

Tour of Innovative Shoreline Design

After the City of Kirkland Shoreline Masterplan Update Forum

Saturday, September 30, 2006, 1-4pm

Tour begins and ends at Kirkland City Hall

See great examples of living with the lake, not just on it

See on-site examples some of the recommended changes in the way we design and build our shorelines by attending the “fieldtrip” portion of the forum. Attendees of the tour will visit lakeshore properties to see

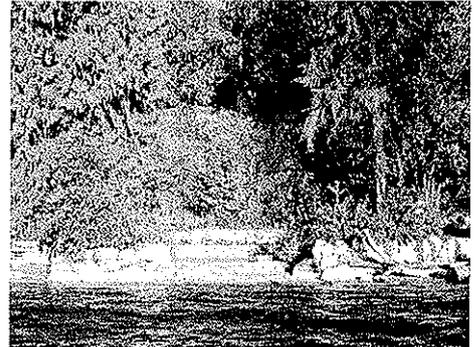
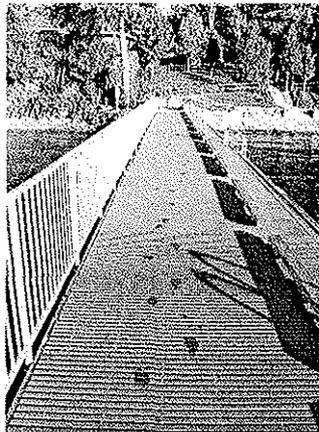
- where older designs which once employed vertical wall bulkheads or rip-rap have been replaced by terraced coves and beaches
- shorelines that are now more accessible and safer for the family and pets
- how proposed changes enhance wildlife
- shoreline plantings that add interest to the yard without sacrificing views
- innovative design and construction methods that have reduced impacts to Sensitive areas (steep slopes) when trying to access the shoreline
- and learn from the experiences of other shoreline property owners

To register or for further information, please contact Debbie Natelson at dnatelson@gmail.com or 425-503-9024.



Report on the
Tour of Innovative Shoreline Design
September 30, 2006

**City of Kirkland
Shoreline Master Program Update**



**Prepared by
Deborah Natelson, coordinator of tour**

*Public Outreach * Environmental Education * Community Involvement
Shoreline Stewardship*

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On September 30th, 2006 twenty-three people participated in a *Tour of Innovative Shoreline Design* along the Lake Washington waterfront. The three-hour tour featured two residential shorelines and one public dock and swimming beach. Attendees were shoreline property owners, including members of the Shoreline Property Owners & Contractors Association known as SPOCA; land-use planners; environmental engineers; landscape designers; fisheries biologists; environmental educators; members of the Audubon Society; and staff videographers and other citizens.

The intent of the tour was to show examples of the types of development that are likely to be considered during Kirkland's Shoreline Master Program Update. Most of Kirkland and the potential annexation areas' shorelines are already developed, so the updates to the plan that might affect shoreline property owners and lakeshore businesses are those involving shoreline structures like docks, boat houses, and bulkheads. With this in mind, the City of Kirkland wanted to offer some good – and already built – examples of alternative designs and construction methods.

Updates to the Shoreline Master Program will also have to consider construction within and access to the lake through environmentally sensitive areas such as steep slopes, wooded greenbelts, and areas prone to landslides. The Tour of Innovative Shoreline also provided examples of design and construction methods that minimized impacts to sensitive areas.

It is important to be aware of the innovative designs and construction methods featured on the tour because they illustrate many of our State and Federal agencies' newer requirements. The requirements have been changing to better protect Chinook salmon, which were officially listed as a threatened species. Since Chinook rear their young along Lake Washington's shoreline, fish-friendly designs and construction methods will be an issue for consideration as Kirkland updates the Shoreline Master Program. Attention to this issue will be necessary to meet the community's objectives for environmental stewardship and for a timely and predictable permit process, as well as the City's legal responsibilities under the US Endangered Species Act

Potential concerns about proposed changes to the Shoreline Master Program held by shoreline property owners and businesses are:

- Will changes limit my access to the water?
- What will my shoreline look like aesthetically?
- Will my views be blocked or compromised?
- Will my use of boats be denied?
- Do we have a way of assessing the benefits of these changes?

The shoreline design tour was designed to address these concerns.

Bios: Tour Coordinator and Invited Speakers

Deborah Natelson has nearly 20 years experience in environmental education and community

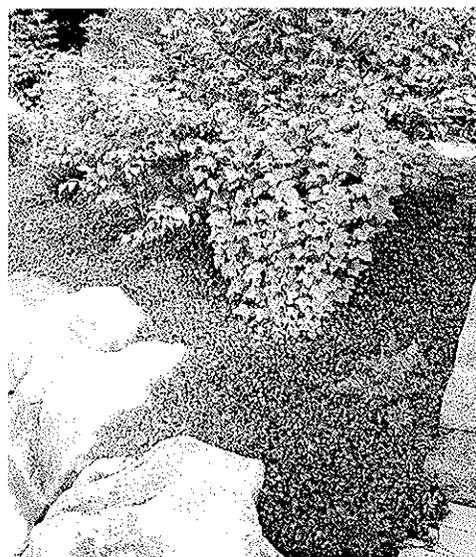
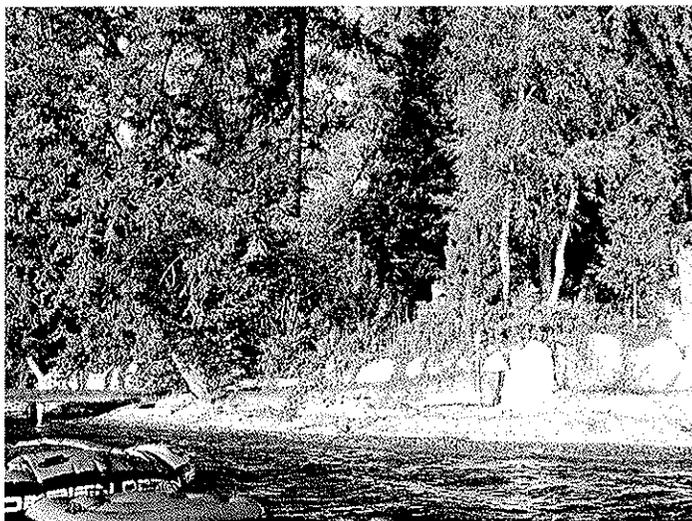
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involvement. She received her Bachelors in Marine Biology from Brown University and her Masters in Landscape Architecture from the University of Washington. She recently served as the Education and Stewardship Coordinator for WRIA 8, the Lake Washington/Cedar/Sammamish Watershed (within which Kirkland lies) developing outreach strategies for the recently adopted *Chinook Salmon Conservation Plan*. During this tenure, Debbie developed and conducted a series of workshops for shoreline property owners along Lakes Washington and Sammamish. The focus of these “Lakeside Living” workshops was on shoreline landscape design; docks; bulkheads and alternative design opportunities. Debbie has also conducted many workshops on natural yard care for the King County Natural Yard Care Neighborhoods programs.

Dan Nickel, Environmental Engineer at The Watershed Company, received a Bachelor of Science degree in Biology from Pacific Lutheran University in 1993 and a Masters of Science degree in Environmental Science from the University of Washington’s Civil and Environmental Engineering Program in 2000. He has been working for The Watershed Company since 2001, providing expertise in the assessment and design of semi-natural shorelines in urban areas, permitting under the Endangered Species Act, including the preparation of biological evaluations, shoreline inventories, critical area regulations review and preparation, and stream/wetland reconnaissance and delineation.

Julian (Jules) Durant, an environmental design-build consultant, speaker, and designer has worked with The Hendrikus Group for over 15 years. As Director of their Soils Division, Jules has not only pioneered new approaches to designing with engineered soils, but has been working towards raising public awareness about the important role of soils in shoreline design and construction. He has won national acclaim for his designs that integrate planting, theater style lighting design, stone work and masonry, along with sustainable ways of working with soil. Jules has developed practical strategies for soil-based restoration and reforestation efforts for individual home owners, communities, and professional colleagues alike. He has over 30 years “hands-on” experience in construction, grading, irrigation, erosion control, as well as project management and estimation.



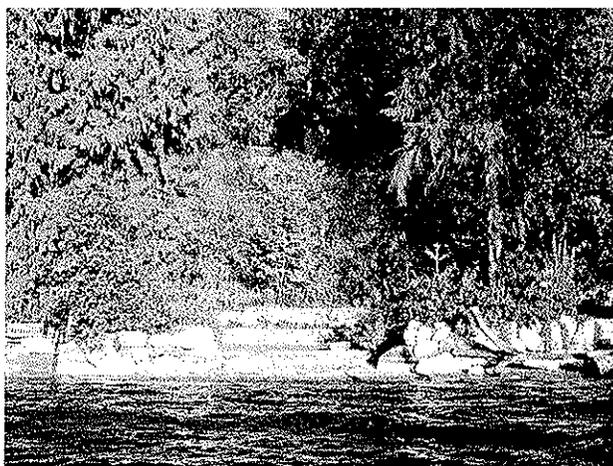
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THE TOUR

Site 1: A uniquely large double lot in with over 200 feet of continuous shoreline, Bellevue. Shoreline Design and Biological Evaluation by The Watershed Co.

This impressive makeover demonstrated a winning combination of creative vision, innovative design, and skillful craftsmanship. Seeing the site before and after renovation, it's hard to believe it is the same yard. Though the homeowners had a luxurious amount of lakeshore footage, they felt frustrated that most of it was underutilized for their family's needs. They simply wanted a lakeshore yard that was safe for young children "and anyone wanting to swim along their beach without being slammed into the bulkhead." They also needed a shoreline that was safe for their dogs; provided easy access to the water; and easy access for small boats.



Pre-existing Conditions:

- Deteriorating wood and concrete bulkhead
- Failing storm sewer line with broken sewer pipe and concrete rubble
- No safe access to water, especially for young children and pets
- Deep water with steep drop off (as typically results from vertical wall bulkheads)
- Violent wave action exacerbated by vertical wall bulkhead (nothing to absorb wave energy causing increased in amplitude and scouring action)
- Expansive lawn extending down to waters edge, but underutilized since steeply sloped (challenge for children playing ball as it would roll directly into lake without any



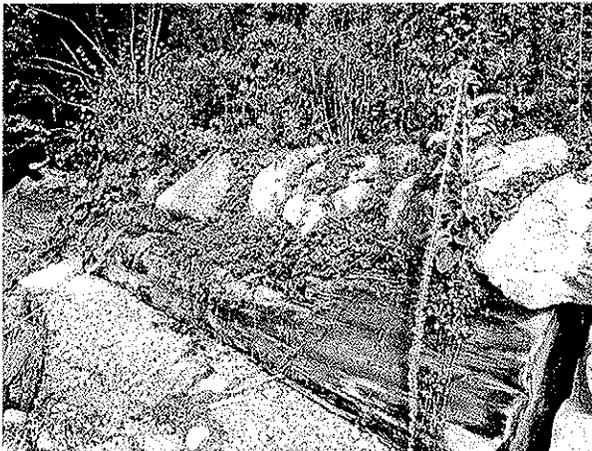
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- buffer)
- Lack of privacy, like living in fish bowl
 - Typical, but uninteresting looking lakeshore yard
 - Lack of fall color
 - Lack of wildlife

Site features provided by redevelopment:

- 1 The traditional concrete vertical-wall bulkhead was removed and replaced with a gradually sloping gravelly beach
- 2 The beach access with shallow gradual slope created safe access for young children and pets
- 3 The yard (much of which was formerly considered unusable by owners) was pulled back from the shoreline to create two distinct coves, each with a different look and feel: one more formal, bordered by dry-stack stone walls; one a sandy, more recreational “beach”
- 4 A native vegetative buffer was installed along the shore
- 5 The addition of a nurse log, cedar stumps, and shoreline vegetation provided habitat for wildlife and effectively softened the hard edges produced by the rocky coves and walls
- 6 Efforts were made to retain as many of the large existing trees as possible and to prevent damage to their root systems during construction
- 7 The gravity fed storm sewer line on this property was also upgraded.



A nurse log supports lush vegetation

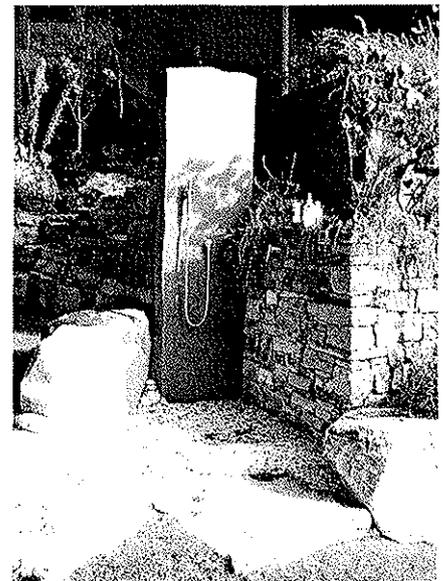


QUESTIONS ASKED BY TOUR PARTICIPANTS

What was the cost of this redevelopment? (from a Kirkland shoreline property owner)

Owner said the cost was in upwards of \$200,000, closer to \$250,000. However, she pointed out that this was for a double-sized lot, included many upland improvements such as an outdoor shower and all the plumbing necessary to bring water down to this level, lighting, electrical, fireplace, stone steps, hand laid dry-stack wall, and complete landscaping along shore and whole backyard. This price also included architectural design services, environmental and engineering consulting, and permit fees.

The consensus from the crowd of tour participants was that this was a very good deal. They expected it to have cost more and considered it excellent value for all the amenities provided.



How the shoreline survived the past years big storms? Was the yard in place for more than a year? (by a concerned Juanita Bay resident)

Yes, the yard has been in place since 2001. All were pleased to hear that the shoreline stood the test of Mother Nature. No storm damage and no erosion that they can detect.

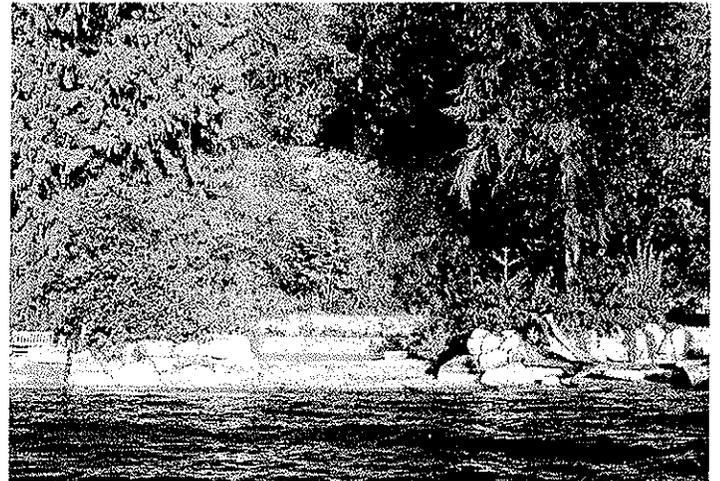
What would owners do differently (if anything)? (from a Kirkland shoreline property owner)

Nothing that really had to do with the shoreline design. Owners' only change would be to site the fireplace located up above such that it faced out toward the lake more.

Would they have liked a larger, more contiguous beach? (by Kitty Nelson, fisheries biologist for NOAA, the National Oceanic & Atmospheric Administration)

Initially (during the planning phase), the owners thought they wanted a more traditional flatter yard, but did not feel it was worth sacrificing the large trees along the shore to make a continuous beach. To save the trees required dividing the shore up into two separate areas, one a flat sandy beach, the other a beach cove enclosed by a more formal *dry-stack stone wall*.

After construction and finding out how enormously useful these “outdoor living rooms” became, owners had no regrets about not having a large continuous beach – or a flatter “sport court” type of yard. A bigger beach would not have been worth losing the big conifers that “add such character to the yard.” Owner claimed that none of the installed or maintained vegetation has in any way impacted their views.



Two very different coves were created along the shore, one a sandy beach cove, the other a more formal lakeshore garden, bordered with a dry-stack wall and mature canopy of trees

How do you quantify the benefit environmentally? It is obvious to us that this design serves the needs of you, the homeowners quite well, but how do you measure benefits to the environment that the Shoreline Master Plan is trying to achieve? Is it even possible? Do you count fish or what? Do you see more turtles? See more wildlife? (by Kirkland shoreline property owner and member of SPOCA, the Shoreline Property Owners & Contractors Association member.)

This question generated various responses.

Debbie Natelson, the shoreline tour coordinator and Kitty Nelson both offered some insight. They described some of the **needs of juvenile salmon that share the lakeshore with human homeowners**. Young salmon, which rear along the shorelines of Lake Washington for months as they make their way out to sea need:

- shallow water at the shoreline to provide protection from predators
- small substrate size such as sand or gravel; large rocks harbor predators
- removal or minimization of
 - armored dock pilings where predators lurk
 - elements that cause sharp shade/shadow lines which force young salmon out into deeper water where predators reside

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- shoreline vegetation to provide a source of food (native invertebrates and leaf litter), shade, and shelter

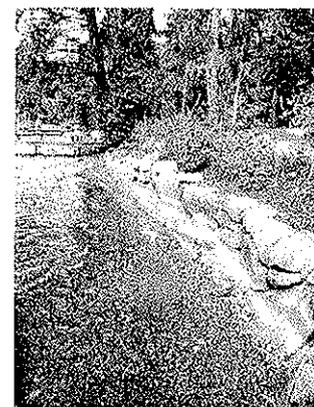
Dan Nickel, the environmental engineer for this project agreed that it may appear somewhat subjective, but there are “more easily measurable ways of defining benefits” when dealing with docks and overwater structures. Parameters like the amount of light transmission through a dock surface; reduction in sharp shade and shadow lines; and spacing between pilings can be measured for these structures. The results are influenced by design.

We can measure benefits to the environment by the amount of changes in habitat generated by shoreline designs. By knowing the habitat needs of juvenile salmon and other aquatic life, we can assess the effectiveness of shoreline design by the habit features they produce – or prevent. For example, if a vertical wall bulkhead results in a steeply sloping beach with deep water and violent wave action, but a terraced cove produces a shallow sloping beach favored by young salmon, then we can measure the benefit to the environment in terms of the desired habitat features that result from our shoreline design practices.

How does one go about planning for shoreline design? With so many decisions, how do you avoid being overwhelmed? (by a Kirkland resident with a lakeshore lot he has yet to build upon). The toursite host replied, You have to decide upfront what your needs and priorities are and then work from there. For example, in their case they were looking for safety for children and pets, preserving existing vegetation, and increasing the use of their sadly underutilized yard. Having clear goals in mind made the design decisions easier to reach.

Overall Tour Participant Response

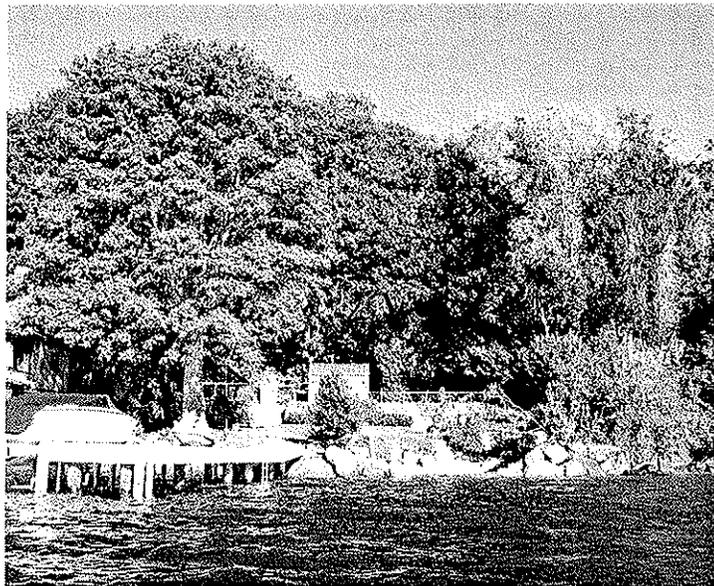
- Visitors were rather impressed by the stylish design and extreme usability afforded by the new layout of the redeveloped shoreline.
- They liked the creative reallocation of the space and the possibilities afforded by departure from typical yard design (continuous lawn extending all the way to water’s edge).
- Tour participants were pleasantly surprised by the variety and appeal of the native vegetation planted along the shoreline.
- They were also impressed by size of shoreline, but this site had the luxury of being a double lot, providing 210 feet of continuous shoreline. While impressive, tour participants noted that this was not typical of most Kirkland lots.



Site 2. A steep site along a heavily wooded bluff above Lake Washington, Medina. Shoreline Design and Construction by The Hendrikus Group

As development pressures increase there will be more of a tendency to try to build along sensitive areas, especially steep/landslide prone slopes. Some of Kirkland's potential annexation areas fall into this category.

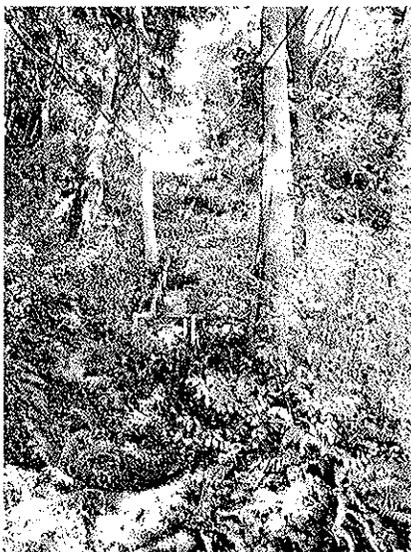
Tour Site 2 is *on* Lake Washington, but the house is located at the top of a very steep and heavily wooded bluff. Properties like that typically gain water access via staircases that switchback widely across the face of the bluff (in order to accommodate the steep grade), or via a tracked tram that cuts a permanent swath of woody (slope-holding) vegetation below the tracks and cab. The impacts posed by these types of shoreline access are not only physical, but visual as well. The City of Medina has been concerned about the amount of visual clutter that development and access to lakeshore could produce.



The Medina tour site provided an example of shoreline access that has been attained with minimal physical or visual disturbance. This access was achieved by the combination of a suspended cable car and a foot path/stair system that "floats" over the terrain rather than having been carved into the slope.

As in the first tour property, this site also provided an example of a lakeside lawn and vertical-wall bulkhead replaced by a sandy beach cove. The shoreline area here was smaller in scale however, perhaps more typical of a Kirkland area yard.

Little Cable Car in the Woods



The standard means of travel that the family employs to get up and down from the lake is a motorized cable car, which had been part of the site for many years. The cable car does not ride along the slope on tracks as is typical of many tram systems but instead, is suspended in the air, snaking through the canopy of the trees, leaving shrubs and roots intact on the slope below. Vegetative clearing has been limited to just the landing areas at top and bottom of the bluff, plus a small "aerial tunnel" (about 10' in diameter) up in the canopy of the trees, to give clearance to the cable and passenger car.

Though native vegetation such as cascara, ferns, and snowberry are planted under the tram, some of the tour attendees noticed that there was also lot of ivy carpeting the

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ground as well. The property owners -- previously unaware of ivy's invasive nature -- are pleased by the success of the natives that were planted as an alternative ground cover along their hillside and are now receptive to trying to introduce more of these in lieu of ivy

The Living Staircase

While the cable car has been on the site for many years, the owners of Site 2 recently wanted to install a non-motorized trail system to provide them with backup access should there be a power failure or mechanical breakdown. A traditional stair system would not be permitted through such sensitive areas.

In order to get a variance the designers had to demonstrate that the proposed access system would not:

- Significantly reduce slope vegetation
- Cause additional runoff
- Cause slope/soil erosion
- Contribute to a catastrophic event such as a landslide

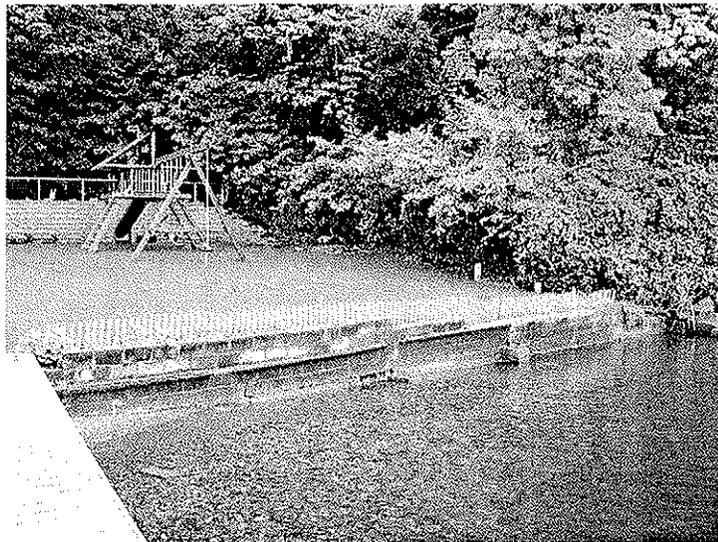
The alternative access design was to construct a stairway system that effectively "floated" along existing contours rather than altering the grade. Difficulty or sacrifices would be borne by humans and not the land. This design also employed the use of engineered soils that are designed to completely absorb runoff and avoid erosion.

- The top section of the slope was constructed of grated aluminum treads, that allowed the maximum amount of light and water to pass through, thus enabling plants to quickly grow underneath and reduce the amount of soil disturbance.
- Wooden steps following the rest of the slope similarly had to conform to the existing contours. The aim was to have humans accommodate nature instead reengineering nature for people's convenience.
- Each step is almost like a small raised planter
- The treads of each step were filled with the engineered soils specifically designed to increase infiltration and be completely non-erosive. This "Living Soil," as described by the designers/contractors, was also engineered to grow plants quickly which in turn, would further stabilize the slope

The resulting staircase occupies a much narrower footprint and is more akin to a goat trail than a typical hillside staircase. As it is much steeper than more traditional lakeside stairways, we wondered how the tour participants would react. While there was some huffing and puffing on the ascent back to the top, most of the tour-goers appreciated it as a great form of exercise (that they didn't have to pay a healthclub to use). Participants appreciated the visual unobtrusiveness and apparent reduced impact

Renovation at the water's edge

Like the tour hosts of Site 1, the owners of Tour Site 2 have young children and pets so safer access to the water was an important issue. They also had a failing retaining wall and an underutilized yard with lawn extending to the water's edge.



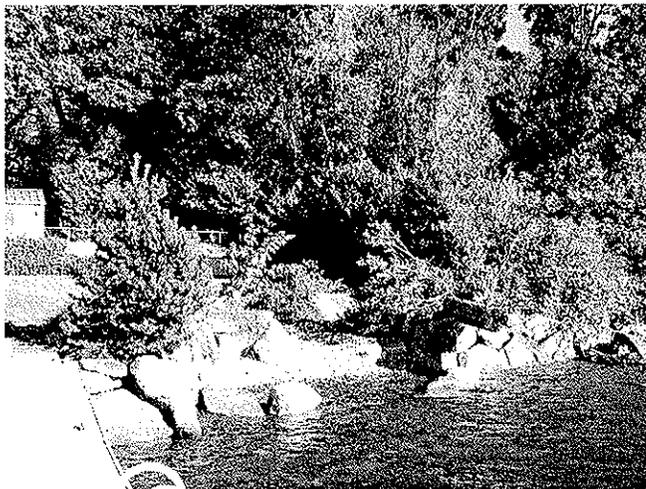
At the water's edge, the soggy, unhealthy lawn and deteriorated vertical-wall bulkhead were removed and replaced with:

- A shallow grade gravelly cove
- A sandy beach
- Steep drop-off corrected; bottom substrate regraded and replaced with size and texture preferred by juvenile salmon (this sand or gravel will have to be replenished periodically)
- Submerged rock ledges, installed to help absorb energy and keep substrate in place
- Native overhanging vegetation planted along edge with tree snags for enhanced habitat
- Stone stairs leading up to a new mid-level lawn that is organically maintained

In order to build a cove and beach, both the property owners at Site 1 and Site 2 had to agree to pull back the shoreline. This at first may be perceived as “giving up land,” but owners soon appreciate that they are instead, gaining a much more useful landscape. It is different than a traditional lakeside lawn, but in both cases proved to be much more useful.

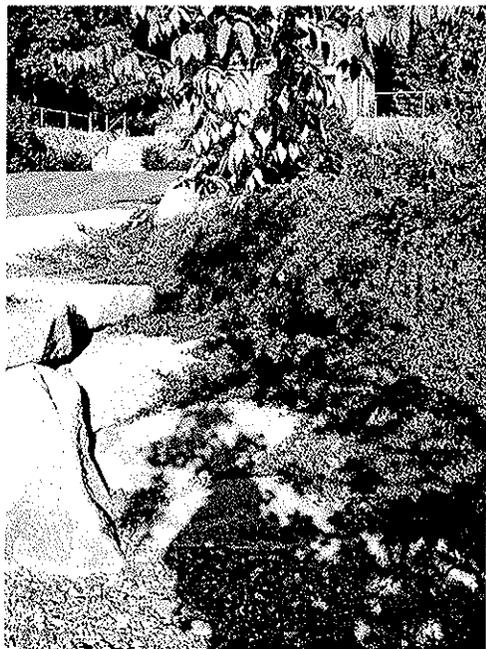
Design elements used to prevent erosion and minimize soil disruption

Julian Durant, the co-designer and builder of Site 2 renovations reiterated to tour participants that successful implementation of the proposed shoreline designs hinged upon the **use of good soil**, which was incorporated



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in everything from the top of the bluff down to the rocks lining the beach cove. This was necessary to prevent erosion, increase infiltration, and enable the plants on slope to grow quickly and further stabilize the slope.



Vegetation softens rockscapes adding color and style to garden

Softening hardscapes with vegetation

The owners of this site, although they could not be present, wanted people to know how great a difference the addition of vegetation around the rock boulders made. Upon first seeing the cove built, but devoid of any vegetation, they thought to themselves, “Oh no, what have we done? Did we just ruin our property?” The rockery plants became established quickly, due to the addition of specially engineered soils and then the owners became enthralled with their new shoreline landscape.



Protecting Shoreline Vegetation

Saving the big leaf maple at the shoreline was an important goal of the design. The tree could have been damaged during the process of removing the bulkhead and constructing the stone cove. Preserving this majestic tree was achieved by a variety of techniques:

- 1 Protecting roots (especially small hair roots) from damage
- 2 Keeping backhoes and excavation equipment away from roots
- 3 Reducing stress on roots and tree during construction by keeping the temperature cool and constant (e.g. use cool wet burlap to cover roots on hot dry days)
- 4 Further protecting with mulch/compost layer (insulation and microbial action helps to fight disease and pests that could prey upon weakened immune system)

Questions and comments posed by the four participants

Should dock material also be made out of metal like the aluminum staircase at top of slope?
(by a Juanita Bay shoreline condominium resident)

This question was referred to Kitty Nelson. While she did not recommend docks be made of aluminum per se, she did advise that the most important considerations in designing a dock are that they:

- Be as “invisible” as possible to fish and other wildlife
- Maximize light permeability
- Reduce sharp shade lines which force young salmon out into deeper predator laden waters, increasing the clearance between the dock water’s surface, by avoiding the use of vertical fascia boards, and by using open decking surface
- Increase the span between pilings

Will the geotextile fabrics used under the imported soil help to prevent sink holes and are they muskrat proof? (by the same Juanita Bay resident). Julian Durant confirmed that they could, though some might require the additional of metal mesh.

Do you need a permit to make shoreline changes below Ordinary High Water Mark or is it just outside of your property line? (a Kirkland resident who has not yet begun construction or design on his shoreline property). Dan and Julian both reiterated that permits are necessary for changes below OHWM. Dan also explained that for Lake Washington, OHWM is a manmade designation set by the US Army Corps of Engineers, as they control the water level at the Chittenden Locks. Whereas in Lake Sammamish, OHWM varies with the natural hydrograph.

Should we add large boulders and stones to the shoreline – and would we need a permit to do so? (Kirkland shoreline resident) They were advised to always ask the City before making changes to the shoreline and that a permit would be required for changes-- including additions of rock – made below Ordinary High Water Mark.

Debbie Natelson tried to clarify some of **the confusion about the benefit or problems associated with large rocks or boulders**. Large rocks at the water’s edge, like riprap or a rock bulkhead sited below OHWM provide perfect hiding places for predator species such as bass and sculpin. These fish prey heavily on juvenile salmon, especially threatened Chinook. However, Dan Nickel added that large rocks are, a good thing to have further out, under the water as they help in absorbing some of the wave energy.

Why all the emphasis on salmon? Why not on other species such as ducks? (by another member of SPOCA, who is also a Kirkland shoreline owner). Kitty Nelson explained that Chinook salmon have been listed as “Threatened” under the Federal Endangered Species Act. And thus, governments are legally required to try to protect them. She also mentioned that Steelhead Trout would soon be similarly protected due to their threatened status.



Kitty further provided homeowners with the five most important elements that NOAA is looking for when submitting shoreline development plans for review. She encouraged applicants to address these conditions within the first 30 of the shore:

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1. Shallow gradient-- provide conditions that maintain or produce it
2. Small substrate such as sand or gravel
3. Avoid big rocks such as riprap where predators can lurk
4. Site bulkheads up high, above the splash zone and OHWM
5. Overhanging native vegetation at the waters edge to provide hiding places for juvenile fish and a source of food (bugs and leaf litter)

Speaking of predators, do bass prefer non-native plants such as the white water lilies she sees off her shore? (from a Kirkland shoreline resident). Kitty Nelson explained that invasive predator species such as bass, do indeed associate with non-native plant species. Therefore, make efforts to remove invasive plants and replace with natives. The native water lily for Lake Washington is the smaller yellow flowered variety.

With reference to non-native plants, Kirkland resident and former City Council member commented **that some of the vegetation around the rock cove was not native, though she was relieved that none of it was invasive.**

Overall Tour Participant Response

- The cable car provided an access solution that was aesthetically pleasing and fun
- The stairs, though steep, were worth the extra work in terms of the reduced environmental and visual impact
- The cove was an attractive landscape feature and made the shoreline seem more useful

SITE 3. Public Dock & Swimming Beach, Road End Beach Park, Town of Yarrow Point, designed by Jongejan, Gerrard, and McNeal.

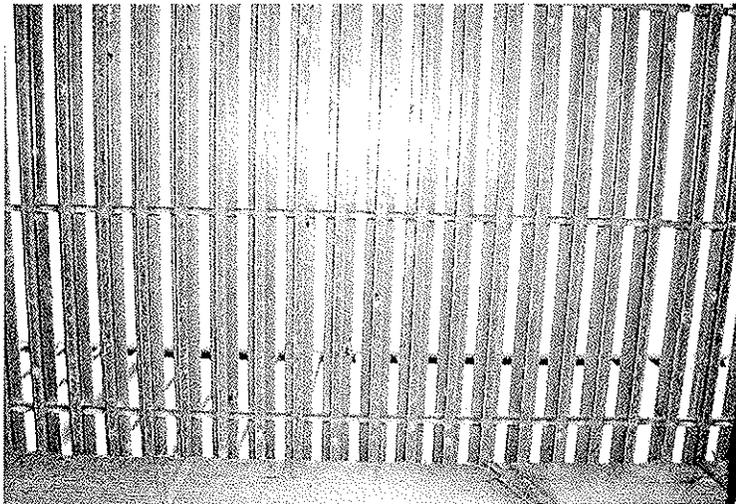


The tour concluded with a brief visit to the public dock and swimming beach known as Road End Park on the northwest tip of Yarrow Point. The Town built the dock and beach largely to accommodate the shoreline access needs of residents who live within Yarrow Point, but not on the water. Located at the site of the old ferry dock (though no remnants were left of dock), the new dock employed the use of alternative decking materials which allowed wider spacing of decking and more light transmission.

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The dock features:

- A high-tech fiberglass deck materials that is lighter than traditional wood decking, requiring less substructure
- Easy on feet, non skid yet no splinters
- Low maintenance
- Greater light permeability through wider slat width and thinner decking
- Dock surface built higher up off the lake surface, allowing more light to enter below
- Vertical fascia boards that would normally be an undesirable feature because of the shadows that they cast, but the height of the dock (4') off the water surface made this less of a problem.
- A wider width than what NOAA would prefer, but since it serves as a public dock it needed to accommodate many more users. It is appropriate for it to be wider.
- No dark shadows or sharp shade lines below
- Pilings spaced farther apart



The net effect of this dock has been to reduce the areas where predators would typically lurk beneath it and the conditions that force salmon out into deeper water (where other predators lie).

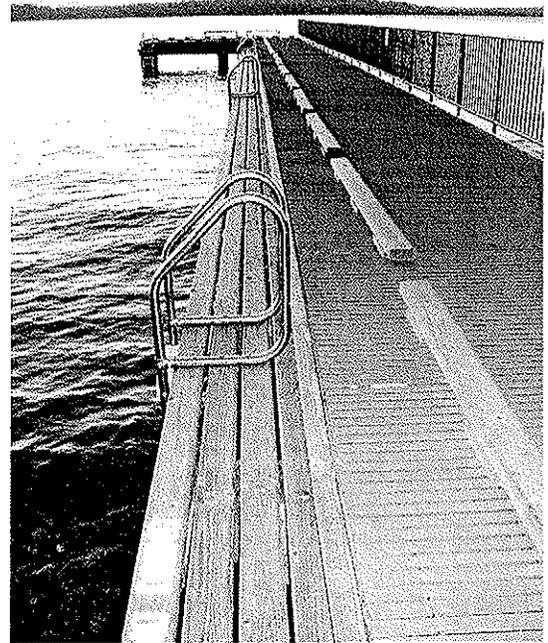
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Tour participants appeared to be impressed with the aesthetics of the dock; the clean lines, and obvious low maintenance. A good contrast has been offered where the fiberglass decking is directly adjacent to the traditional wood decking (with closer spacing between the deck boards). Since the first 30 feet of nearshore is the most critical area for juvenile salmon, it was less important to extend the fiberglass decking beyond this point. However,



nails protruding up from the weathered wood decking contrasted the smooth fiberglass decking where users could safely walk barefoot. Visitors could also see that the design changes did not limit boat access or any uses typically associated with docks, including swimming. As it was the end of the day of a busy tour, less questions and conversation occurred at this tour site.



As we returned back to Kirkland City Hall many of the attendees mentioned how much they enjoyed the tour and thanked us for the opportunity to see and experience some other shoreline possibilities. Some of the participants commented that the tour provided some options that they didn't even know existed. On the whole, they found the Tour of Innovative Shoreline Design to be inspirational.

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