

GREEN shorelines

Bulkhead alternatives
for a healthier
Lake Washington



City of Seattle Department of



Partners:

Seattle - Restore Our Waters

King Conservation District

Lake Washington/Cedar/Sammamish
Watershed Salmon Recovery
Council (WRIA 8)

Background

- Chinook salmon is listed as threatened under ESA - 1999.
- Development at the shoreline eliminates crucial habitat for Chinook, birds, insects, plants, and other organisms. 2001, 70% of Lake Washington was armored and 2,737 docks.
- Regulatory agencies are discouraging shoreline armoring, but there has been a lack of clear information about the alternatives
- Start to address problem by encouraging voluntary improvements on residential properties.



Roger Tabor

Thursday, December 10, 2009



What is *Green Shorelines*?

- A guidebook developed to inform homeowners about more sustainable options and stimulate interest in these projects – compile information in one place.
- Surveys indicate that a majority of homeowners prefer the vegetated shoreline “look,” but that they have four main concerns:
 - Lack of information
 - Cost
 - Reliability
 - Permitting process
- Designed to provide information and images to address issues, shift preferences away from the mono-habitat of a bulkhead to more diversity at the shoreline.

Process

- Literature review -- WRIA 8 Chinook Salmon Conservation Plan, UW studies, various publications on shoreline stabilization practices
- Draw up draft recommended practices, look for existing sites
- Review and revise with input Technical Advisory Committee: engineers, designers, contractors, regulators



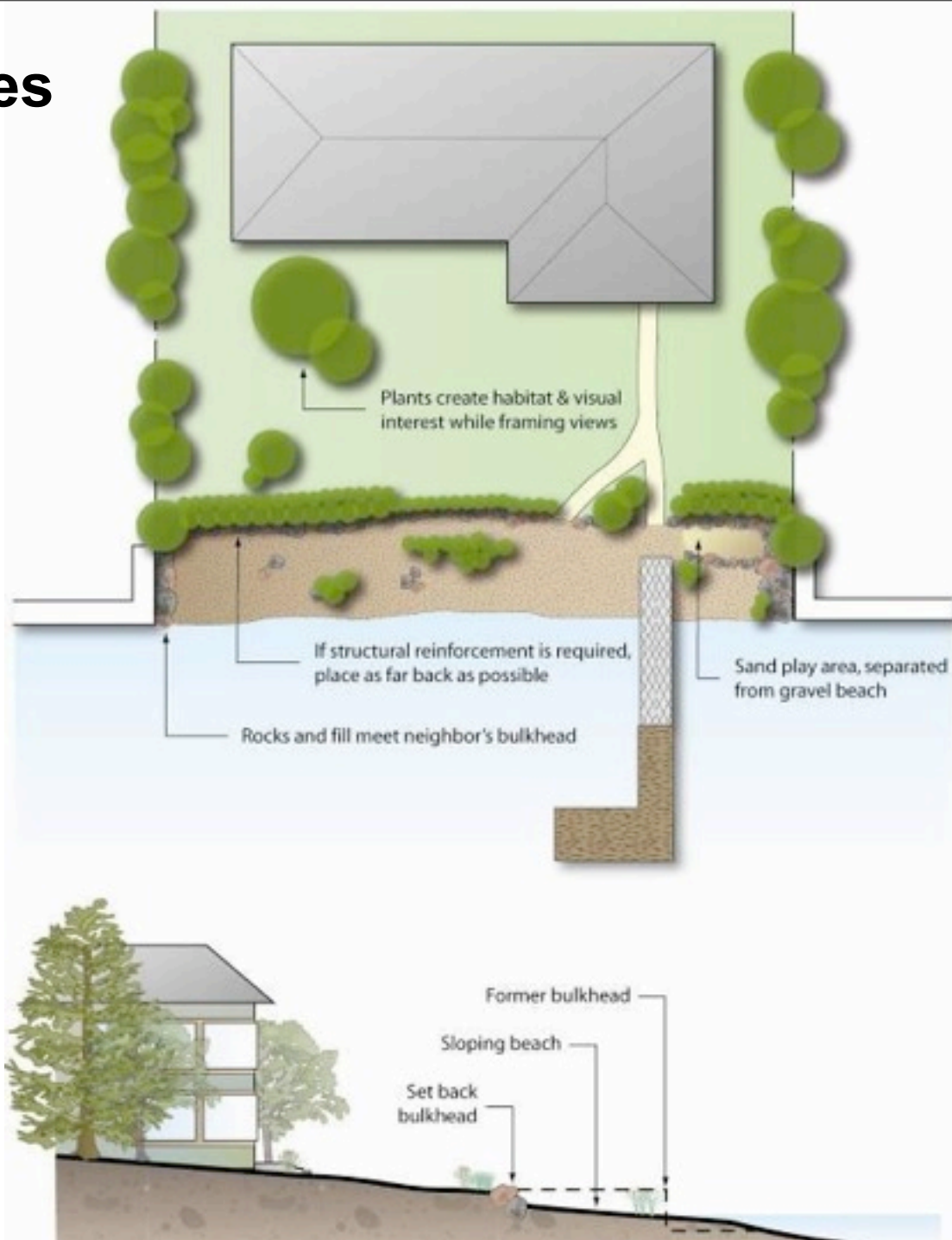
Anchor Environmental

Green Shorelines practices

- Full beach installation
- Beach coves
- Setting back bulkheads
- Vegetated buffers
- Slope bioengineering
- Log placement



Full Beaches





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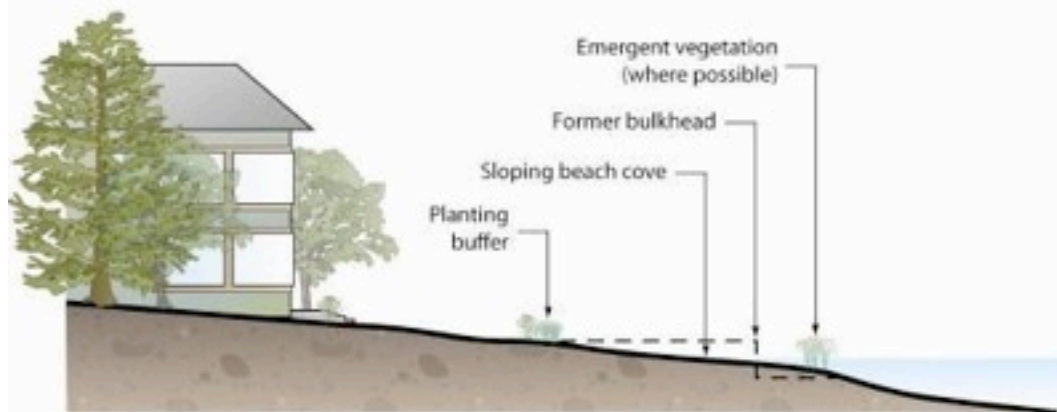
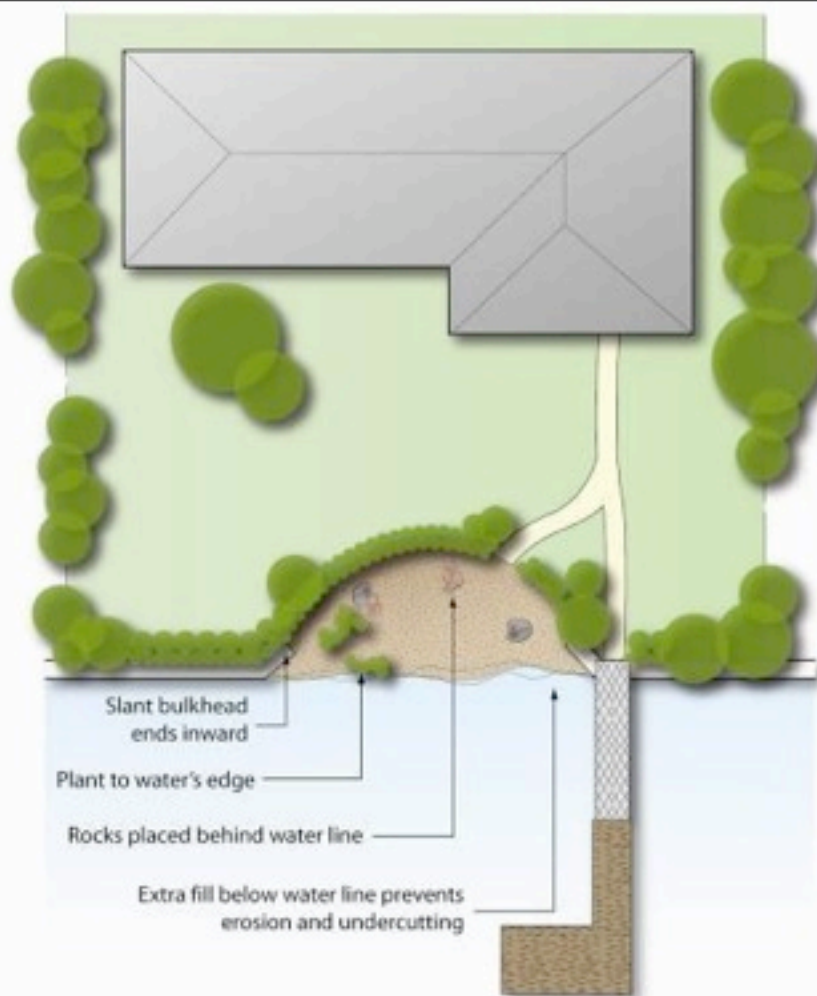


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Beach Coves





Watershed Company

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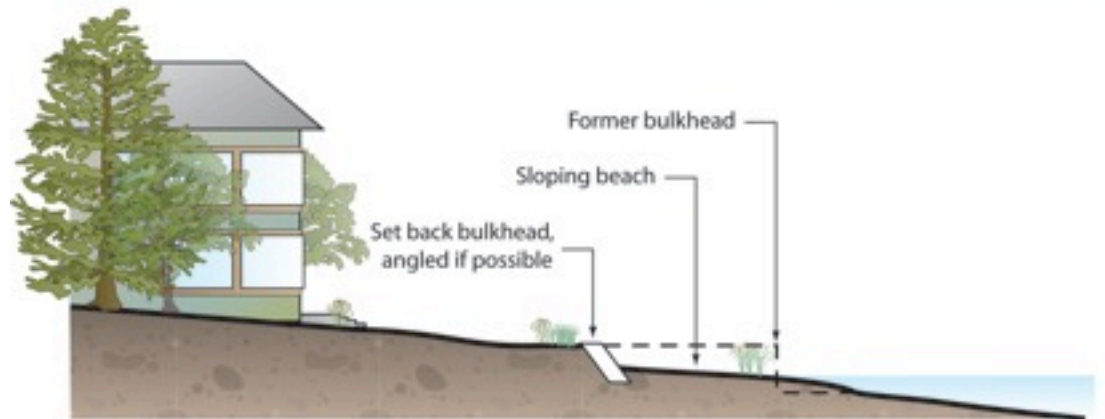
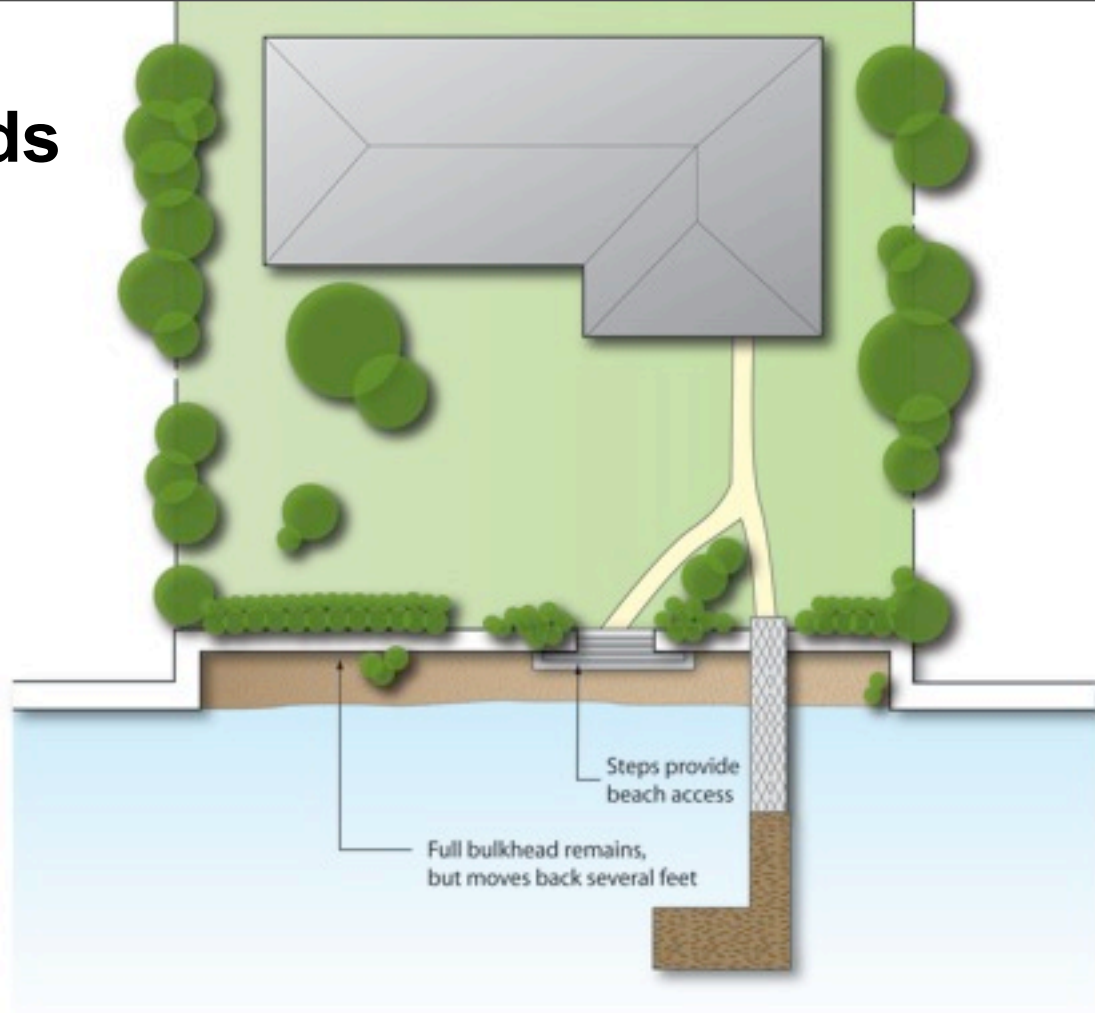
Hendrikus Group

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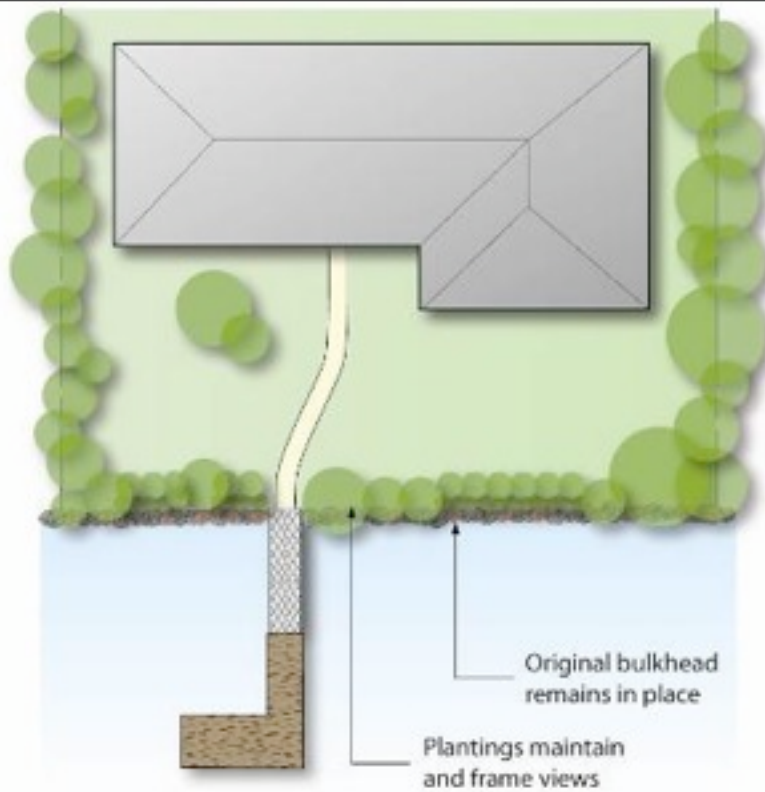


Waterfront Construction
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Setting Back Bulkheads



Vegetated Buffers





Waterfront Construction

Thursday, December 10, 2009



Berger Partnership



Joanna Buehler

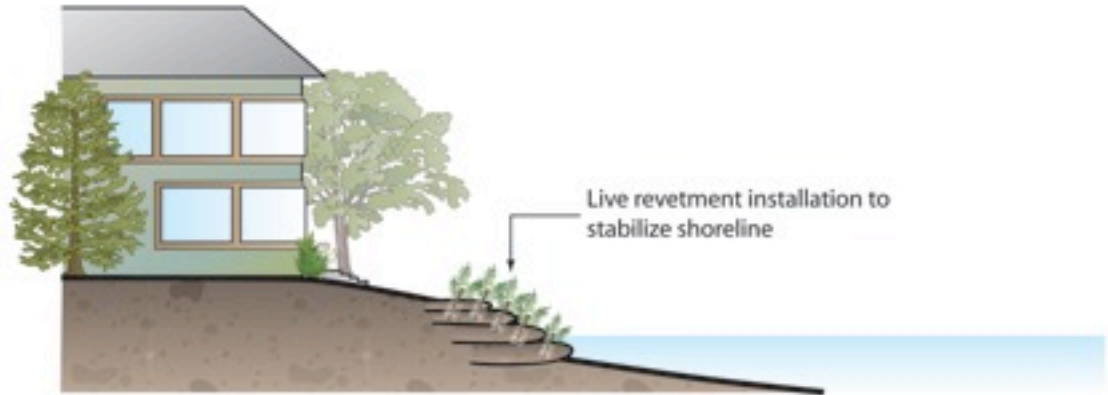
Slope Bioengineering



Live stakes, inserted in the ground, establish roots and hold soil in place



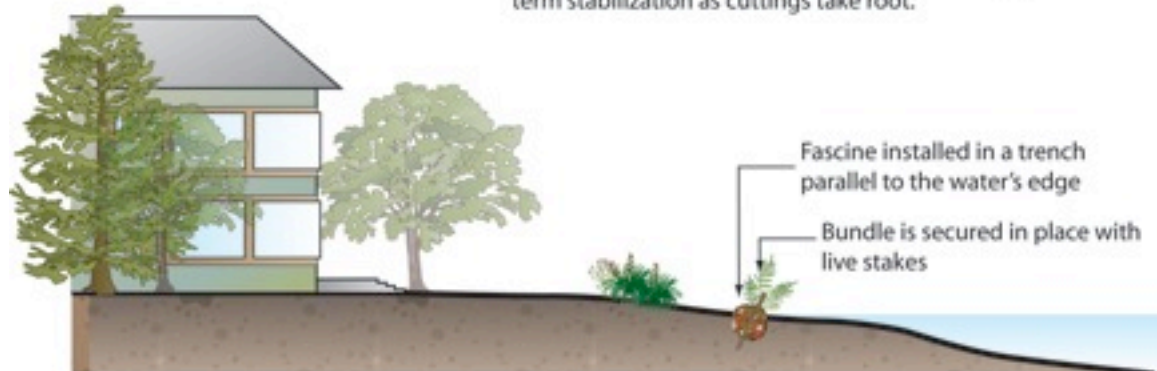
Live revetment uses live stakes and geotextile fabric to rebuild slopes



Live revetment installation to stabilize shoreline



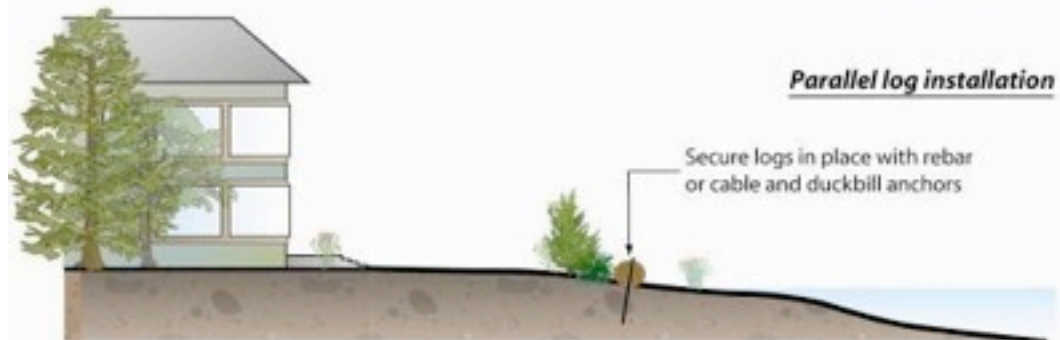
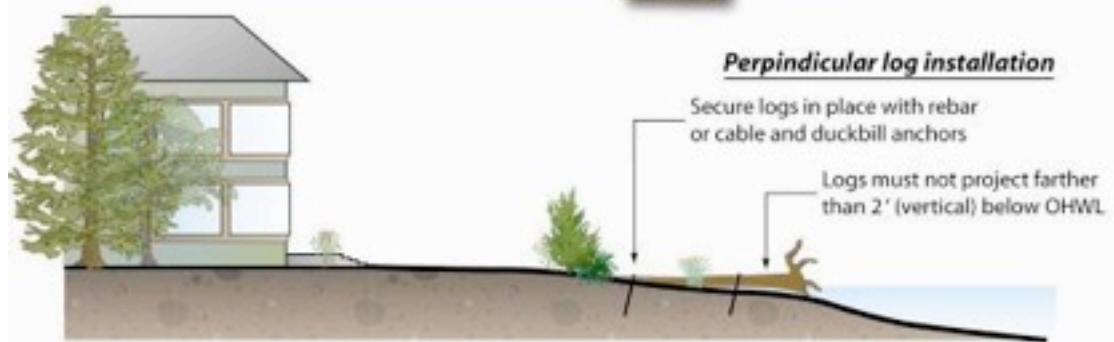
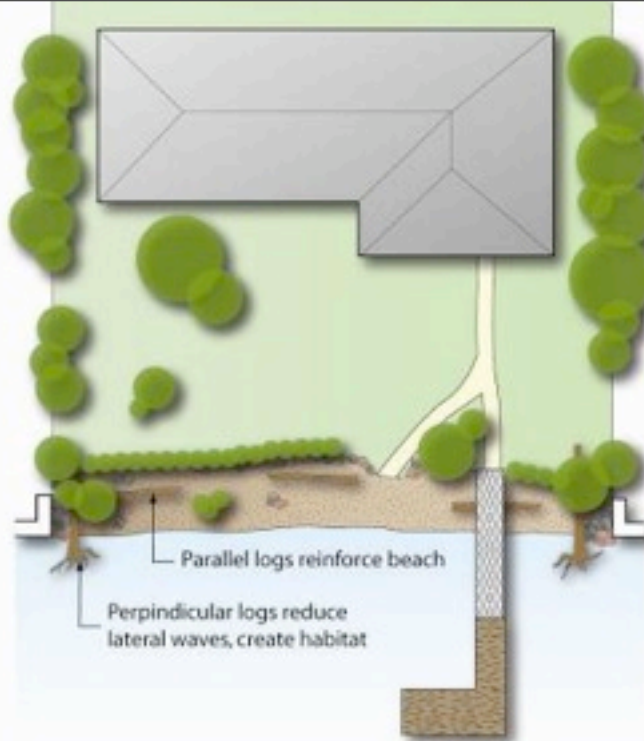
Fascines are bundles of live plant cuttings, used to provide short term erosion control as well as long-term stabilization as cuttings take root.



Fascine installed in a trench parallel to the water's edge

Bundle is secured in place with live stakes

Log placement





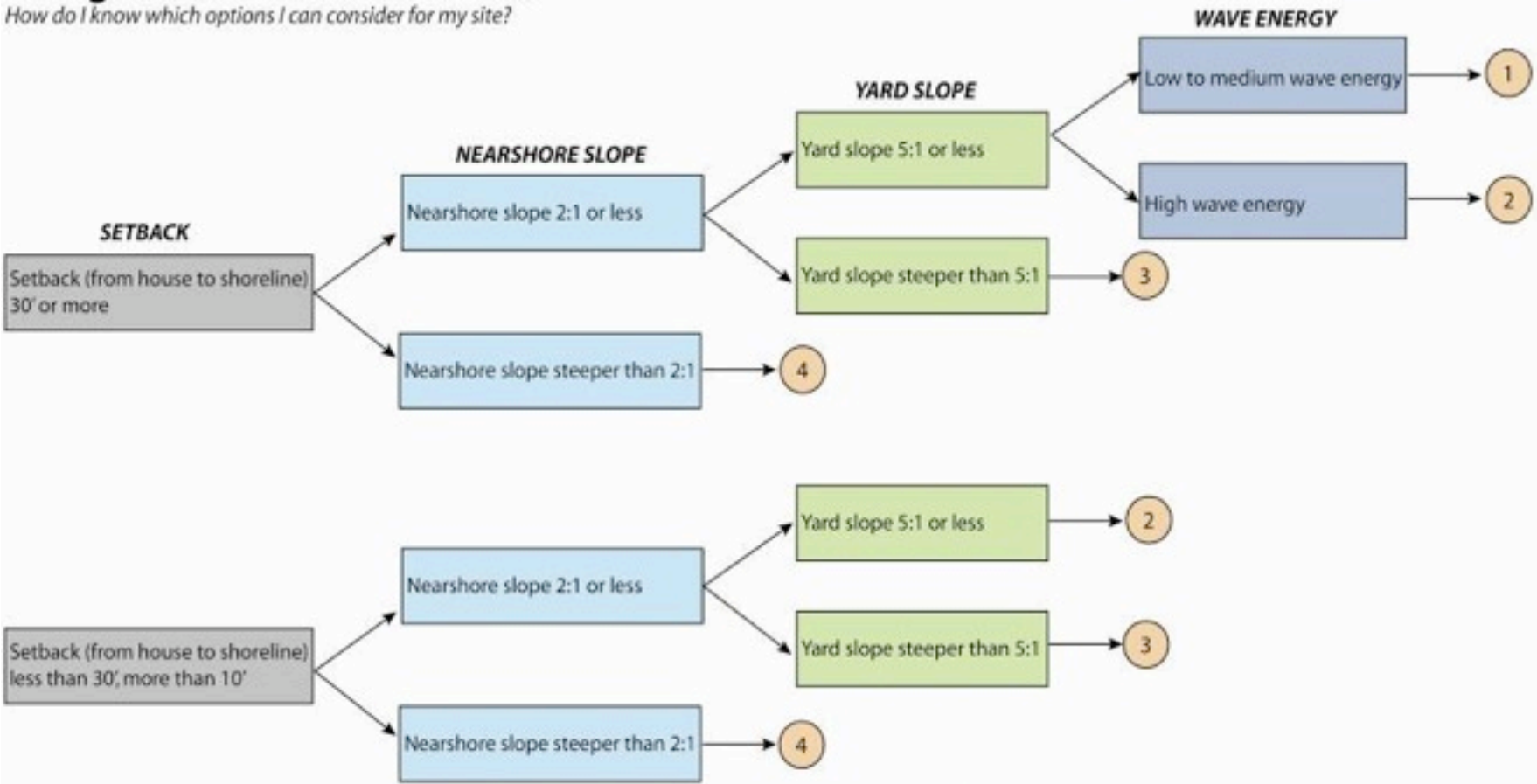
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Green Shorelines Decision Tree

How do I know which options I can consider for my site?



- Notes:**
- The use of plant buffers or logs is a viable option for any site, including those that employ hard engineering such as bulkheads.
 - Sites with less than a 10' setback are not included on this decision tree, because in most cases they will depend on hard engineering solutions like bulkheads or riprap. As noted above, plant buffers are appropriate.
- 1 full beach, beach coves, setting back bulkhead, bioengineering
 - 2 beach coves, setting back bulkhead, bioengineering
 - 3 setting back bulkhead, bioengineering
 - 4 bioengineering

Shoreline construction costs

	Bulkhead Removal Costs for 50 Linear Feet of Shoreline		
Site Access	Wood	Riprap	Concrete
Accessible from shore	\$1750	\$2625	\$5125
Accessible from water only	\$2375	\$3375	\$5625

	CONVENTIONAL TREATMENTS		GREEN SHORELINES	
Cost Category	Bulkheads	Riprap	Slope bioengineering	Beach Establishment
Capital Costs	Concrete = \$18,750	\$8,125	\$32,500	\$17,500
Design and Permitting	20–25% for smaller projects 10–15% of capital costs for larger projects (greater than \$100K),		15–20% for smaller projects 7–12% of capital costs for larger projects (greater than \$100K),	
Maintenance	No maintenance is usually required for 25–50 year life span of projects		Sand replenishment at a 1–5 year frequency, gravel at 5–10 years, both \$3 to \$6 per square foot of beach Approximate cost \$3,000 – \$6,000	

Other practices and topics...

- Salmon-friendly docks
- The permitting process, including streamlined options
- Choosing designers and contractors
- Recommended plants
- Public shoreline restoration projects



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Transforming Coastal Development

**Katrina Hoffman
Washington Sea Grant
Coastal Resources Specialist
APA Washington Conference
November 2009**

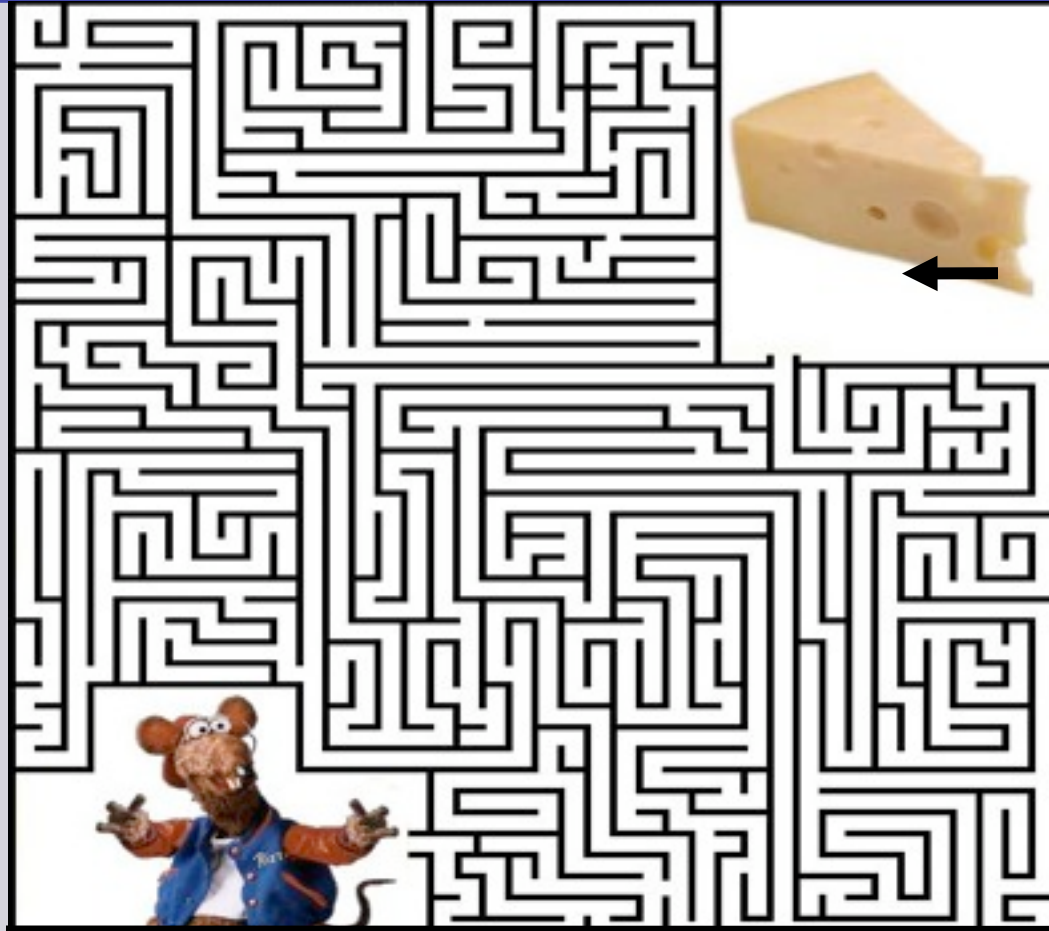


What Some People Think They Want....

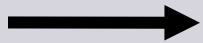


And what they have to go through to get there...

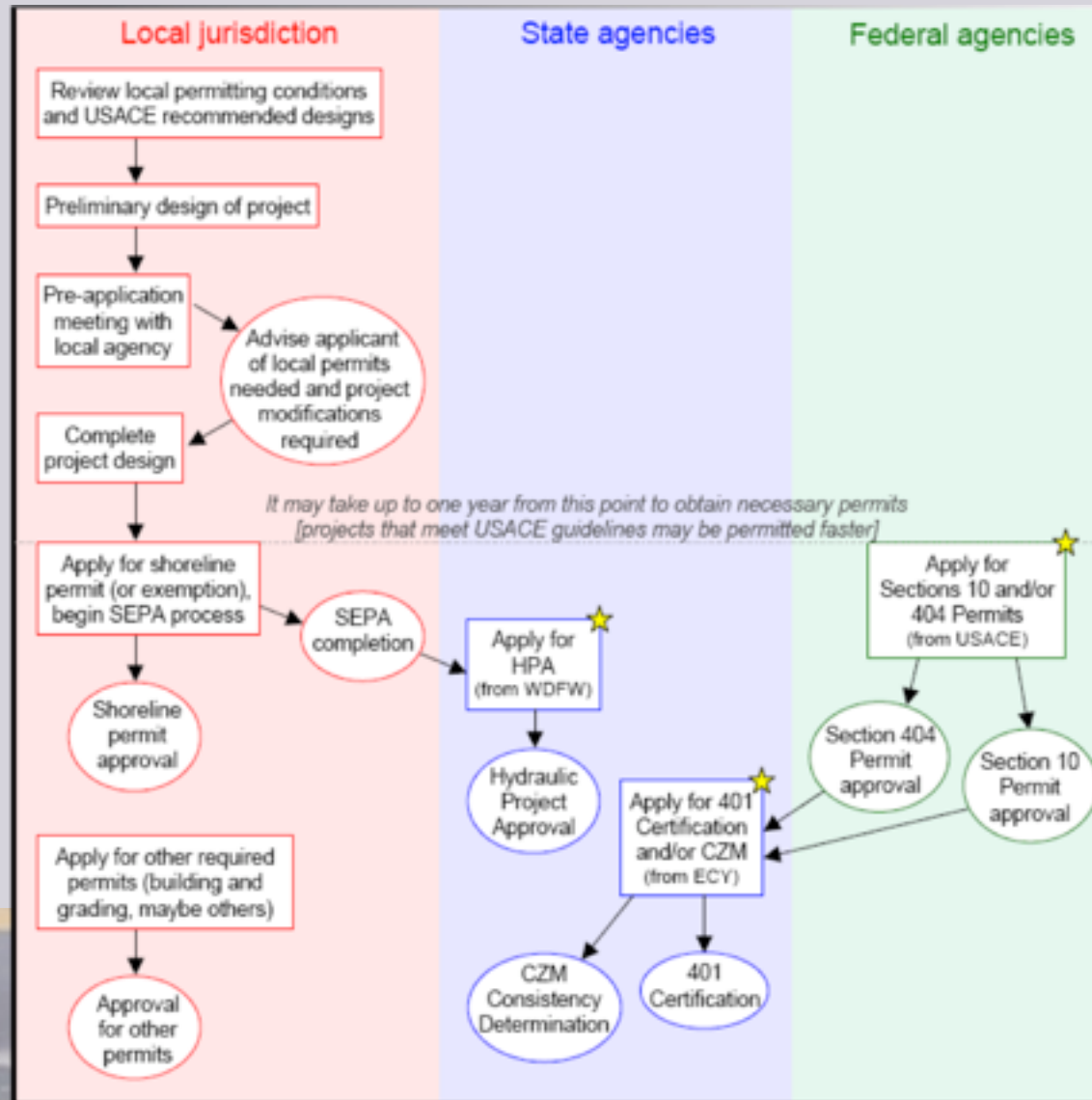
□ Local,
State
and
Federal
Permits
Issued



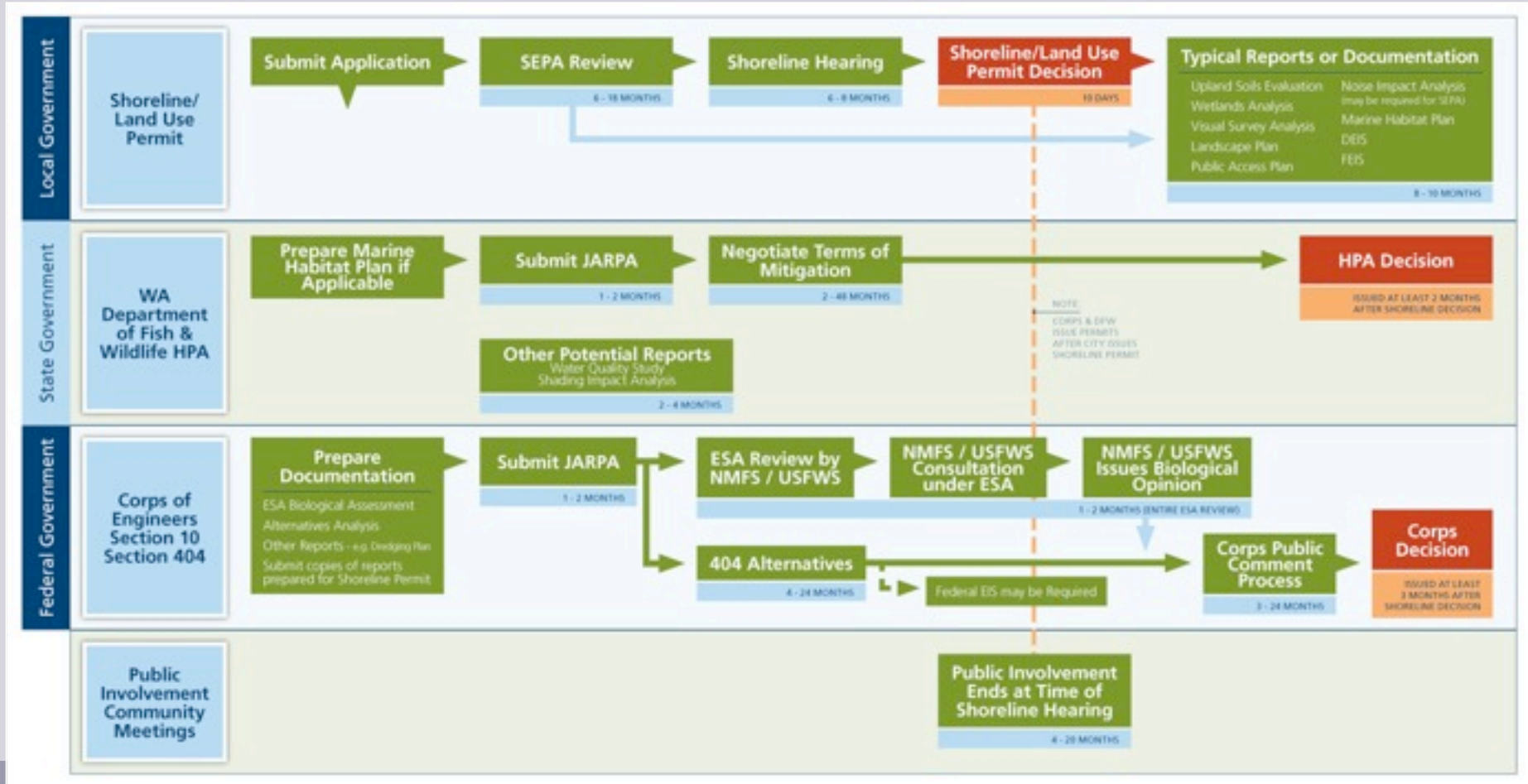
□ Innocent and
Unsuspecting
Applicant



The details of getting “there”...



Straightforward Process?



***Meanwhile, as we go about our
usual business...***



“In the next century, the majority of America’s tidal shorelines could be replaced by a wall, not because anyone decided that this should happen but because no one decided that it should not.”

J. G. Titus, Maryland Law Review 57(4), 1998



What's happening along our shorelines?

- ❑ **Population Growth** – lots of people want to live here
- ❑ **Waterfront Development Pressure** - new and re-development representing major \$\$
- ❑ **Climate Change** - warmer, wetter, sea level rise
- ❑ **Jurisdictional Jumble** – rules and responsibilities are complex



Shoreline Encroachment, Vegetation Removal



Removal of riparian vegetation
– loss of habitat, food input to
nearshore zone, bank stability
(‘seawalls in waiting’)



Protective works placed below
natural boundary – impacts on
habitat, shoreline processes,
public access

Shoreline Hardening

- Physical function - increase beach erosion at seawall toe and disrupt sediment movement
- Ecological function - reduce habitat complexity and diversity
- Human function – lose access and beach!



Toe Erosion due to Seawall Construction

Ross Bay, Victoria

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Ross Bay, Victoria

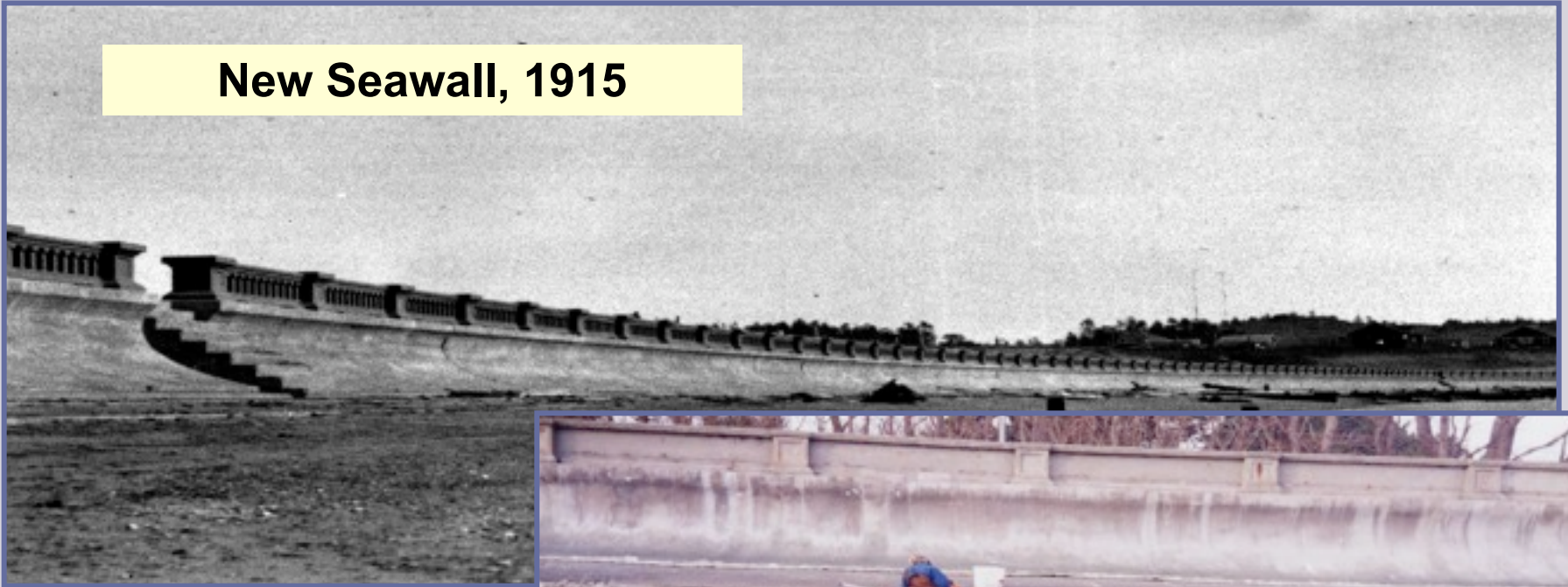
New Seawall, 1915



Toe Erosion due to Seawall Construction

Ross Bay, Victoria

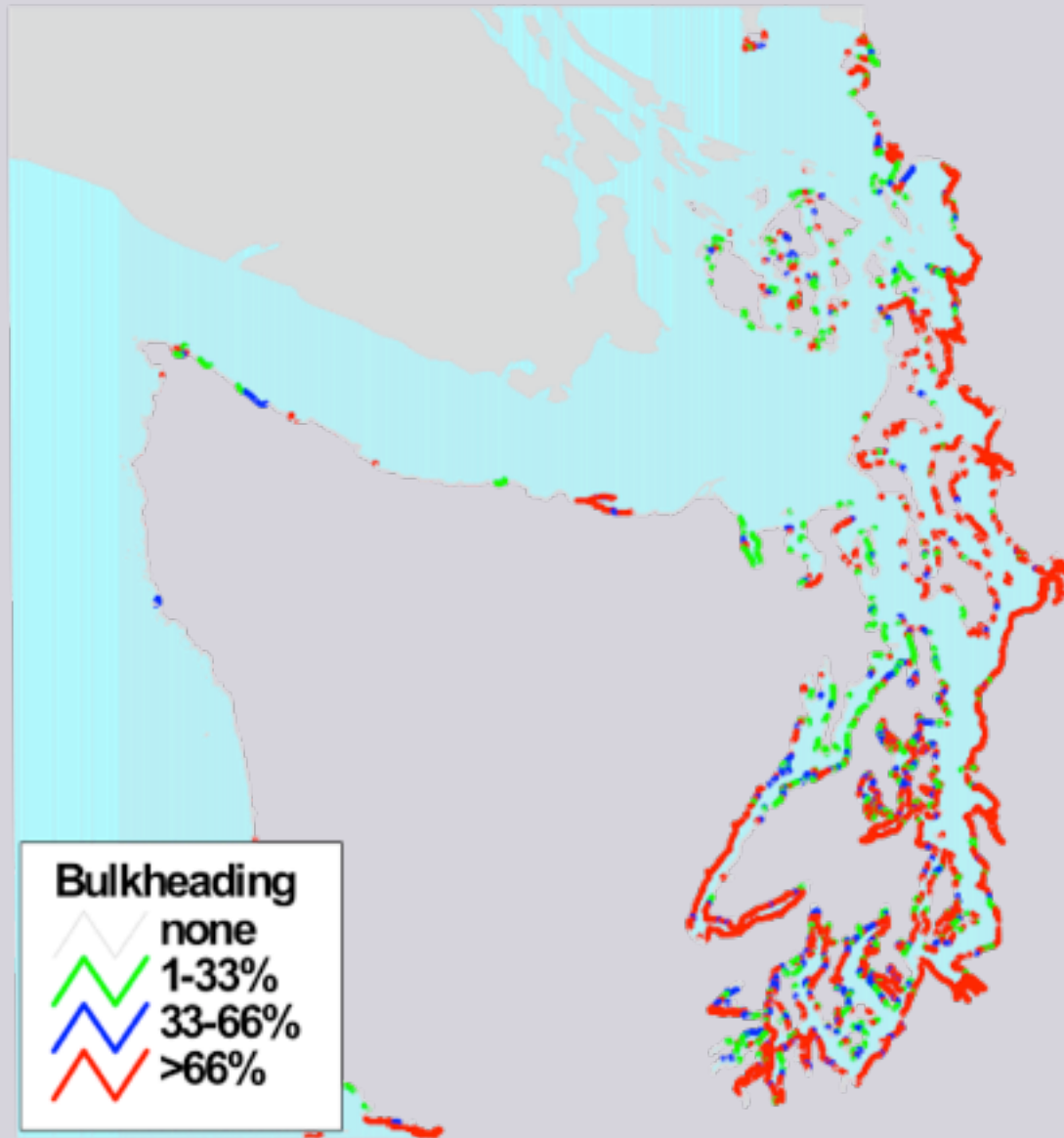
New Seawall, 1915



Toe of Seawall, 1996



Puget Sound - Cumulative Shoreline Hardening



A Few Questions:

- What makes humans change behavior?
- How can you get people to initiate a process voluntarily?
- What does it take to make that happen?
- Do we need to give gold stars?



How do we get homeowners from this...



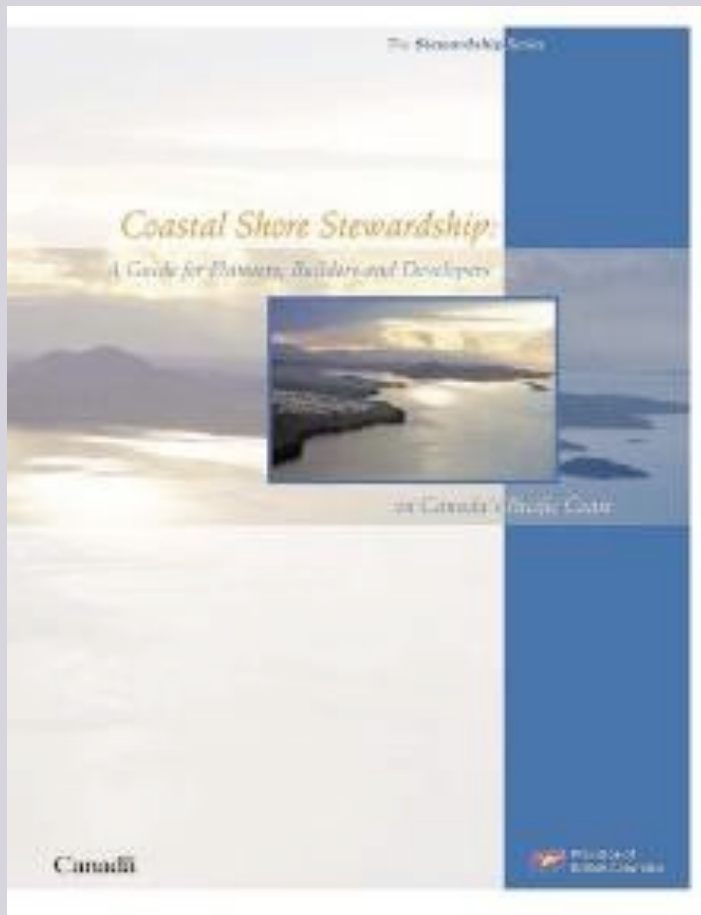
...to this?



www.greeshores.ca

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The Green Shores Program



A Program of the



www.stewardshipcentre.bc.ca



www.greenshores.ca

Green Shores

Promotes sustainable use of coastal ecosystems through planning and design that:

- **Preserves the integrity or connectivity of coastal processes.**
- **Maintains or enhances habitat diversity and function.**
- **Minimizes or reduces pollutants to the marine environment.**
- **Reduces cumulative impacts to the coastal environment.**



Green Shores Technical Team

Brian Emmett – Marine Biologist (Archipelago Marine Research Ltd.)

John Harper – Coastal Geomorphologist (Coastal & Ocean Resources Inc.)

John Readshaw – Coastal Engineer (Sandwell Engineering Inc.)

Martine Desbois – LEED Specialist (MD and Associates)

Harriet Rueggeberg – Planner (HB Lanarc Consultants Ltd.)

Gretchen Harlow – Stewardship BC (Canadian Wildlife Service)

Patrick Walshe – Project Coordinator



Funders and Sponsors

- ❑ **BC Real Estate Foundation**
- ❑ **BC Ministry of Environment** - Ocean and Marine Fisheries Branch
- ❑ **Environment Canada** – EcoAction Program; National Program of Action for the Protection of the Marine Environment & Georgia Basin Action Plan
- ❑ **Bridge Coastal Legacy Fund**
- ❑ **Habitat Conservation Trust Fund**
- ❑ **Ducks Unlimited**
- ❑ **Fisheries and Oceans Canada**
- ❑ **Sunshine Coast Regional District**
- ❑ **Comox/Strathcona Regional District**
- ❑ **District of Squamish**

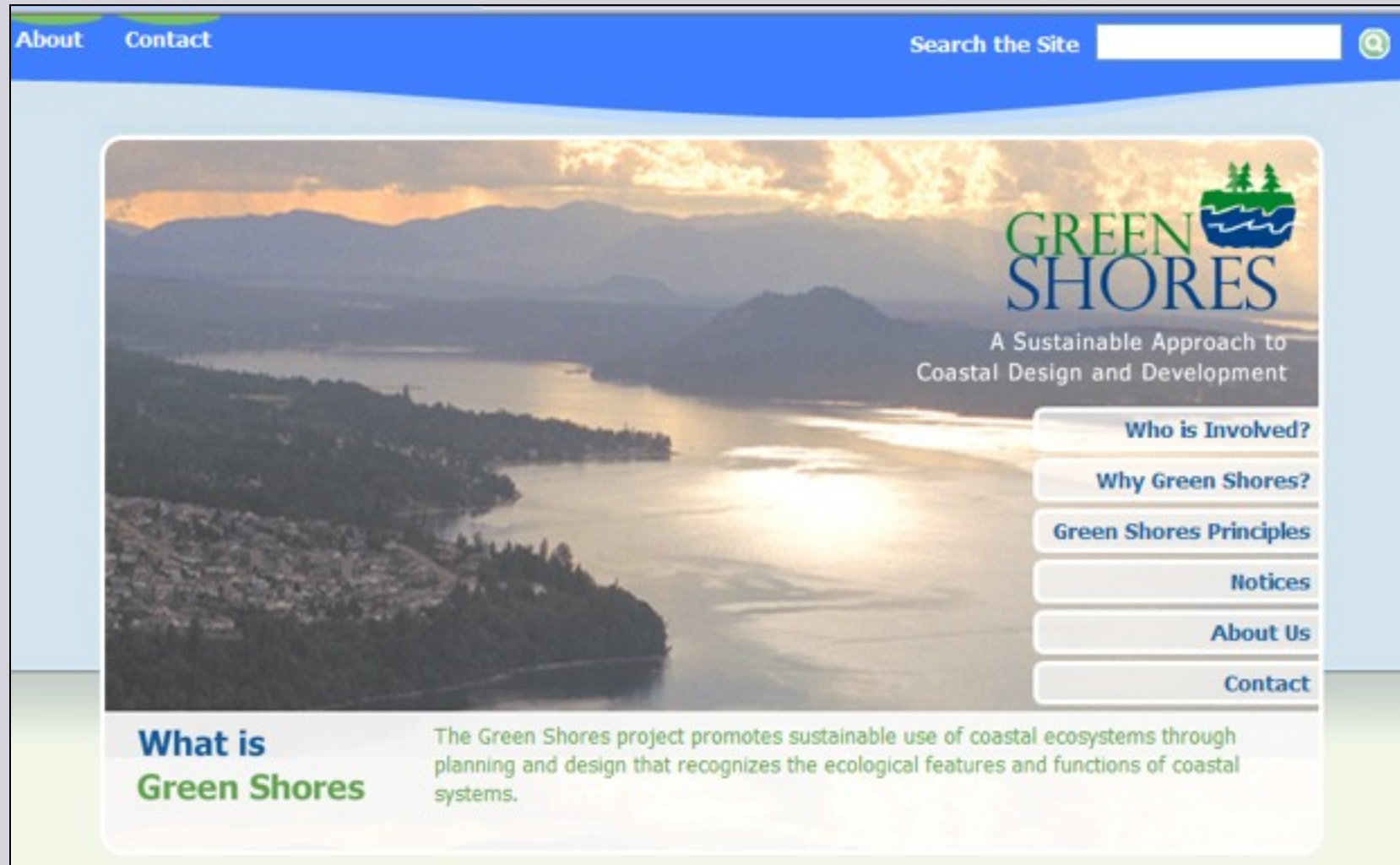


Green Shores Program Components

- ❑ **Green Shores Rating and Certification** – an assessment tool for developers and local governments
- ❑ **Pilot Projects** - testing the rating system and providing examples for users
- ❑ **Design Examples** – greener alternatives for shoreline protection
- ❑ **Bylaw Language** – information and support for communities/ local governments
- ❑ **Issue Sheets** – coastal jurisdiction, climate change and shore zone natural value
- ❑ **Outreach and Training Program** – to developers, the professional community and waterfront property owners



www.greenshores.ca



Green Shores Development Basics...

- ❑ **Shorelines are special places with special management needs**
- ❑ **We need to account for and work with natural processes**
- ❑ **Different shores - different concerns**



GREEN SHORES COASTAL DEVELOPMENT RATING SYSTEM



GREEN SHORES DEVELOPMENT RATING CREDITS VER. D1

ISSUED FOR PILOT USE AND PUBLIC COMMENT

JUNE 2008



Green Shores Pilot Rating System

- ❑ Voluntary credit rating system designed to promote sustainable coastal development
- ❑ Modelled after LEED™ (Green Building and LEED ND)
- ❑ 3rd party certification process to “encourage and accelerate adoption of sustainable green building and development practices.”
- ❑ Promotes greater setbacks, soft-shore approaches, riparian buffers, stormwater management



Green Shores Pilot Credits (June 2008)

Project and Building Siting

1	Siting of Permanent Structures	Prerequisite
2	Siting of Permanent Structures	2 points
3	Site Design with Conservation of Shoreline	1 point
4	Re-Development of Contaminated Sites	1 point

Shore Habitat and Coastal Processes

1	Conservation of Critical/Sensitive Habitats	Prerequisite
2	Riparian Zone	Prerequisite
3	Coastal Sediment Processes	Prerequisite
4	Rehabilitation of Critical/Sensitive Habitats	1 point
5	Rehabilitation of Degraded Habitats	1 - 2 points
6	Enhanced Riparian Zone	0.5-4.0 points
7	Light Pollution Reduction	1 point
8	Remediation of Coastal Sediment Processes	1 or 2 points

Stormwater Management

1	Integrated Stormwater Planning and Design	1 –3 points
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Project Development Process

1	Environmental Management Plan	Prerequisite
2	Innovation	1-2 points
3	Outreach and Public Education	1 point

Why a Voluntary Rating/Certification System?



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- ❑ **Adoptable**
 - Local governments can use as a “bar” to meet in development applications

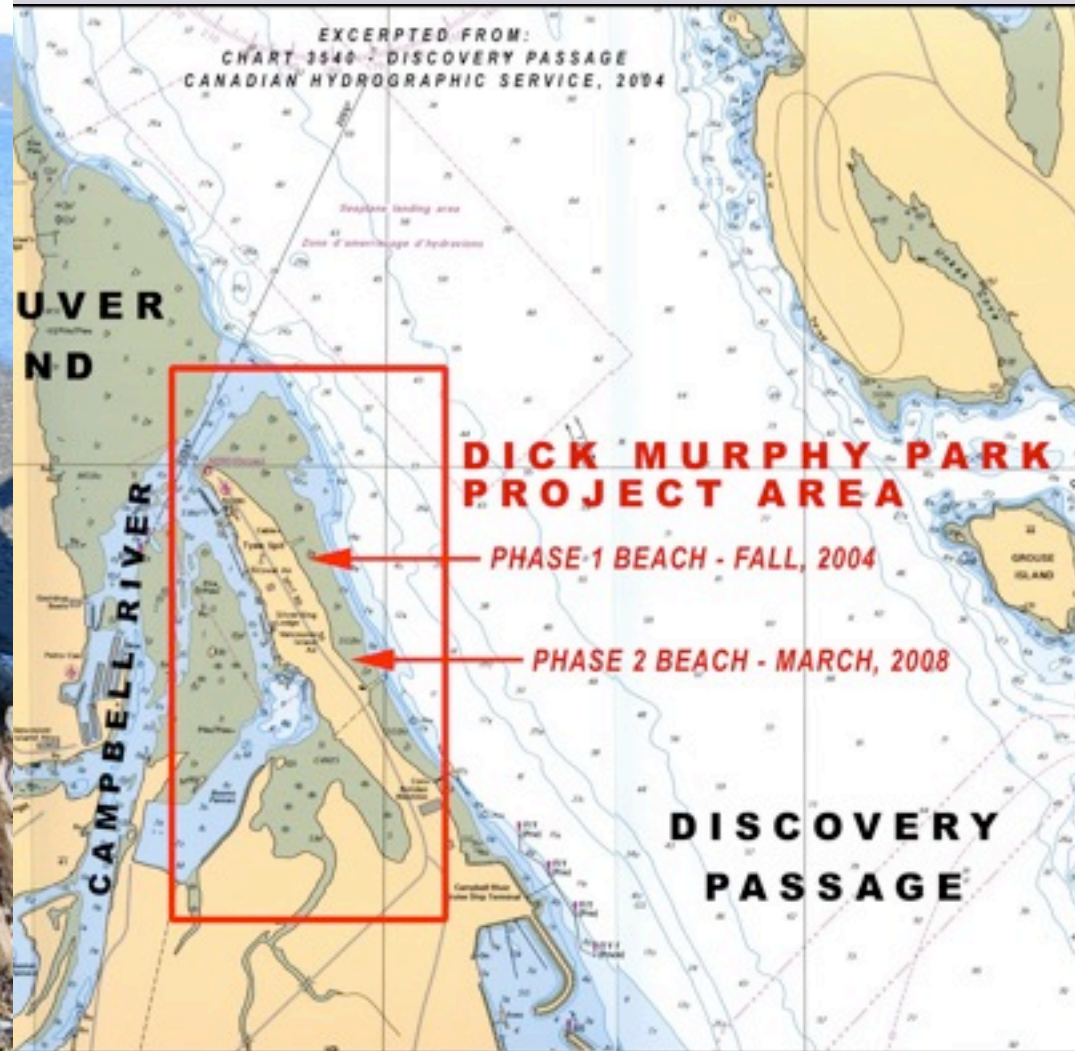


Current Green Shores Pilot Rating Projects

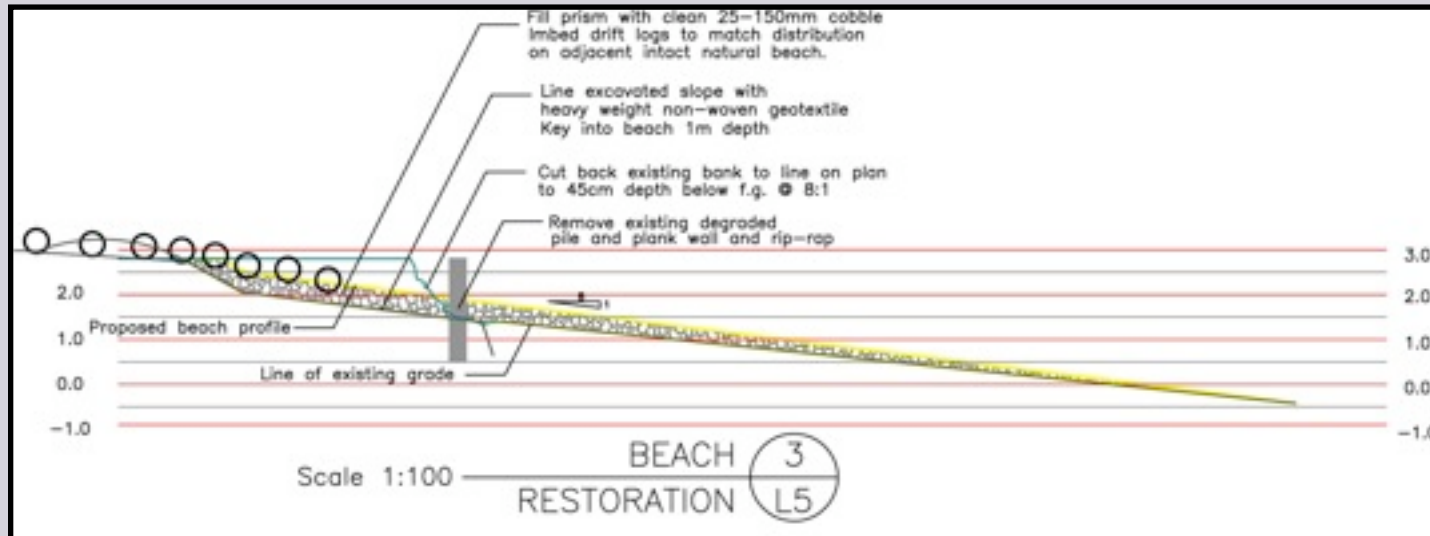
- ❑ **Dick Murphy Park, Campbell River BC** – restoration of a commercial site.
- ❑ **Southeast False Creek Olympic Village** – establishment of a waterfront park & walkway
- ❑ **Essencia Development** – Esquimalt Lagoon, near Victoria, BC
- ❑ **Snaw'naw'as First Nation Beach Replenishment-** Vancouver Island, BC)



Ratings Pilot Project - Dick Murphy Park, Campbell River, Pre-existing Condition



Ratings Pilot Project #1- Dick Murphy Park, Campbell River, Design and Post Construction



Timber wall removal, beach replenishment and planting

Ratings Pilot Project #2

SE False Creek Olympic Village Waterfront





SE False Creek - Habitat Island constructed in False Creek





SE False Creek -
Herring spawn
(eggs) on the rocky
shoreline



30.03.2009



- Mixed residential/commercial development
- Low lying setting inside a coastal lagoon
- Currently in design stage



Pilot #4 - Snaw'naw'as First Nation Beach Berm

Pre-existing condition - bank erosion and rip rap fill



GS Pilot #4 - Snaw'naw'as First Nation Beach Berm

Post Construction – Beach berm and fill, riparian vegetation



Green Shores Outreach

Workshops for local planners, engineers, landscape architects, habitat biologists, developers

- 120 workshop attendees
- Green Shores list of practitioners, GS “LinkedIn” group
- Volunteer pilot assessor group



What's Next for Green Shores



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- ❑ **Revise Green Shores V.1**– Operational Release March 2010



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- ❑ **Continued Outreach**
- ❑ **Improvement of ecosystem function through implementation of GS tools & incentives**





Sea Grant

Washington

Thursday, December 10, 2009



GREENING OUR SHORES

Shoreline Management and Beyond

Washington APA Fall Conference
Vancouver, WA
November 13, 2009

Susan Drummond, Foster Pepper
Maggie Glowacki, City of Seattle
Katrina Hoffman, WA Sea Grant
Nicole Faghin, Reid Middleton



INDUSTRIAL WATERFRONT



PUBLIC PARK ON A LAKE

Thursday, December 10, 2009



SINGLE FAMILY RESIDENCE ON A LAKE



MULTI-FAMILY DEVELOPMENT