Public Amenity: Public Access
27th Street Foreshore Enhancement

Opportunities

• Improve public amenities and physical access to the shoreline.
• Encourage the public to engage with the shoreline and local environment.

2008

A straight single-track pathway running between two private properties provided public access to the site. The footpath was considerably higher than the beach level with a temporary step for beach access. Overgrown invasive vegetation surrounded the trail creating a visual obstruction of the shore from the pathway.

Achievements

• Reconstruction of the footpath to provide safer public access to the shore.
• Improvement of public amenities and viewpoints by enhancing aesthetic and ecological value.

2010

The invasive vegetation was replaced with native riparian species and dune grass, enhancing the aesthetic and ecological value of the site. The footpath was rebuilt creating a gentle, winding slope down to the shore, emulating a natural path through sand dunes and providing better physical access to the beach. The bench and lookout point were positioned to provide a better view of the shoreline.

Economic Benefits: Beach Stabilization

27th Avenue Foreshore Enhancement

Opportunities

2008

- Stabilise existing sediments and reduce beach erosion.
- Provide more effective and sustainable shoreline protection measures.

Wave erosion is typically amplified by urban developments such as hard-faced seawalls, as they reflect waves back down the beach instead of disrupting them. Heavy erosion had undercut sections of the seawall at 27th street making the wall itself vulnerable to damage. Sustainable and effective shoreline protection can be created by using measures that work with coastal processes instead of combatting them.

Achievements

2010

- Successful combination of enhanced habitat features and protective measures that work with natural coastal process to create a self-sustaining shoreline.

Strategically placed boulders create tombolas and drift sills which guide and trap sediments on the upper shore, continuously replenishing the beach.

The riparian habitat created on the upper shore acts as a natural wave defence and stabilises fine sediments, and the newly created creek will feed new sediments onto the shoreline. These three components of the project will work together and with natural coastal processes to provide more effective, long term shoreline protection.

Economic Benefits: Fish Habitat

27th Street Foreshore Enhancement

Opportunities

2008

- Create new and valuable fish habitat.
- Improve lower intertidal and subtidal habitat and encourage kelp growth.

The ground water flow through the site would have greater benefits for marine flora and fauna if it were enhanced to create a creek habitat.

Kelp was found subtidally wherever the substrate was stable. Large kelp beds have much greater value as fish habitat, than small patches.

Achievements

2010

- 'Daylighting' of an underground freshwater course, into purpose built fish breeding habitat.
- Construction of a subtidal reef to allow growth of kelp beds and create valuable fish habitat.

The ground-water was day-lighted through a purpose built creek bed. The new creek was planted with native riparian plants to provide habitat for birds and insects, and feed intertidal fish habitat.

Large boulders were used to build a subtidal reef, providing suitable space for kelp and invertebrates, allowing the existing kelp beds to expand, creating valuable fish habitat.

McDonald Creek Foreshore Enhancement

District of West Vancouver

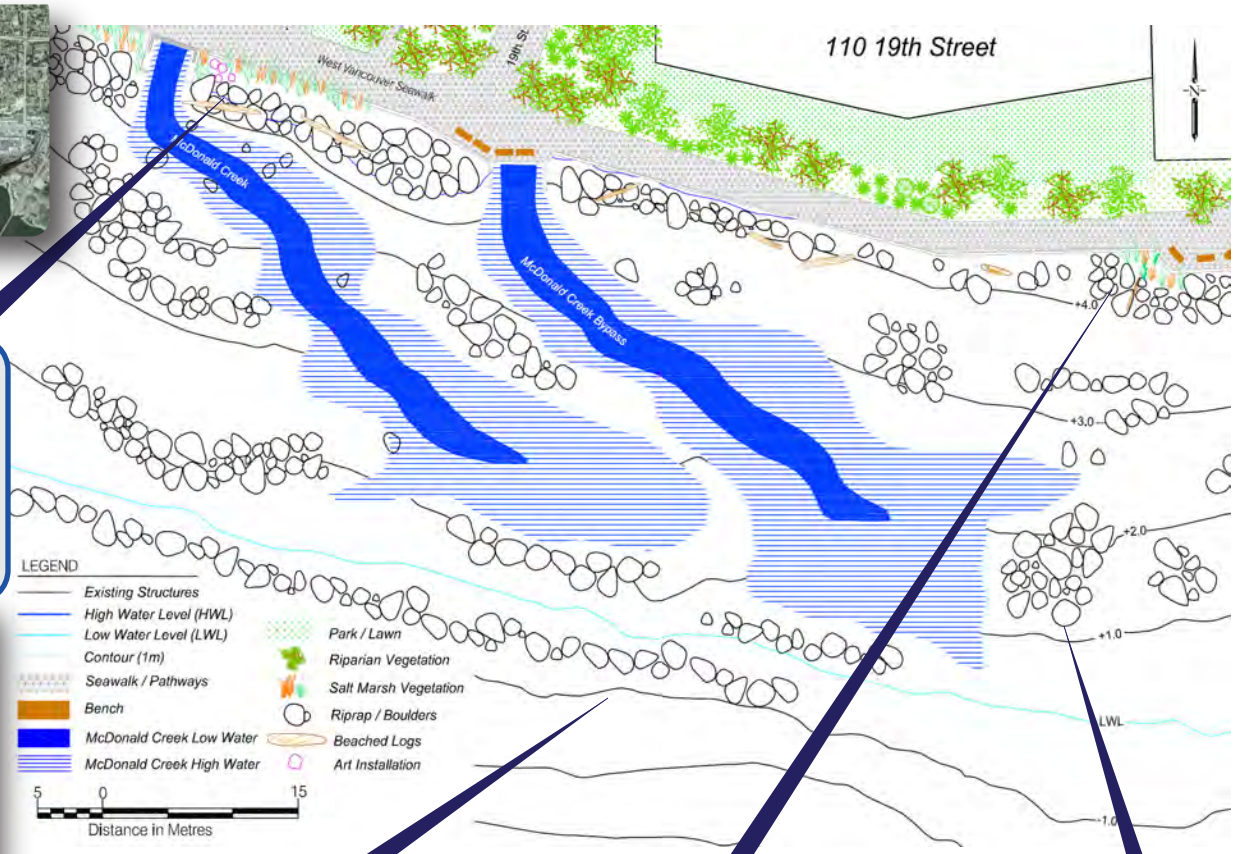
BALANCED ENVIRONMENTAL

Summary

The purpose of this project was to provide protection for the seawall and re-establish a more natural shoreline by deflecting creek sediments onto the upper beach, stabilizing existing substrates and introducing wave trips. These shoreline works would also increase habitat values and public access

Status

Conceived 2006. Major works 2007-2008. There is ongoing habitat monitoring.



Public Amenities

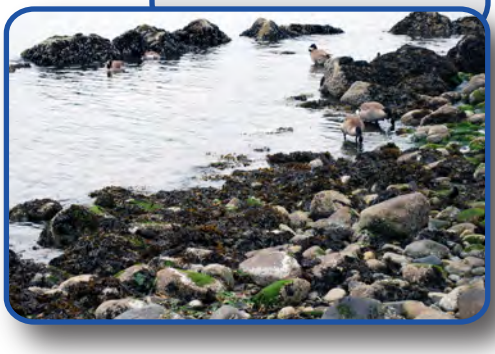
- Public Access
- Environmental Engagement

Economic Benefits

- Stream Enhancement
- Beach Stabilization

Habitat Development

- Freshwater Streams
- Shoreline Ecosystem
- Salt Marsh



Shoreline Protection

- Sediment Transport
- Shoreline Roughening

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Shoreline Protection: Sediment Transport

McDonald Creek Foreshore Enhancement

Opportunities

- Reduce beach erosion caused by concentrated flow from McDonald Creek.
- Encourage deposition of sediments from the creek, replenishing the beach.

2006

Streams carry sediments from their inland source and watershed down to the coast. As these sediments are deposited on the shore, beaches are formed and replenished. Re-directing and slowing the flow of McDonald Creek will ensure that it's sediments are deposited on the shore to replenish the beach.

Achievements

- Large boulders slow and direct the stream channel along the beach, reducing erosion.
- Sediments carried in the stream are deposited on the shore for natural beach nourishment.

2010

Strips of boulders along the channel deflect the stream along the beach which slows the flow, reduces erosion and causes sediments carried in the stream to be deposited on midshore. Groups of boulders also act as tombolas, guiding and trapping sediments carried to the shore by waves and currents.

Shoreline Protection: Shoreline Roughening

McDonald Creek Foreshore Enhancement

Opportunities

- Reduce erosion by creating a naturally protective and self-sustaining shoreline.
- Provide protection for the Seawalk and shoreline developments.

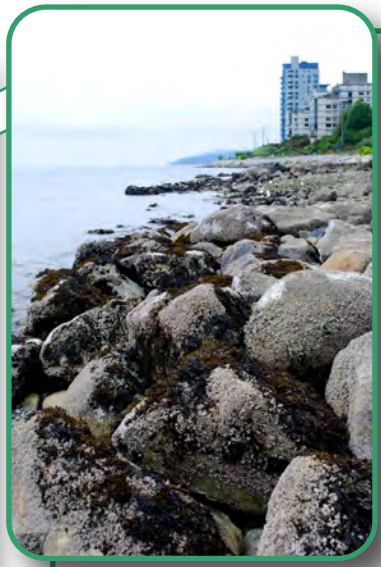
2006

The shoreline at McDonald Creek had historically experienced significant erosion, leaving a low-profile beach vulnerable to continued erosion from waves. Wave erosion can be limited by 'roughening' the shoreline, using large riprap to create an irregular and sloping beach that diffuses wave power before the waves reach the upper shore and Seawalk.

Achievements

- Creation of a more natural and protective shoreline using boulders and reclaimed riprap.
- Boulders strategically positioned as wave trips and tombolas, and to increase the beach profile.

2010



Riprap from the seawall was re-positioned along the shoreline to create wave trips and tombolas. Wave trips disrupt wave energy on the lower shore, providing better protection for the upper shore and Seawalk. Tombolas trap fine sediments on the upper shore; raising the beach profile increases the natural resistance of the shoreline to waves.

Habitat Development: Freshwater Streams

McDonald Creek Foreshore Enhancement

Opportunities

2006

- Stabilize the channels from McDonald Creek and McDonald Creek bypass.
- Improve the creek environment to create suitable fish habitat.

McDonald creek is a fish bearing stream with populations of coho salmon, cutthroat trout, and sculpins. Ideal fish habitat includes riffle pools and meanders, to provide shelter and feeding opportunities. The existing channel was heavily eroded with little structure or complexity. Improving the stream channel would create more viable and productive fish habitat.

Achievements

2010

- Large boulders were positioned to direct and stabilize the creek channel.
- Boulders were placed in the channel to increase complexity and provide more habitat.

Large boulders placed along the shore direct the stream channel and ensure that it does not get eroded by waves. Boulders in the creek increase the complexity of the channels, creating riffle pools and meanders which provide a more diverse habitat for fishes and invertebrates, providing shelter and feeding opportunities for migrating salmon.

Habitat Development: Shoreline Ecosystems

McDonald Creek Foreshore Enhancement

Opportunities

2006

- Improve the existing habitat for more marine species, by stabilizing beach sediments.
- Increase biodiversity by creating new habitats and colonisation opportunities.

There was considerable green algae growth on the existing loose pebble and small cobble beach, but intertidal species were limited by the unstable substrate. Larger boulders provide colonisation and attachment opportunities for a wider range of marine species, including rockweed, mussels and shore crabs.

Achievements

2010

- Large boulders were positioned along the shoreline to provide attachment opportunities and habitat for a range of marine plants and animals.

Boulders placed along the lower shore stabilizes the existing substrate and provides colonisation and attachment opportunities for a variety of algae, barnacles, mussels and other marine species, greatly increasing the biodiversity across the site. Algae, invertebrates and their larvae are an important source of food for coastal fishes and sea birds.

Habitat Development: Salt Marsh

McDonald Creek Foreshore Enhancement

Opportunities

2006

- Recreate a natural salt marsh habitat to connect the Seawalk and the shoreline.
- Improve the local biodiversity by reintroducing native plants and creating habitat.

Salt marshes are an important coastal feature. They are a buffer between the ocean and land; they protect the shoreline from terrestrial pollutants and the upland from waves, and provide important habitat and resources for many plants, birds and insects.

Achievements

2010

- Natural salt marshes were created between the Seawalk and the shoreline to act as a buffer, create important natural habitat, and to help stabilize fine sediments.

Dune grass, beach pea and other native species were planted to create a salt marsh connecting the Seawalk to the shore. The complex root systems of these plants also help to stabilize fine sediments on the upper shore, Salt marshes provide valuable habitat for insects and birds. The plant and insect waste they drop on the shoreline is an important source of food for many fish.

Public Amenity : Public Access

McDonald Creek Foreshore Enhancement

Opportunities

2006

- Re-connect the West Vancouver Seawalk with the shoreline.
- Improve public access to the shoreline and the local environment.

The large gap between the elevated Seawalk path and low-profile beach, and the sections of steep riprap slope limited safe beach access to one or two places. Reconnecting the Seawalk with the shoreline by replacing the existing hard-faced sea wall with a more natural coastline will improve the accessibility of the shoreline to the public.

Achievements

2010

- Replaced hard faced seawall with a more natural, riprap and salt marsh shoreline.
- Reconnected the Seawalk and shore, increasing public access to the beach and the ocean.

Using boulders and salt marsh to elevate the upper shore and create a more natural, sloping shoreline, closes the gap between the beach and the Seawalk. The wave trips, drift sills and tombolas will continue to trap sediments and increase the beach profile, closing the physical gap between the Seawalk and the beach and improving public access to the shoreline.

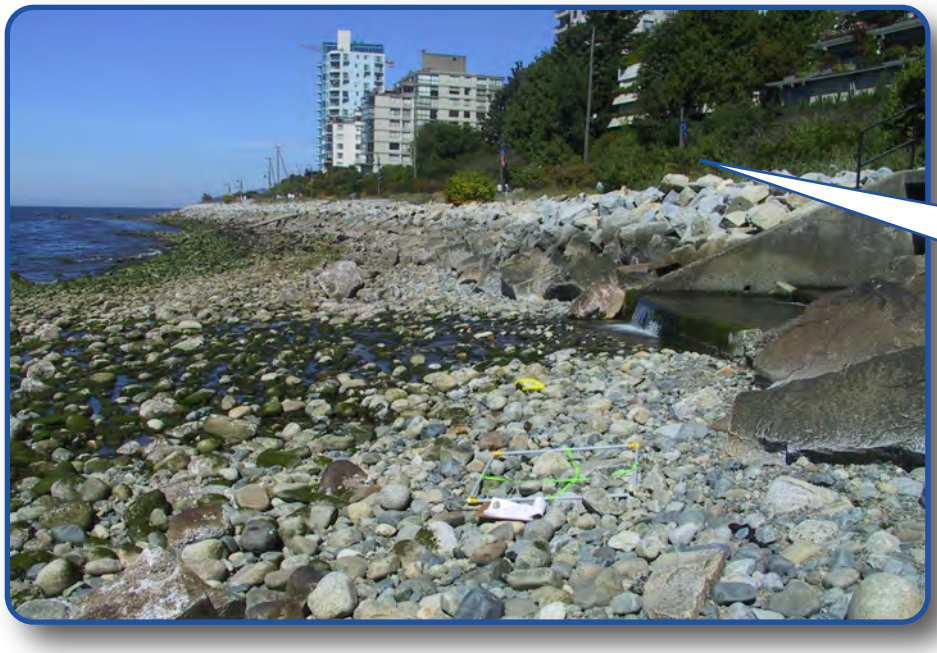
Public Amenity : Environmental Engagement

McDonald Creek Foreshore Enhancement

Opportunities

- Identify and utilize all opportunities for the public to engage with the habitat.
- Create spaces for the public to re-connect with the shoreline and the local environment.

2006



Creating new and identifying existing opportunities to engage the public with the local environment helps to raise awareness of the connection between McDonald Creek and the shoreline. Promoting McDonald Creek as a community resource can help to foster a sense of public stewardship over the local environment

Achievements

- Creation of permanent art installations and signage to raise awareness of the environment.
- Improvement of opportunities for public engagement with the habitat.

2010

Local students created colourful art work at the creek (above) to raise awareness of McDonald Creek as fish habitat and the importance of healthy streams and oceans. Salt marsh habitat, art installations and signage encourage the public to stop and engage with the environment, emphasizing the connection between the Seawalk, creek and shoreline.

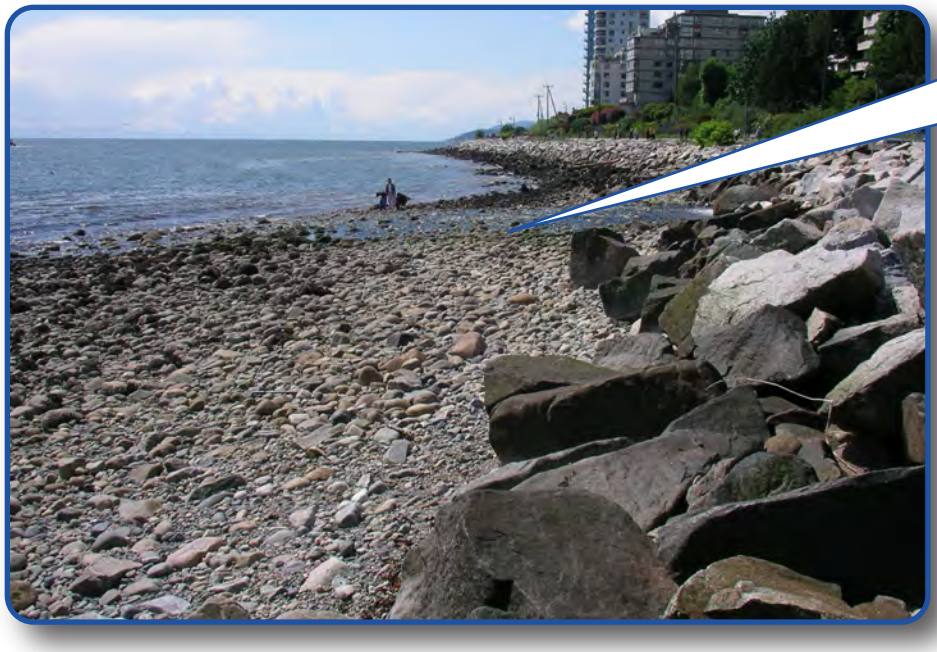
Economic Benefits: Beach Stabilization

McDonald Creek Foreshore Enhancement

Opportunities

- Reduce beach erosion and the associated costs of ongoing infrastructure and habitat repair.
- Prevent further erosion and the future need for continuous artificial beach nourishment

2006



Creeks carry sediments from their inland source and watershed to the shoreline. Newly deposited sediments are important for beach nourishment. During high velocity flows, McDonald Creek and Bypass carries sediments directly to the ocean. By slowing the creek flow sediments can be deflected onto the upper shore beach naturally replenish the beach

Achievements

- Use of boulders to direct and slow the creek flow, deflecting sediments onto the beach.
- Reduction of erosion and restoration of a self-sustaining and naturally protective shoreline.

2010

Strips of boulders direct the channel along the shore, instead of allowing it to flow straight out to sea, causing sediments to be deposited on the beach. Strategically positioned boulders guide and trap sediments in areas vulnerable to erosion and also act as ‘wave trips’, tripping waves before they reach the upper shore reducing their erosional force.

Economic Benefits: Fish Habitat

McDonald Creek Foreshore Enhancement

Opportunities

• Improve McDonald Creek as suitable fish habitat, especially for migrating salmon.
• Stabilise and safeguard the stream channel from erosion, to provide accessible habitat.

2006

Coho salmon, trout and sculpins can be found in McDonald creek, and coho salmon fry releases have been conducted on several occaisions. Beach erosion has made the creek channel shallow and less hospitable for for migratory fishes. During high velocity flows the creek also scours the beach, contributing to further erosion.

Achievements

• Use of large boulders to guide and protect the stream channel, preventing erosion.
• Improvement of channel complexity and provision of more diverse habitat for fishes.

2010

The creek was channelled and protected by boulders to create better habitat for fishes, especially migratory salmon. The boulders stabilize sediments along the mid and lower shore, improving the intertidal habitat for algae and invertebrates. A healthy and diverse ecosystem will better support local fisheries.

Navvy Jack Point Foreshore Enhancement

District of West Vancouver

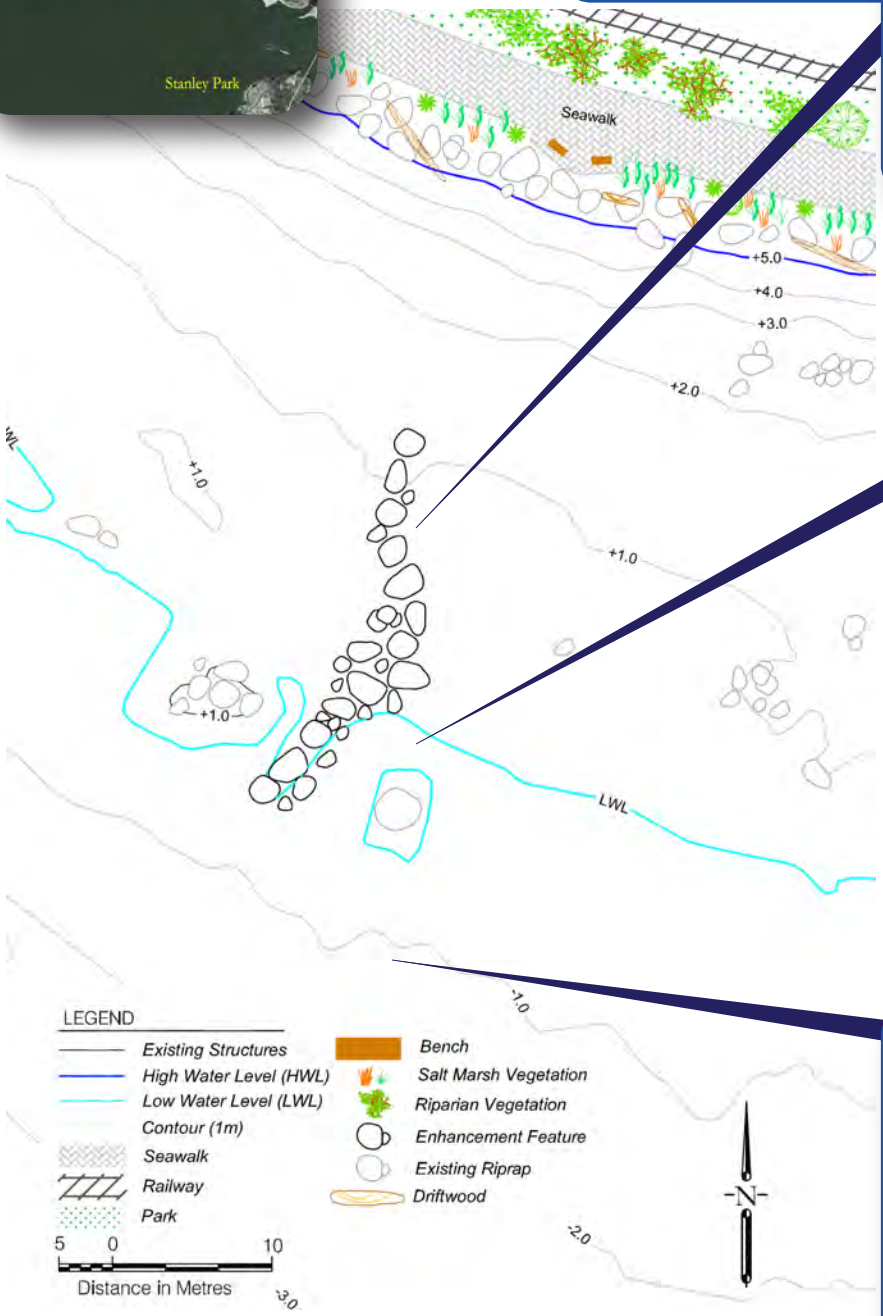
BALANCED ENVIRONMENTAL

Summary

The aim of this project was to increase the biodiversity of this area by expanding the available hard substrates for kelp and other algae to colonise, increasing the amount of important fish habitat. The goal was to create features which would blend into the existing shoreline. A drift sill was constructed to help retain fine materials and stabilize the beach, and to provide wave shelter for eelgrass beds.

Status

Conceived 2006. Major works 2007-2008. Future works are planned. There is ongoing habitat monitoring.



Habitat Development

•Habitat Boulders

Shoreline Protection

•Sediment Transport

•Wave Trips

Economic Benefits

•Fish Habitat

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Shoreline Protection: Sediment Transport

Navvy Jack Point Foreshore Enhancement

Opportunities

• Promote the growth of eelgrass beds by preventing the erosion of fine sediments.
• Encourage natural deposition of sediments, replenishing the lower shoreline.

2006

Eelgrass is an important and productive habitat that needs a fine sandy seabed in order to set root and grow. Fine sediments are easily eroded if they are not sheltered from waves and strong currents. Strategically placed boulders can be used to guide and trap near-shore sediments along the shore.

Achievements

• A strip of boulders running down the shore create a 'drift sill' to guide and trap sediments.
• Sediments are retained and stabilized on the lower shore to protect eelgrass beds.

2010

A strip of boulders perpendicular to the shore creates a 'drift sill' that traps and stabilizes sediments at Navvy Jack Point, helping to stabilize beaches further along the shore. By directing and trapping sediments in this way we can protect and expand important eelgrass beds along the lower shore, providing breeding, shelter and feeding grounds for many species including salmon, herring and clams.

Shoreline Protection: Wave Trips

Navvy Jack Point Foreshore Enhancement

BALANCED ENVIRONMENTAL

Opportunities

2006

- Prevent erosion and storm damage by reducing the power of waves further from shore.
- Implement natural and ecologically sound sea defences that have long-term benefit.

The Seawalk had previously sustained considerable damage in this area from waves and debris overtopping the sea wall during storms. The subtidal marine environment at Navvy Jack Point is also at risk of damage by waves. Erosion of the sandy seabed results in a loss of habitat and damage to the eelgrass beds.

Achievements

2010

- Boulders positioned along the lower shore trigger waves and diffuse their energy.
- Wave trips provide shelter and protection the Seawalk as well intertidal and subtidal habitat.

Wave trips positioned along lower shore and subtidal zone trigger waves to break and diffuse their energy before they reach the upper shore or the Seawalk, preventing damage, erosion and overtopping. Submerged wave trips and habitat boulders also provide shelter for eelgrass beds protecting the fine sediments from erosion and damage by waves.

Habitat Development: Habitat Boulders

Navvy Jack Point Foreshore Enhancement

Opportunities

2006

- Encourage the expansion and growth of existing kelp and eel grass beds.
- Increase the biological productivity and diversity of the area.

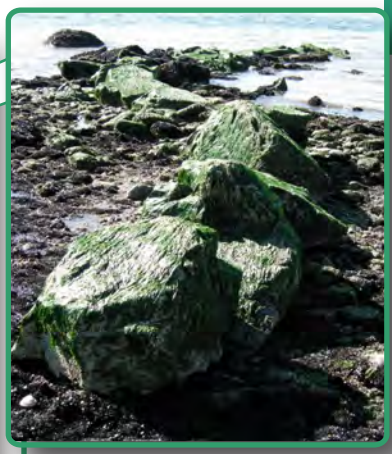
Navvy Jack Point is a productive area, with existing kelp and eelgrass beds that support great bio-diversity.

Habitat boulders allowing the existing kelp beds and intertidal communities to expand, increasing the productivity of the site. It was the goal of the project to create habitat features that would blend into the existing seabed and shoreline.

Achievements

2010

- Habitat boulders were positioned along the shoreline to provide attachment opportunities and habitat for a range of marine plants and animals.



Habitat boulders were positioned at various depths along the lower shore, to create suitable habitat for kelp, broad-leaf algaes and a range of invertebrates and fishes. Kelp beds are highly productive, providing shelter, breeding and feeding grounds for many marine species. Kelp needs hard rock, which it anchors itself to using root-like holdfasts.

Economic Benefits: Fish Habitat

Navvy Jack Point Foreshore Enhancement

Opportunities

• Increase the productive capacity of Navvy Jack Point by increasing available habitat.
• Encourage development of important fish habitat such as kelp forests and eelgrass meadows.

2006

Navvy Jack Point already provided high value fish habitat, the goal of this project was to enhance and protect the existing high value habitat. Subtidal habitat boulders create more substrate on which kelp can settle and grow, allowing the exisitng kelp beds to expand. The boulders also protect eelgrass beds and sandy areas from wave erosion.

Achievements

• Expansion and protection of important habitat for kelp, broad-leaf algae and eelgrass.
• Creation of important habitat features which blend into the existing seabed and shoreline.

2010

By protecting a range of habitats, from rocky kelp beds to sandy bottoms for clams (above) and eelgrass, a diverse and productive ecosystem is preserved, benefitting many species. In particular, kelp and eelgrass beds are very important habitat for fishes; they are herring spawning grounds, salmon nurseries, and home to many other key species such as rockfish and lingcod.

Ferndale Avenue Foreshore Enhancement

District of West Vancouver

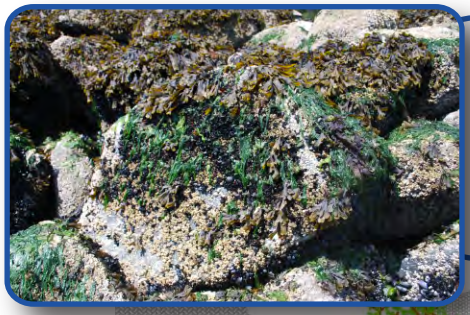
BALANCED ENVIRONMENTAL

Summary

The low profile cobble and boulder beach at Ferndale Avenue had historically experienced a high level of erosion. To stop the erosion, trap sediments and protect the upper shoreline, the beach profile was elevated by the creation of a boulder berm. The berm was backfilled with cobble and covered with the existing beach substrate, creating a natural gently sloping upper shore. Wave trips provide further protection from erosion and overtopping of the seawall. Large boulders also provide important colonisation opportunities for algae and invertebrates, improving biodiversity and supporting fish habitat.

Status

Conceived 2008. Major works 2008-2009. There is ongoing habitat monitoring.



Habitat Development

- Habitat Boulders
- Fish Habitat

Economic Benefits

- Beach Stabilization

Public Amenity

- Public Access

Shoreline Protection

- Shoreline Roughening
- Wave Trips
- Sediment Transportation

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Shoreline Protection: Sediment Transport

Ferndale Avenue Foreshore Enhancement

Opportunities

• Prevent loss of fine and unstable sediments from the upper shore.
• Trap sediments on the upper shore to rebuild the beach with long term effect.

2008

Fine sediments are vulnerable to erosion as they are easily carried off the beach by waves and currents. A low profile beach presents little resistance to waves and is susceptible to erosion. By ensuring that fine sediments are trapped on the upper shore the beach can be rebuilt and maintained using natural coastal processes such as longshore drift.

Achievements

• Strategically positioned boulders guide and trap sediments on the upper shore.
• Elevating the upper shore and raising the beach profile reduces erosion, protecting sediments.

2010

Large boulders guide and trap fine sediments as they are carried along the beach by longshore drift. By elevating the upper shore and raising the beach profile, erosion is prevented and the newly trapped sediments are protected. As they work with natural coastal processes, these methods can provide a long term solution to erosion and help build and maintain a natural upper shore for years to come.

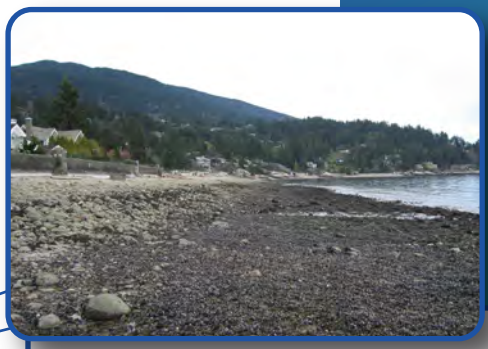
Shoreline Protection: Shoreline Roughening

Ferndale Avenue Foreshore Enhancement

Opportunities

2008

- Reduce coastal erosion and storm damage by restoring the shoreline to a more natural state.
- Implement sea defence measures on the lower shore to protect and support the seawall.



Low profile beaches, which have already been heavily eroded, offer little resistance to waves travelling inshore. Hard-faced concrete sea walls reflect waves instead of diffusing them, increasing wave erosion. By returning the shoreline to a more natural state developments are better protected and erosion is more effectively reduced.

Achievements

2010

- Use of boulders to create a natural, irregular shoreline and diffuse waves on the lower shore.
- Elevation of the upper shore to provide more resistance to waves.

Large boulder riprap was used to construct a berm along the mid-intertidal zone to roughening the lower shore and disrupt waves before they reached the upper shore. The berm was then backfilled with natural and reclaimed materials raising the upper shore and creating a gentle gradient, increasing the resistance to waves travelling up the beach.

Shoreline Protection: Wave Trips

Ferndale Avenue Foreshore Enhancement

Opportunities

2008

- Prevent erosion by reducing the power of waves reaching the upper shore.
- Create more effective wave protection on the lower and upper shoreline.

Waves that strike the hard-faced sea wall are reflected back down the beach gathering momentum with gravity and carrying away fine sediments to deeper waters. A natural irregular and rocky shore line disrupts waves on the lower shore, preventing waves from heavily impacting the upper shore and the overtopping the sea wall.

Achievements

2010

- Large boulders along the edge of the berm disrupt wave energy on the lower shore.
- Positioning of large boulders in front of the sea wall provide extra wave defenses.

A row of large boulders along the lower edge of the berm act as wave trips, disrupting wave energy before they reach the upper shore. The elevated and sloping upper shore provides greater resistence to waves and a second line of wave protection in front of the sea wall on the upper shore, provide extra reinforcement during high water and extreme weather events.

Habitat Development: Fish Habitat

Ferndale Avenue Foreshore Enhancement

Opportunities

2008

- Increase the diversity of intertidal zone substrate and create valuable coastal fish habitat.
- Stabilize the upper shoreline to protect and create a suitable habitat for riparian vegetation.

Both the upper and lower shore are important as 'fish habitat'. The lower shore provides physical habitat for fishes and the riparian habitat on the upper shoreline protects the lower shore from terrestrial pollution and contributes insect and plant material to the shoreline which are important food sources for many young fish.

Achievements

2010

- Improvement of intertidal fish habitat and biodiversity supports healthy fisheries.
- Rebuilding the upper shore allows the regrowth of riparian vegetation critical to fish habitat.

Large boulders used to stabilize sediments also function as fish habitat by providing space for algae and invertebrates to colonize, creating shelter and feeding grounds for fish. Rebuilding the upper shore encourages the re-growth of the riparian zone and expansion of the existing dune grass patches.

Habitat Development: Habitat Boulders

Ferndale Avenue Foreshore Enhancement

Opportunities

- Improve the existing intertidal habitat by stabilizing beach sediments.
- Increase biological value by creating new habitats and colonisation opportunities.

2008

The existing cobble beach was home to typical barnacle, mussel and rockweed communities wherever the intertidal substrate was suitable. Similarly, kelp was found along the lower shore wherever suitably large and stable boulders were located, creating pockets of valuable fish habitat.

Achievements

- Large boulders positioned along the shore for wave protection and to elevate the beach also provide valuable habitat opportunities for marine animals and plants.

2010

Large boulders along the intertidal zone provide stable attachment points and shelter for a range of algae and invertebrates such as limpets, isopods and shore crabs. The large boulders positioned subtidally will provide new colonisation opportunities for kelp, allowing the existing patches of kelp to expand, providing more valuable fish habitat. Kelp forests are important breeding and feeding grounds for many species of fish and invertebrates.

Public Amenity: Public Access

Ferndale Avenue Foreshore Enhancement

Opportunities

- Improve physical access along the beach for greater public accessibility.
- Increase the value of the beach as a public amenity by improving the upper shore.

2008

Heavily eroded beaches can be physically challenging to navigate, reducing public accessibility and functionality. By stabilizing and trapping fine sediments on the upper shore, the beach can be made more easily accessible while restoring natural habitats such as riparian vegetation.

Achievements

- Trapping fine sediments on the upper shore improves aesthetic value and accessibility.
- Elevating the upper shore prevents debris from blocking the back of the beach.

2010

Large boulders, recycled woody debris and native materials were used to elevate the upper shore and stabilize fine sediments, improving public access along the back of the beach. The collection of fine sediments on the upper shore will create a more desirable public amenity. As a young project, the enhancements at Ferndale are just taking shape and the site is regularly surveyed to monitor changes.

Economic Benefits: Beach Stabilization

Ferndale Avenue Foreshore Enhancement

Opportunities

- Reduce beach erosion and the associated costs of infrastructure and habitat repair.
- Prevent the need for artificial beach nourishment by supporting natural coastal processes.

2008

Beach erosion can affect extended stretches of coastline; erosion in one area can lead to further erosion or infilling further down the coast.

Finding a solution to erosion at Ferndale that will help to reinstate natural coastal processes will safeguard a much larger area of the West Vancouver shoreline.

Achievements

- Creation of a berm and elevation of the upper shore to trap fine sediments.
- Restoration of a self-sustaining and naturally protective shoreline.

2010

Construction of a buried berm and elevation of the upper shore, using recycled and native beach materials, help to trap and stabilize fine sediments.

Creating a natural sloping shoreline that works with natural coastal processes provides a long term and sustainable solution to beach erosion with environmental benefits.

Seaside Place Foreshore Enhancement

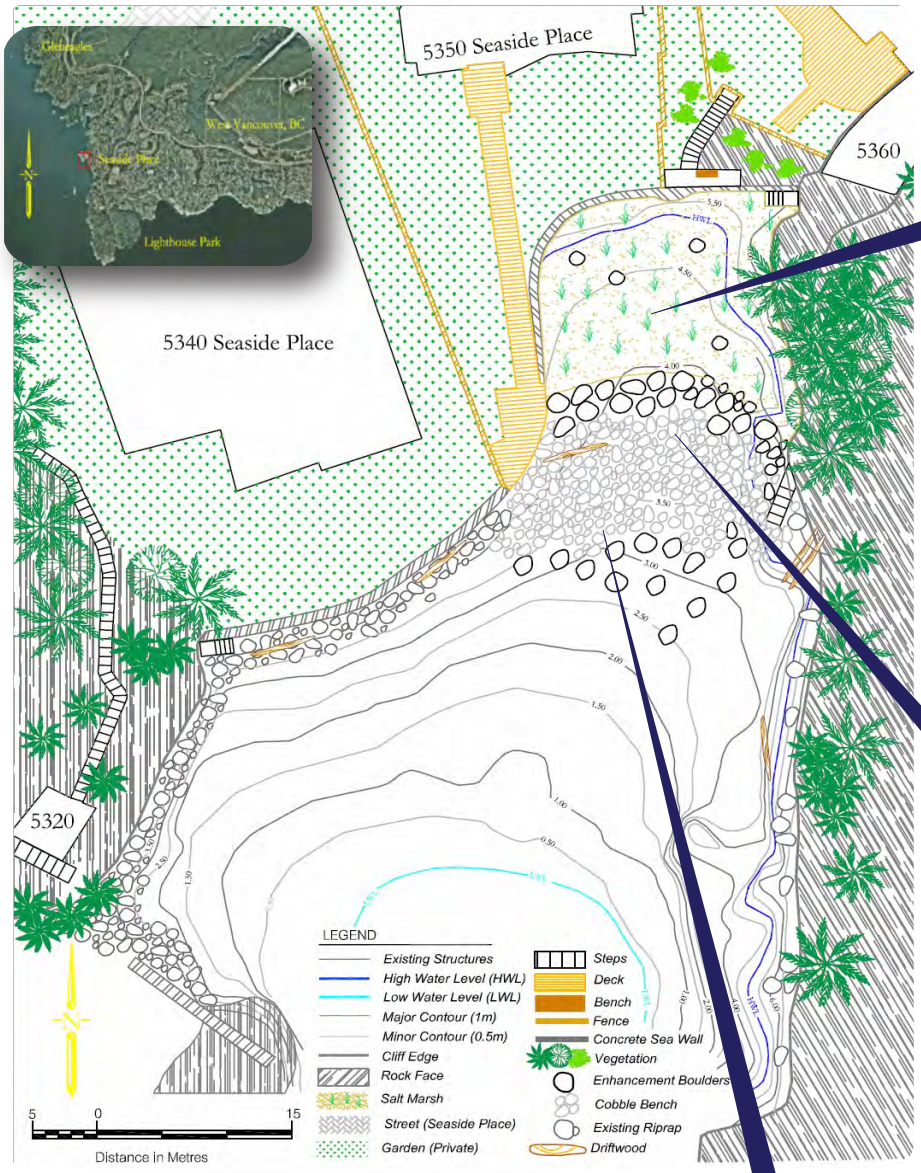
District of West Vancouver

Summary

The beach at Seaside Place has historically been filled with logs and debris. The debris was cleared, and by elevating the beach profile a natural salt marsh was recreated to improve the ecological and aesthetic value. Riprap drift sills were constructed to protect the habitat features during the first storm season then dismantled and redistributed to elevate the mid and lower shore, provide protection from wave erosion and create valuable intertidal habitat for marine life.

Status

Conceived 2009. Major works 2010. Second phase 2011. There is ongoing monitoring of this project.



Habitat Development

- Salt Marsh
- Habitat Boulders
- Woody Debris

Shoreline Protection

- Wave Trips
- Habitat Stabilization

Economic Benefits

- Beach Stabilization
- Enhanced Fish Habitat

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Shoreline Protection: Habitat Stabilization

Seaside Place Foreshore Enhancement

Opportunities

2009

- Protect the upper shore and salt marsh from erosion and stabilize fine sediments.
- Use natural coastal processes to provide a long term solution to erosion.

As waves and currents sweep the beach fine sediments are washed away leaving only larger and heavier substrate. This process is amplified on low profile shorelines and by urban developments. The fine sediments covering the enhanced upper shore salt marsh at Seaside Place would be at great risk from wave erosion if unprotected.

Achievements

2011

- The upper shore was elevated and a salt marsh was created to stabilize fine sediments.
- Riprap drift sills protected the salt marsh from erosion during the first winter storms.
- Drift sills were dismantled in spring and used to raise the mid and lower shore profile.

Riprap drift sills were installed along the mid and lower shore to protect the salt marsh through its first winter storms. The following spring the drift sills were dismantled and the rip rap was spread along the mid shore and covered with cobble to raise the profile of the beach, improving the natural wave resistence. Large riprap wave trips provide further protection and intertidal habitat.

Shoreline Protection: Wave Trips

Seaside Place Foreshore Enhancement

Opportunities

• Protect the upper shoreline salt marsh and neighbouring properties from wave erosion.
• Implement natural sea defences that will have long term benefit.

2009

The low profile beach at Seaside Place had historically suffered considerable erosion. There were no fine sediments remaining on the upper shore, which had become jammed with flotsam and debris. Implementing wave defenses on the lower shore would improve protection for the upper shore, prevent overtopping of the sea wall and erosion.

Achievements

• Boulders placed along the lower shore 'trip' waves and diffuse their energy.
• These 'wave trips' work like a natural rocky shore to provide long-term protection.

2011

Strategically placed boulders on the lower shore 'trip' incoming waves, causing them to break and lose energy before they reach the upper shore. By doing this they protect the upper shore and upland from damage and erosion by waves and debris. Wave trips provide long term protection and are ecologically sound as they provide habitat for algae and invertebrates.

Habitat Development: Habitat Boulders

Seaside Place Foreshore Enhancement

Opportunities

2009

- Improve the intertidal habitat by creating attachment sites for plants and animals.
- Create coastal defense structures that improve fish habitat and increase biodiversity.

The inter-tidal bedrock bears a variety of algae and sessile marine life such as mussels barnacles and rock-weed. However, the smaller cobbles in the lower intertidal zone were too unstable for most algae and invertebrates to colonize. Large boulders stabilize the surrounding sediments, improving their value as habitat and create additional habitat.

Achievements

2011

- Large boulders used to create wave trips and sediment traps provide attachment points for plants and animals, and create suitable and diverse habitat for coastal fishes.

By using large boulders and riprap to create wave trips and stabilize the lower shore the amount of habitat available for colonization by algae and invertebrates is increased. Gaps and crevices between the boulders provide important habitat for fishes such as and motile marine life such as lingcod, crabs, shrimps and seastars, creating a diverse and highly productive intertidal ecosystem.

Habitat Development: Salt Marsh

Seaside Place Foreshore Enhancement

Opportunities

- Improve the ecological and aesthetic value of the site by recreating natural habitat.
- Create a naturally self-sustaining shoreline that benefits both terrestrial and marine habitats.

2009

Salt marshes are important as a protective buffer between the sea and land. They provide important habitat for many birds and insects, trap terrestrial pollutants and stabilise sediments. They also help cycle nutrients into the inter-tidal zone; the diverse insect life they support is an important food source for many fishes, especially juveniles.

Achievements

- Recreation of a natural salt marsh habitat to support terrestrial and marine ecosystems.
- Development of a naturally self-sustaining shoreline with improved aesthetic value.

2011

The excess debris was used to increase the elevation of the upper beach, covered with fine sediments and planted with dune grass. After the habitat had matured for a year, additional salt marsh species were planted such as nootka rose and ocean spray, to attract birds and insects. A mature salt marsh is a productive and important habitat, preventing beach erosion and supporting marine and terrestrial ecosystems.

Habitat Development: Woody Debris

Seaside Place Foreshore Enhancement

Opportunities

- Improve the biodiversity and ecological quality of the habitat by introducing nourishment and resources for existing species and allowing new species to colonise naturally.

2009

Formerly, large woody debris was stranded on the beach in such large quantities that it choked the upper beach. Much of this debris was removed to provide space on the upper beach for the creation of a salt marsh and riparian zone. Some of the reclaimed woody debris was reclaimed and strategically placed as part of the upper shore habitat enhancement.

Achievements

- Recycling of appropriate amounts of woody debris to improve salt marsh and riparian habitat.
- Allowing limited recruitment of debris to permit new species to colonise the habitat naturally.

2010

Woody debris is an important feature of a healthy North Pacific shoreline; providing habitat and resources for existing species and allowing colonisation by insects and plants, which necessary for the development of a healthy salt marsh or riparian zone. Allowing access to the shore for a limited amount of debris helps to ensure the health and biodiversity of the enhanced habitat.

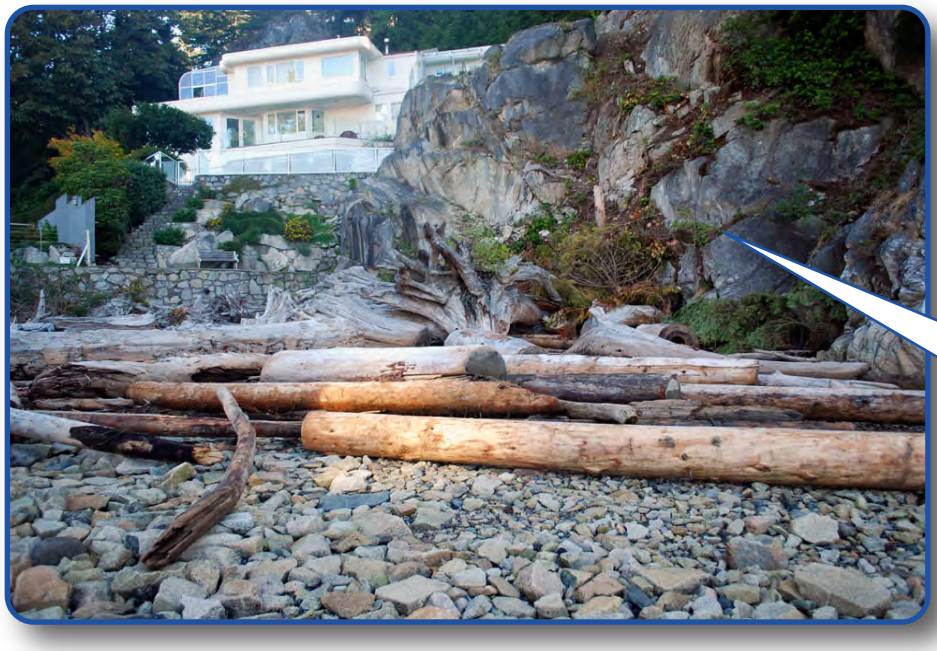
Economic Benefits: Beach Stabilization

Seaside Place Foreshore Enhancement

Opportunities

- Restore the upper shore to a more natural state, trapping and stabilising fine sediments.
- Create a self-sustaining shoreline to prevent erosion and habitat degradation.

2009



The existing conditions at Seaside Place amplified wave erosion, resulting in a loss of natural coastal habitat. Fine sediments had been swept off the upper shore, which was jammed with flotsam and debris carried in by waves, leaving little room for salt marsh or riparian habitats.

Achievements

- Restoration of the upper shore including the creation of a natural salt marsh.
- Elevation of the beach profile and creation of a naturally sloping cobble and boulder shoreline.

2011

The upper shore was elevated using large woody debris, covered with fine sediments and planted with dune grass to create a natural salt marsh. The complex root system of dune grass helps to stabilise fine sediments. The profile of the midshore was raised using riprap and cobble to create a naturally sloping shoreline which will provide more resistance to waves and protect the upper shore and salt marsh habitat.

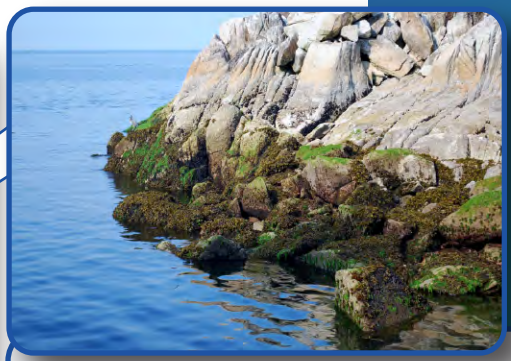
Economic Benefits: Fish Habitat

Seaside Place Foreshore Enhancement

Opportunities

2009

- Re-establish the intertidal zone and foreshore as effective fish habitat; every bit counts.
- Improvement of intertidal biodiversity and upper shore habitat as valuable fisheries resources.



The different component habitats of the coastal zone all work together to sustain a healthy marine ecosystem and support productive fisheries. The loss or degradation of any one component can have far reaching consequences on the marine environment. Inshore coastal habitats are important nursery, breeding and feeding grounds for many species of fishes, including salmon and herring.

Achievements

2011

- Restoration of the upper shore and recreation of natural salt marsh habitat.
- Creation of habitat for algae, marine invertebrates, plants and insects to increase biodiversity.

The restoration of natural habitat features will help to support fish populations in the area. Habitat boulders provide shelter and feeding grounds for many fish, after their first season the boulders are colonized by mussel and barnacle communities. In addition, the new salt marsh habitat will protect coastal waters from terrestrial pollutants and accomodate insect populations, an important food for many young fishes.

Horseshoe Bay Foreshore Enhancement

District of West Vancouver

BALANCED ENVIRONMENTAL

Summary

Propeller wash and waves from the BC Ferries terminal and marina boat traffic were contributing to scour of the adjacent beach and shoreline. To address this issue a riprap deflector wall was constructed alongside the terminal to protect the surrounding shoreline from erosion. The upper shore was elevated using imported sediments; habitat boulders and an intertidal algae bench improved the existing biodiversity along the shoreline and stabilized the upper shore. Boat access to the marina was improved by dredging the fine sediments that had accreted in the bay

Status

Conceived 2008. Major works 2008-2009. There is ongoing habitat monitoring.

Public Amenity

- Environmental Engagement
- Public Access

Habitat Development

- Habitat Boulders
- Fresh Water Culvert
- Subtidal Algae Bench

Economic Benefits

- Shoreline Protection
- Natural Resources

Shoreline Protection

- Wave Protection
- Shoreline Roughening

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IP consulting

WEST VANCOUVER COMMUNITY FOUNDATION

WVSPS

Shoreline Protection: Shoreline Roughening

Horseshoe Bay Foreshore Enhancement

Opportunities

2008

- Replace the low profile beach and supplement existing sea defences with more naturally protective shoreline features.

Waves lose momentum as they 'climb' a naturally sloping shoreline. The low profile beach at Horseshoe Bay offered little resistance to waves and was subject to significant erosion. By returning the shoreline to a more natural state, developments are better protected and beach erosion is reduced with long term benefit.

Achievements

2010

- Re-creation of a more natural and defensive shoreline, that works with coastal processes to achieve long term protective benefits and improved ecological value.

A cobble and boulder bench was built along the lower shore to protect the beach by tripping waves and dispersing their energy. A series of crescent shaped cobble and boulder berms elevate and stabilise the upper shore, which was thickened with fine sediments. By increasing the gradient and roughening the lower shore, the beach was returned to a natural state to protect and replenish the shoreline.

Shoreline Protection: Wave Defences

Horseshoe Bay Foreshore Enhancement

Opportunities

2008

- To support the existing wave defences, making them more effective and ecologically beneficial.

The shoreline at Horseshoe Bay experienced erosion caused by propeller wash and wave erosion from boat and ferry traffic. Enhancements to the existing wave deflector were designed to work with natural processes to diminish wave energy, provide long term shoreline protection, and create habitat enhancement features.

Achievements

2010

- A subtidal riprap berm effectively disrupts wave energy, reducing wave erosion along the shore, while providing suitable habitat for marine plants and animals.

Construction of a rock berm at the shoreward end of the wave deflector improves shoreline protection by disrupting wave energy. The rock berm acts like a natural reef, protecting the shore from erosive waves and propeller wash while providing habitat for algae, invertebrates and fish. The reef will become more effective wave protection as kelp and broad-leaf algae grow.

Habitat Development: Freshwater Culvert

Horseshoe Bay Foreshore Enhancement

Opportunities

- Channel the existing stormwater culvert along the shoreline creating resources for wildlife and improving the productive capacity of the beach while preventing erosion.

2008

Fresh water sources along the shore carry fine sediments for beach replenishment, nourishment for algae and animals, and are an important source of water for many species of coastal birds. The existing culvert had scoured the beach during high volume flows, reducing suitable habitat for marine species and contributing to beach erosion.

Achievements

- Large boulders were used to channel and slow the freshwater flow, providing habitat for species which benefit from fresh water and preventing further erosion.

2010

Large boulders lining the culvert direct the flow, reducing the speed and erosive force of the stream during high flow events. The resulting channel can be used by various species of birds for preening and drinking. Habitat boulders at the end of the channel disseminate fresh water across the lower shore and provide valuable habitat for algae and invertebrates such as mussels which benefit from access to fresh water.

Habitat Development: Habitat Boulders

Horseshoe Bay Foreshore Enhancement

Opportunities

- Increase suitable habitat for algae, marine invertebrates and fishes.
- Improve the biological productive capacity of the site.

2008

Erosion of the shoreline had destabilized existing substrates, leaving limited opportunities for colonization by algae and invertebrates. Providing better protection from waves and more stable substrate would increase intertidal biodiversity throughout the site.

Achievements

- Creation of a cobble bench and strategically placed habitat boulders provide attachment opportunities for algae and invertebrates while stabilizing existing sediments.

2010

An intertidal cobble and boulder habitat bench was created along the shore to provide more stable substrate for algae and invertebrates such as rockweed, mussels and barnacles. The habitat bench also stabilises fine sediments along the subtidal shoreline, improving the habitat available for eelgrass, bottom-dwelling animals and fish.

Habitat Development: Algae Habitat Bench

Horseshoe Bay Foreshore Enhancement

Opportunities

2008

- Improve wave defence features to provide suitable habitat for algae and invertebrates.
- Creation of subtidal habitat for broad-leafed algae and fish.

The existing hard-faced wave defense measures were not suitable for colonization by most algae and invertebrates. The riprap berm, built to reduce wave impacts and effects of prop-wash on the site, provided an opportunity to create subtidal and intertidal habitat for algae, invertebrates and fishes

Achievements

2010

- The riprap berm was extended inshore to provide ideal conditions for kelp.
- Creation of a subtidal kelp reef as high-value fish habitat.

The riprap berm wave protection was extended to create an algae bench. The large boulders provided a stable attachment point for broad-leafed algae, such as kelp. Gaps between the boulders and the algae itself create shelter, feeding and spawning grounds for many invertebrates and fishes. Kelp beds are key features of a healthy marine ecosystem and support productive fisheries.

Public Amenity: Environmental Engagement

Horseshoe Bay Foreshore Enhancement

Opportunities

2008

- Enhancement of the natural environment and shoreline to provide points of interest, engaging the public with the marine and coastal environment.

Horseshoe Bay is popular with tourists and residents alike, with a busy ferry terminal and marina, eco-tourism businesses, waterfront cafes and restaurants. Improvements to the shoreline, enhancing the ecological and aesthetic value of the site would encourage visitors to the shoreline to actively engage with the local environment.

Achievements

2010

- Creation of accessible natural habitat features improves biodiversity and aesthetic value of the site, encouraging public interest.

Habitat features such as the subtidal reef and the intertidal habitat berm increase biodiversity and create easily accessible points of interest to actively engage the public with the environment. The enhancement features have also increased the productive capacity of the local environment and provide valuable habitat for marine wildlife, such as this lesser yellowlegs (above), allowing the public to view and enjoy native species.

Public Amenity: Public Access

Horseshoe Bay Foreshore Enhancement

Opportunities

- Improve the beach as a public amenity by creating usable space and public facilities.
- Restore safe boating access to the marina and floats.

2008

The marina and beach at Horseshoe Bay are popular recreational sites. Erosion had affected the beach, and the accretion of eroded sediments in the marina threatened to impinge access for boat users. Returning the beach to a natural state would increase the usable space along the upper shore and dredging infill would improve the safety of the site for boat users.

Achievements

- Removal of accreted sediment to improve float access for boat users.
- Improvement of the beach by rebuilding the upper shore and creation of kayak access.

2010

The subtidal accretion of sediments, scoured from the beach and ferry terminal posed an inconvenience and safety issue for recreational boat users. Waterways were dredged to a safe depth and the improved wave protection will help prevent this problem in the future. The upper shore was elevated with fine sediments and the creation of a kayak access point also improves the value of the site as a public amenity.

Economic Benefits: Natural Resources

Horseshoe Bay Foreshore Enhancement

Opportunities

- Restore, protect and enhance natural resources across the site.
- Promote sustainable use and development of the site with minimal environmental impacts.

2008

Horseshoe Bay is a popular with vistors and residents because of its natural resources; a sandy beach, sheltered cove, boat access to Howe Sound, and local flora and fauna. Taking measures to restore, protect and enhance the natural features and habitats of Horseshoe Bay safeguards these natural resources and ensures sustainable use of the site for many years to come.

Achievements

- Enhancement of habitat features increases biodiversity and supports healthy fisheries.
- Restoration and protection of a natural shoreline improves its value as a public amenity.

2010

Safeguarding natural resources is key to ensuring the sustainable use of the site. The subtidal reefs and intertidal berms help to create a self-sustaining shoreline which is naturally protective, while improving the biological environment by providing suitable habitat for algae, invertebrates, fishes, marine mammals and birds. Improving the productive capacity of the site helps to support healthy fisheries, a healthy environment and growing numbers of visitors.