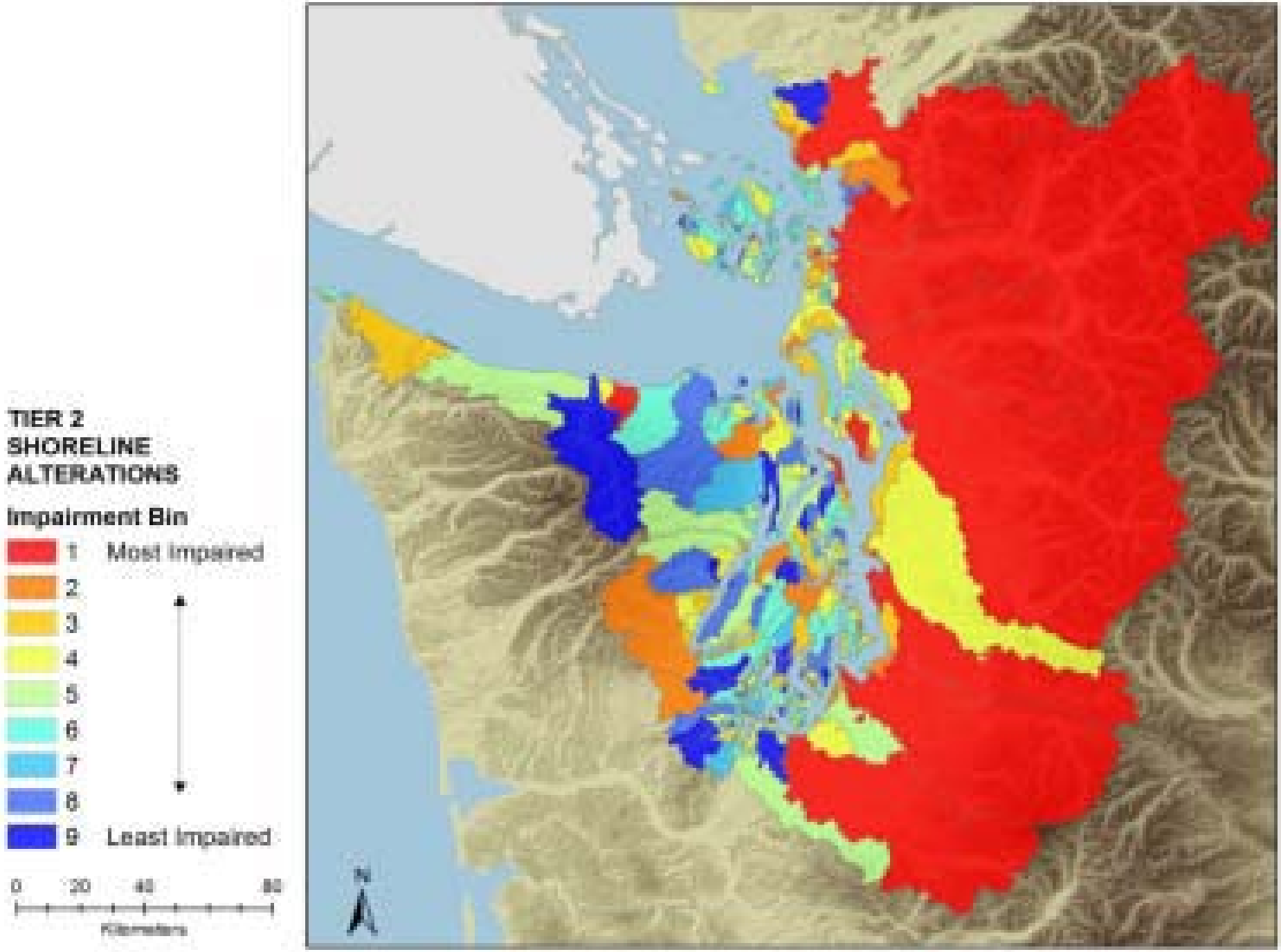
SF40441- N Bainbridge Is



#2 – Spit eroded as tide channel moved south toward island, or Tsheet mapping error (NST called #1). Left as #3.

SOUTH PUGET SOUND (HENDERSON BAY) - TIER 2 SHORELINE ALTERATIONS




TIER 2
SHORELINE
ALTERATIONS
Impairment Bin
1 Most Impaired
2
3
4
5
6
7
8
9 Least Impaired
0 20 40 80
Kilometers