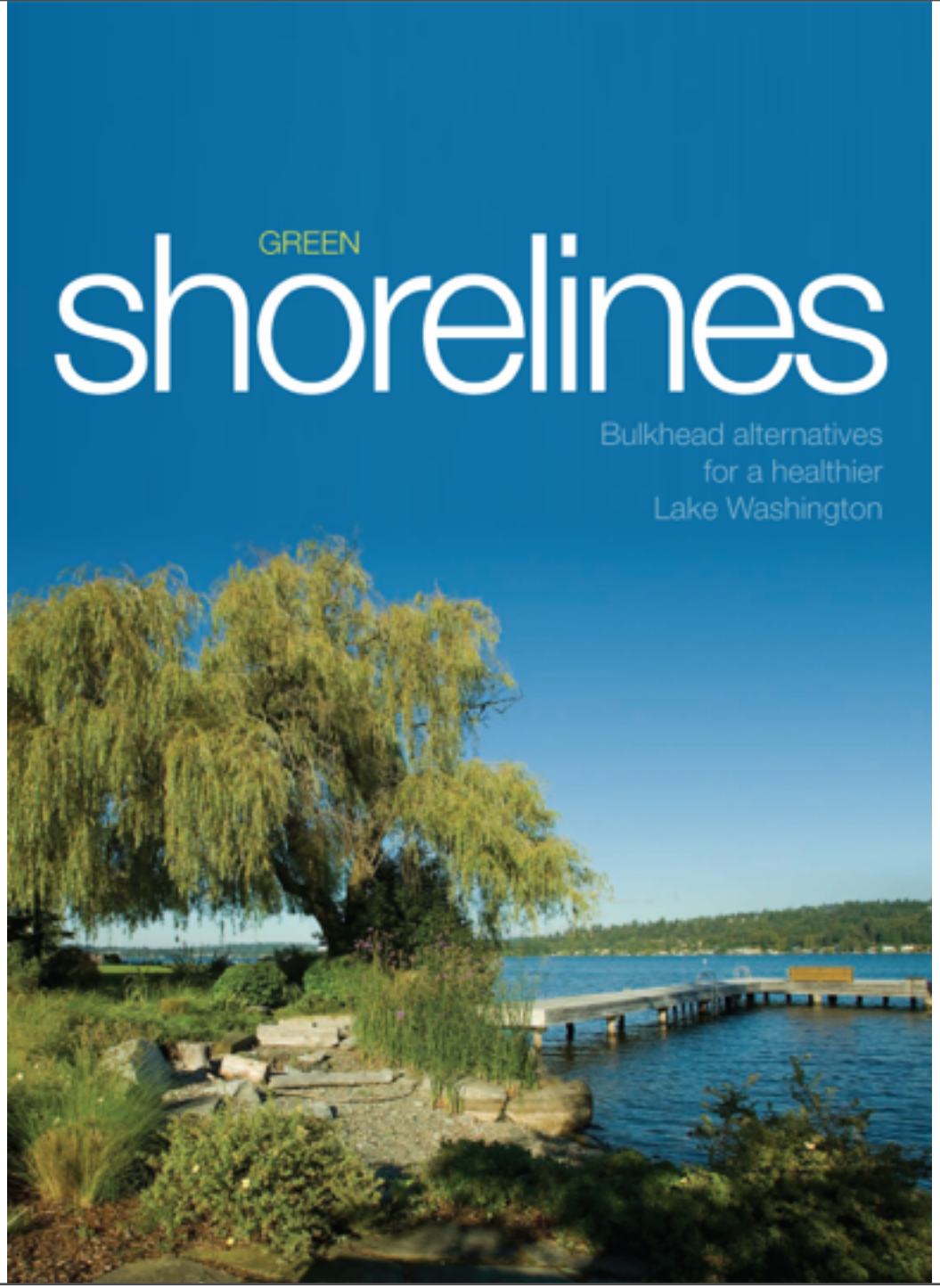


City of Seattle
Department of

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.

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

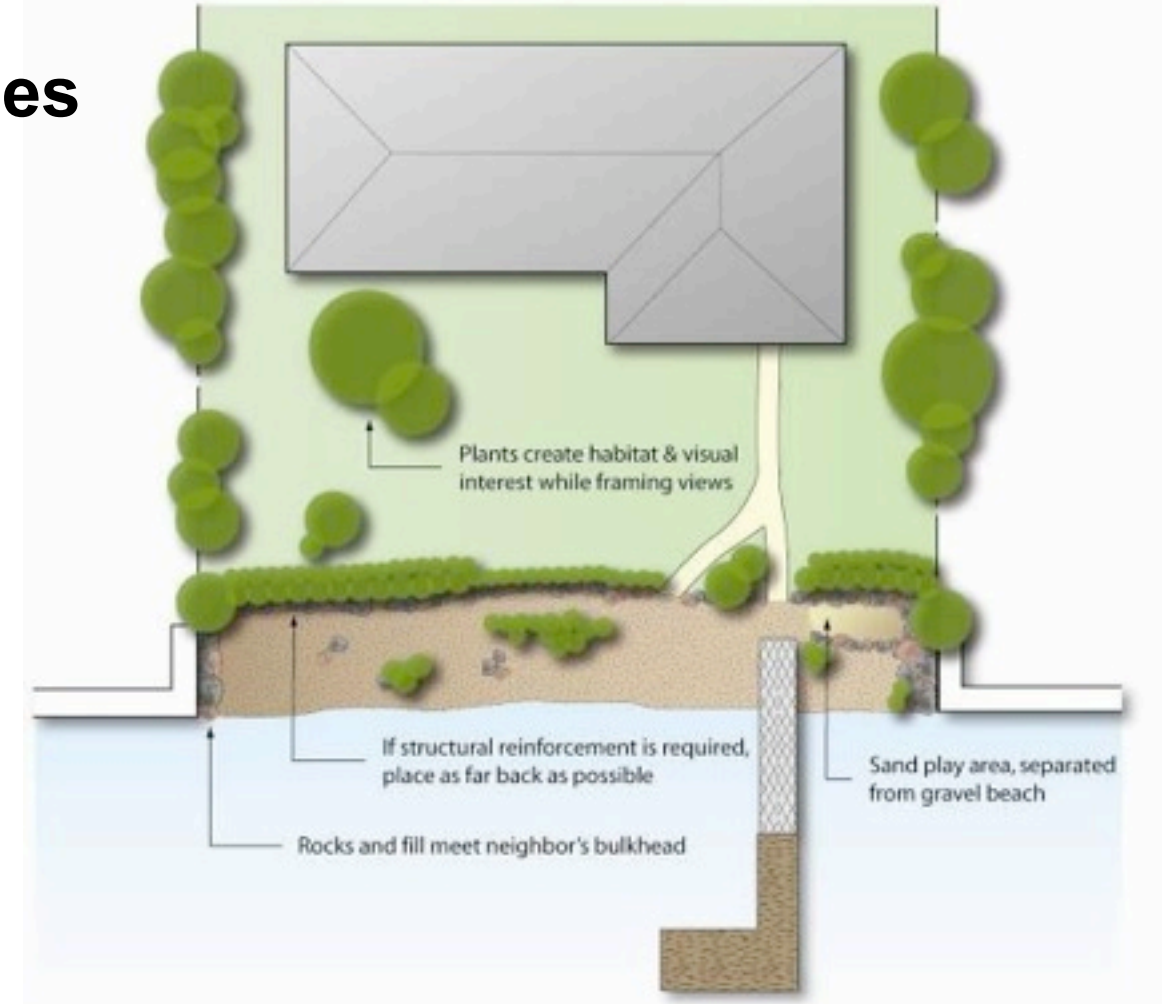
- Literature review -- WRIA 8 Chinook Salmon Conservation Plan, UW studies, various publications on shoreline stabilization practices
- Draw up draft recommended practices, look for existing sites
- Review and revise with input Technical Advisory Committee: engineers, designers, contractors, regulators

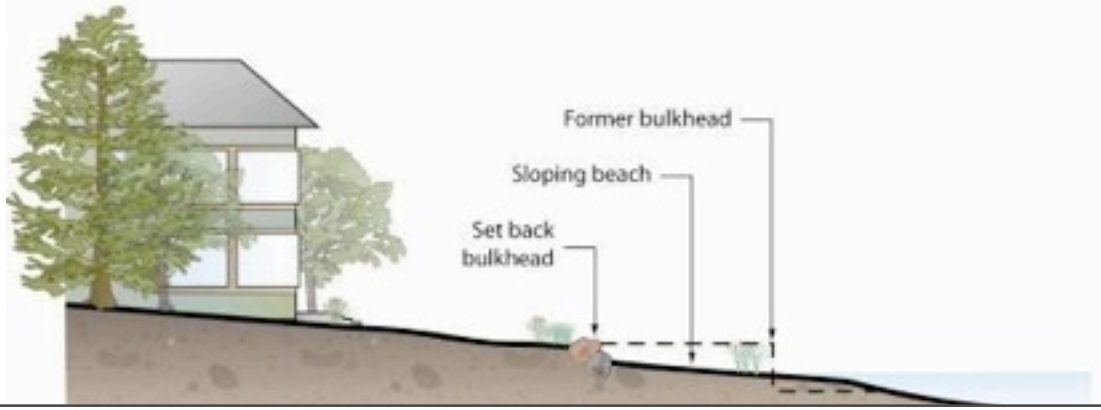
Anchor Environmental

Green Shorelines practices

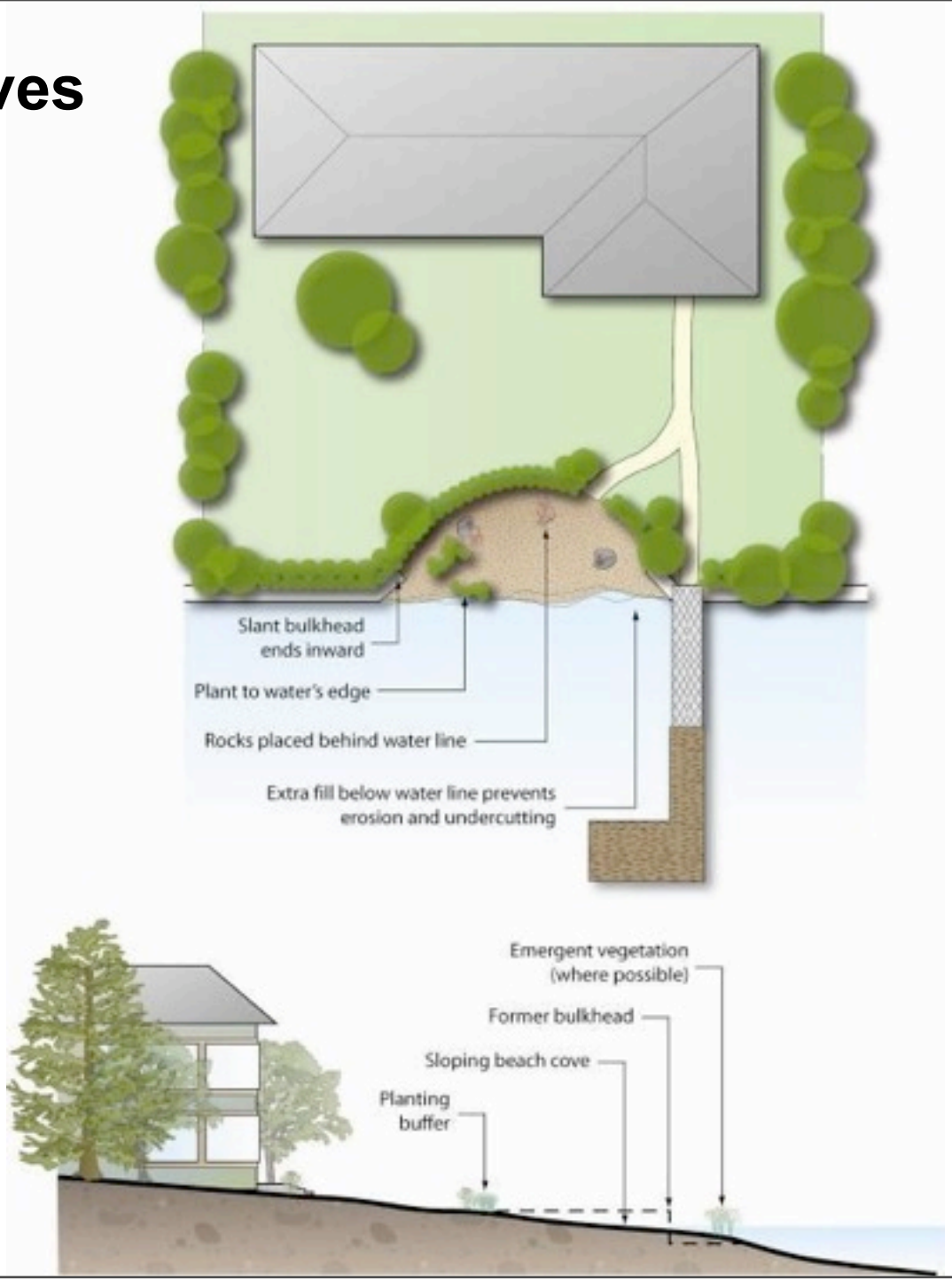
- Full beach installation
- Beach coves
- Setting back bulkheads
- Vegetated buffers
- Slope bioengineering
- Log placement

Full Beaches





Beach Coves


Slant bulkhead ends inward
Plant to water's edge
Rocks placed behind water line
Extra fill below water line prevents erosion and undercutting
Emergent vegetation (where possible)
Former bulkhead
Sloping beach cove
Planting buffer

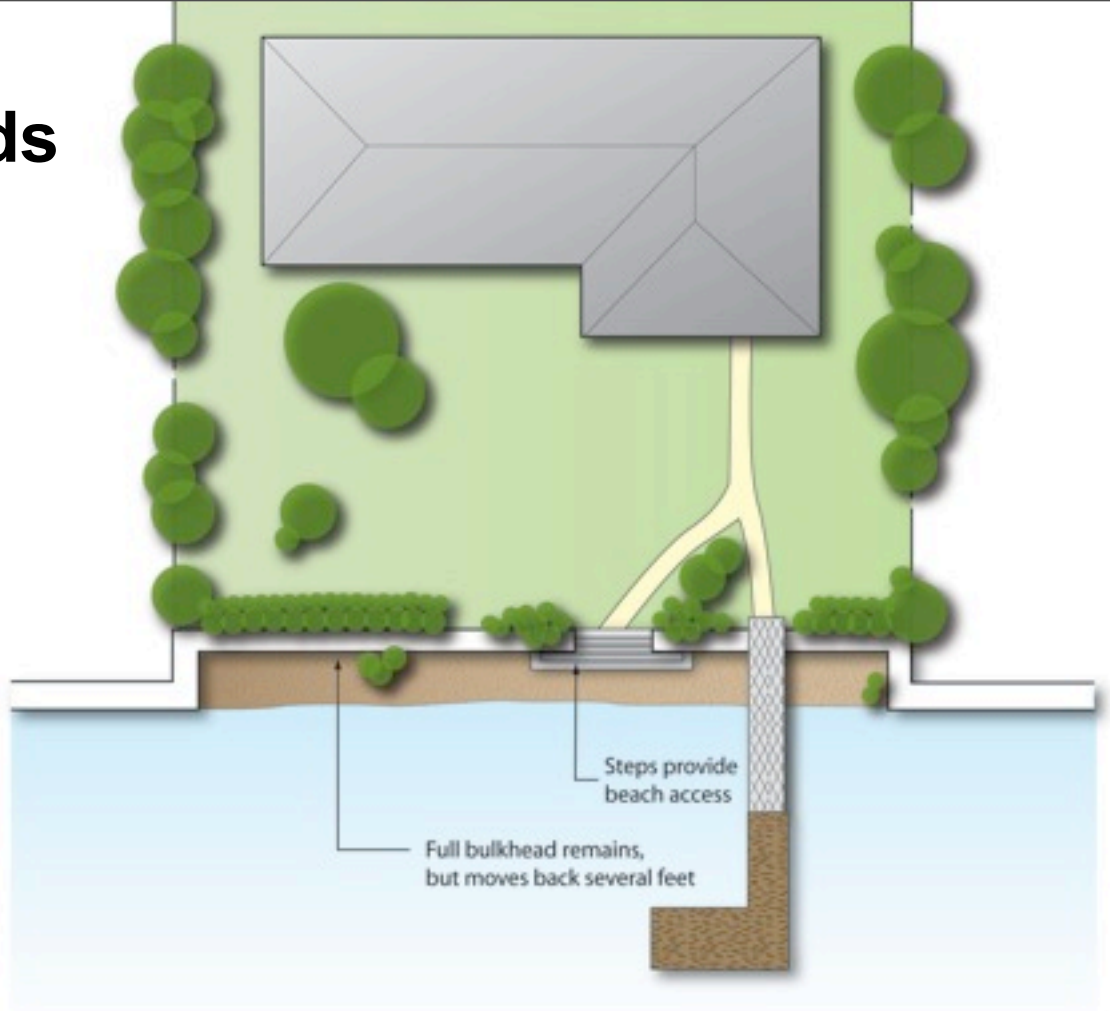

Watershed Company

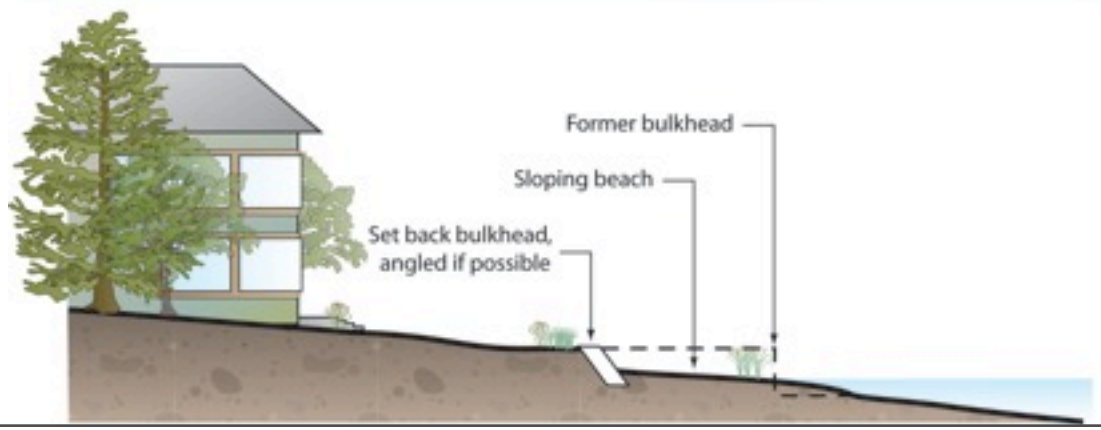

Hendrikus Group

Waterfront Construction

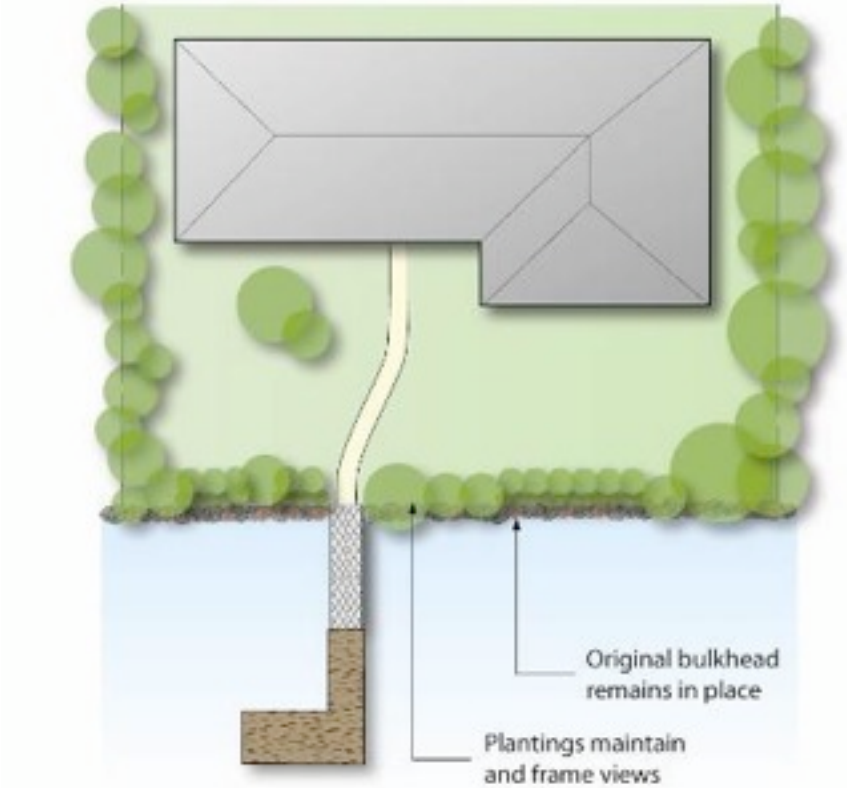
Thursday, December 10, 2009

Setting Back Bulkheads





Vegetated Buffers



Waterfront Construction

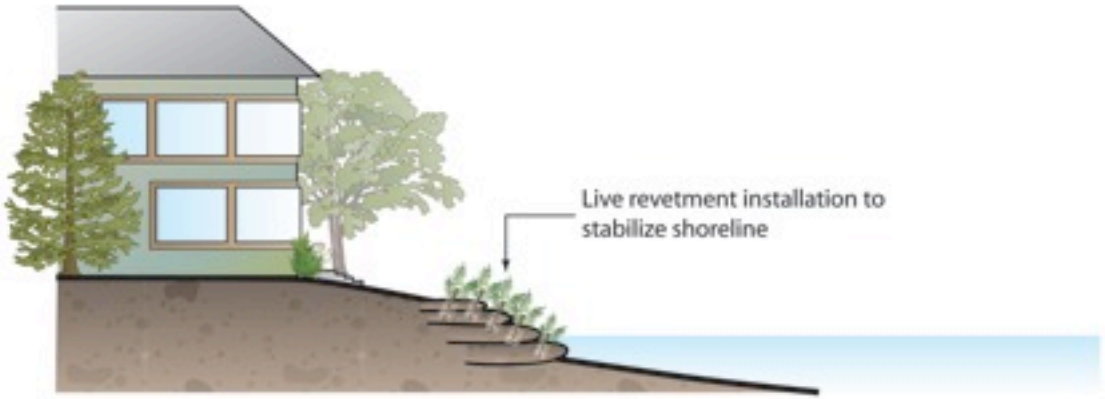

Berger Partnership


Joanna Buehler

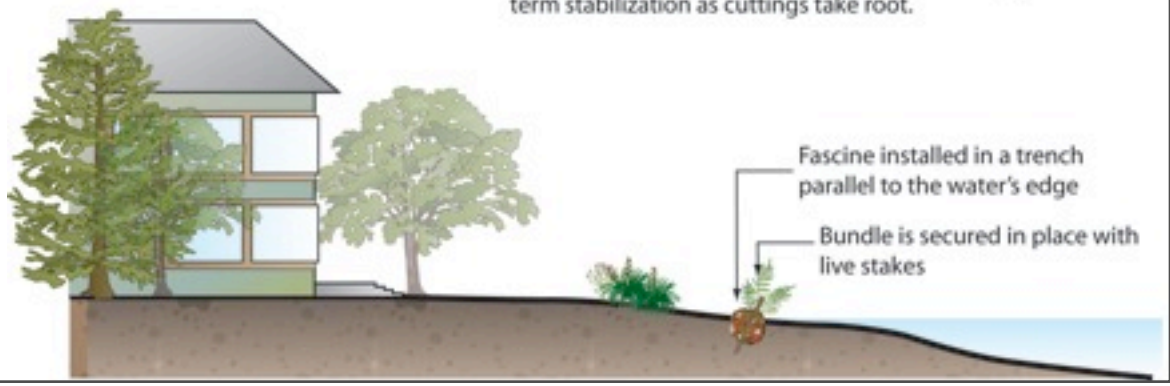
Slope Bioengineering

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

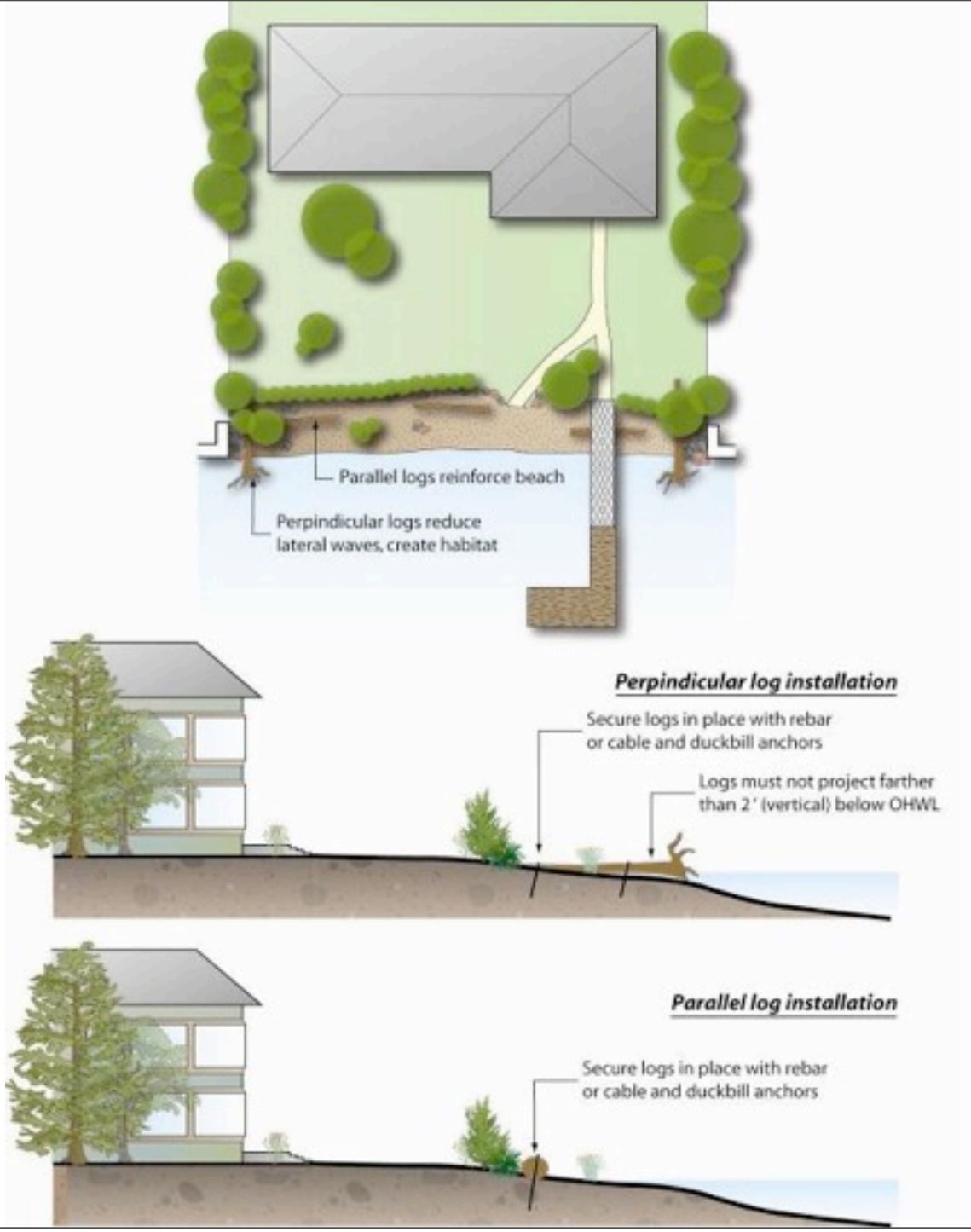
Live revetment uses live stakes and geotextile fabric to rebuild slopes



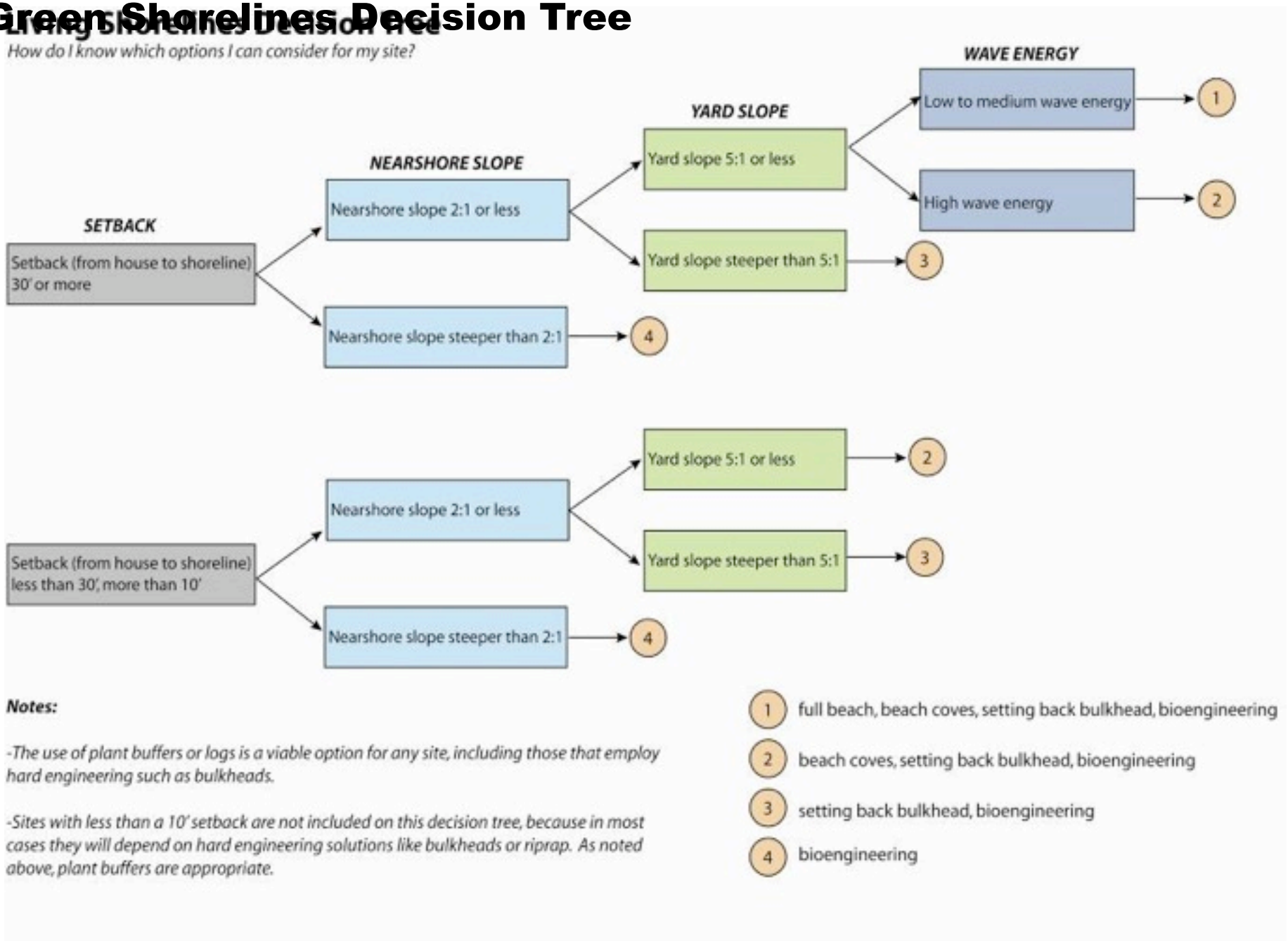
Fascines are bundles of live plant cuttings, used to provide short term erosion control as well as long-term stabilization as cuttings take root.



Log placement



Green Shorelines Decision Tree



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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