

APPENDIX E
DWV GIS Project Profiles

Summary

Ambleside Beach is a popular recreational beach which has historically experienced considerable erosion resulting in the construction of two large rock groynes. The main purposes of the shoreline preservation works were to create a more stable toe at Ambleside to prevent erosion and to create valuable habitat for kelp, algae, invertebrates and fishes.

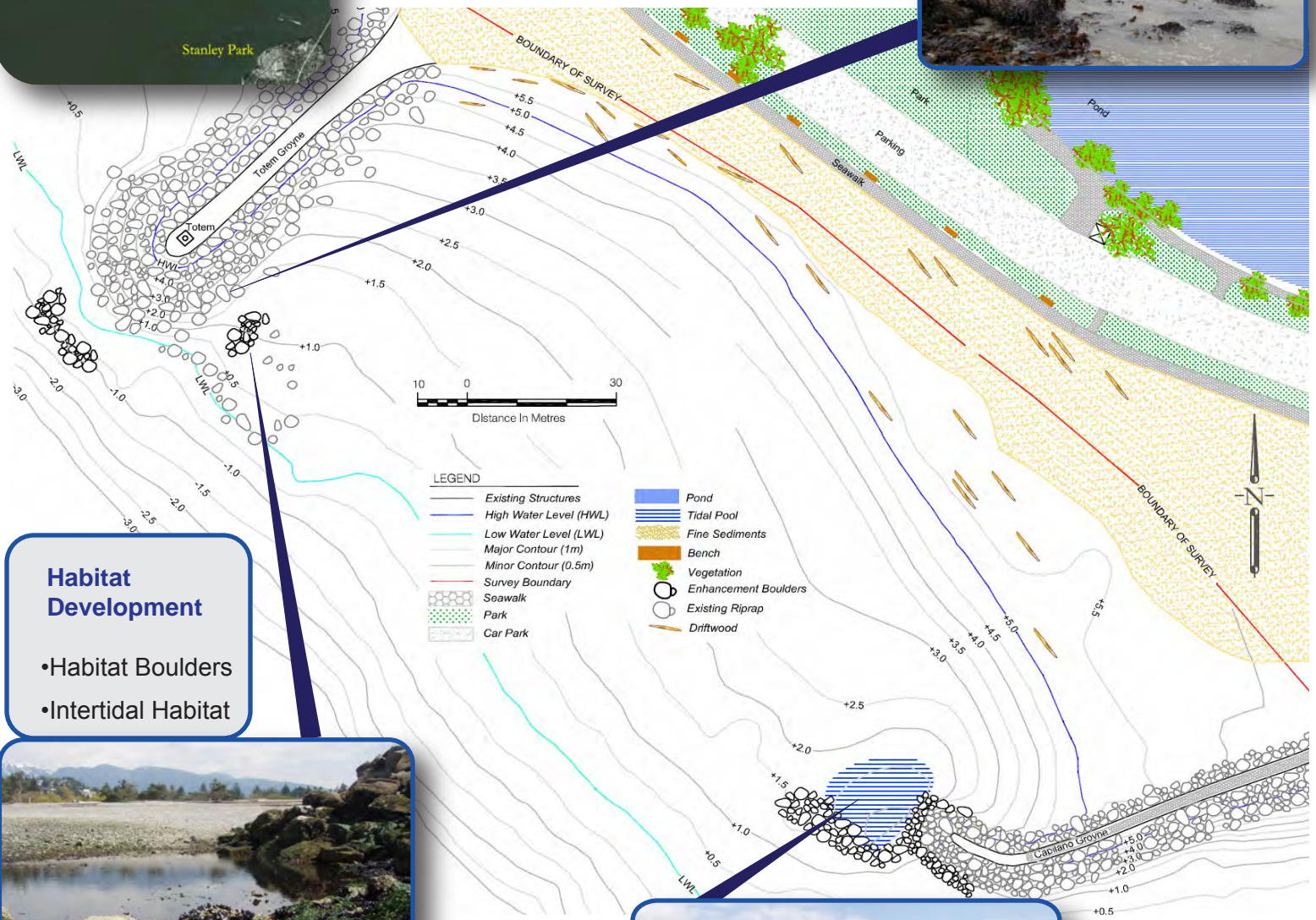
Status

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



Economic Benefits

- Natural Resources



Habitat Development

- Habitat Boulders
- Intertidal Habitat

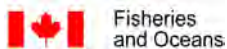


Shoreline Protection

- Sediment Transport



West Vancouver would like to thank the following organizations for their support:



Opportunities

- Improve biodiversity by creating new habitat and colonisation opportunities.
- Create lower shore habitats that also provide wave protection for the upper shore

2006



Kelp and broad-leaf algae had colonised the available large, stable substrate along the lower intertidal and subtidal zone. Kelp and broad-leaf algae beds provide important habitat for many marine species, including salmon, lingcod and rockfish, but they require stable substrate upon which they can settle and grow.

Achievements

- Excess rock from the top of the groyne was removed and repositioned along the lower shore and subtidal zone to create habitat for kelp, algae, invertebrates and fish.

2010



Rock was taken from the groyne where it was too high for marine species and used to create valuable intertidal and subtidal habitat for marine flora and fauna.



The boulders extended the toe of the groyne below the low water mark, creating stable substrate for kelp and broad-leaf algae to colonise, allowing the existing kelp beds to expand.

Opportunities

- Improve the habitat for more marine species by creating high value habitat features.
- Increasing the productive capacity of the site.

2006



Stable substrate across lower intertidal zone provided habitat for broad-leaved algae. By diversifying the mainly cobble beach along the lower shore, new habitat features and ecosystems could be created to accommodate more species and improve the productive capacity of the site.

Achievements

- Bare rock from the upper groyne was used to construct an intertidal reef along the lower shore containing a tidal pool, creating highly productive habitat.

2010



Large boulders from the top of the groyne were used to create a tidal pool and kelp habitat. Tidal pools are highly productive ecosystems within the coastal environment, providing habitat for various algae, small fishes, and invertebrates. These habitat features increase the productive capacity of the Ambleside shoreline, providing shelter and food for large fishes and birds.

Opportunities

- To create a naturally sustainable shoreline and public resource.
- To improve the productive capacity of the shoreline and create fish habitat.

2006



In 1965 due to concerns about erosion, sediments were dredged from the Capilano River and used to replenish Ambleside beach. Artificial beach nourishment is a temporary solution, however restoring the shore line to a more natural state would create a self-sustaining shoreline and improve the existing fish habitat.

Achievements

- Extending the groynes subtidally improved near-shore sediment transport to trap more fine sediments on the uppershore and created subtidal habitat for kelp and fishes.

2010



Intertidal and subtidal habitat boulders for kelp, algae and invertebrates creates valuable fish

habitat and significantly increase the productive capacity of the shoreline.



Restoring natural habitat features such as reefs and kelp beds also helps to stop erosion, trap nearshore

sediments and stabilise the beach, creating a naturally self-sustaining shore.

Summary

Various projects have been carried out at Ambleside with the aim of increasing public amenities and public access, creating and enhancing valuable natural habitats and preserving the physical coastline. These works have included the repositioning of riprap to prevent erosion of the beach to the west of the pier and to create important habitat for kelp, algae and other marine species; clearing sediment infill to maintain access to the public boat ramps and floats; and creation of a riparian bench to increase biodiversity and aesthetic value, connecting the developed sea front to the foreshore.

Status

Conceived 2006. Major works 2007-2010. There is ongoing habitat monitoring.

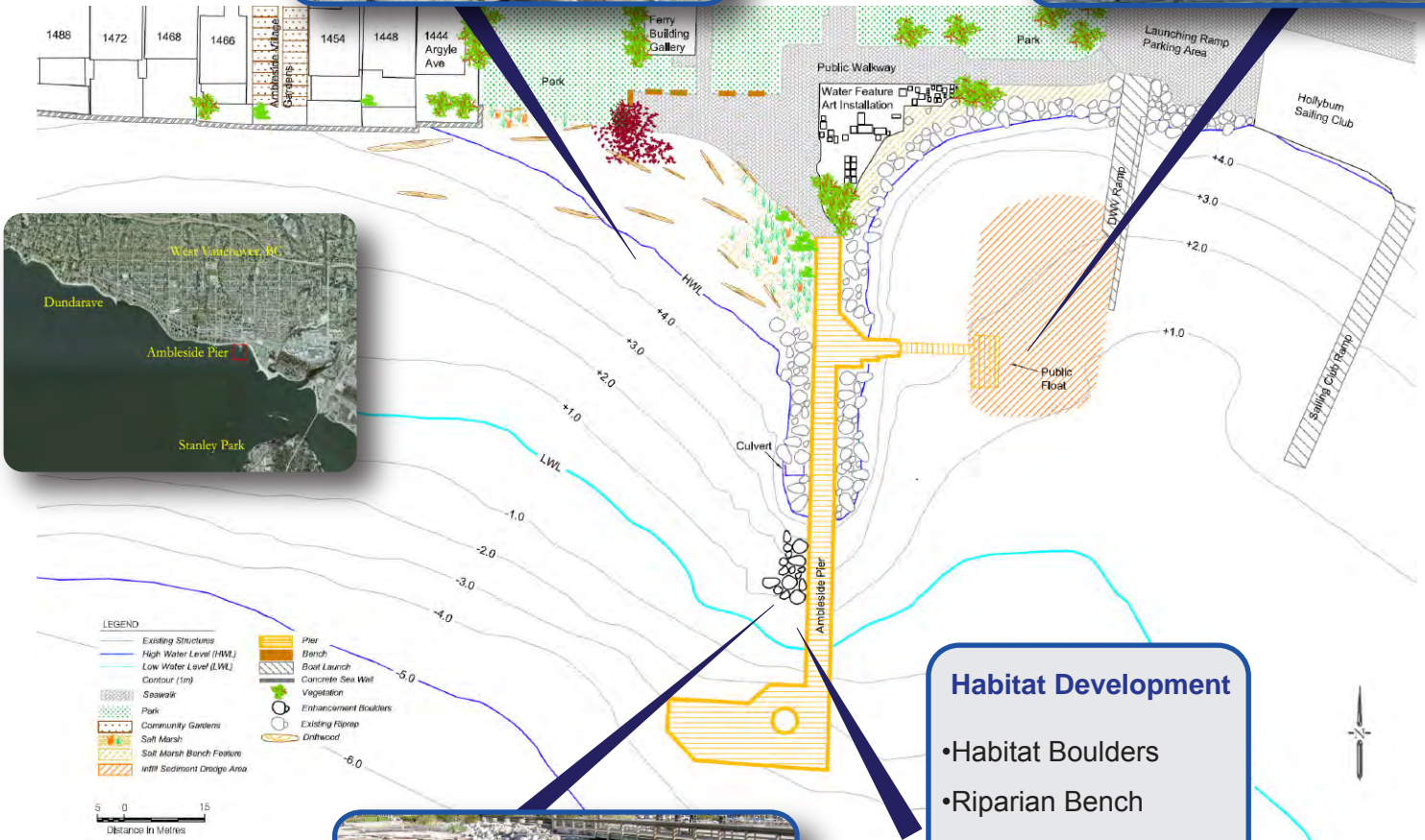
Economic Benefits

- Beach Stabilization



Public Amenities

- Public Access
- Environmental Engagement



Habitat Development

- Habitat Boulders
- Riparian Bench

Shoreline Protection

- Sediment Transportation

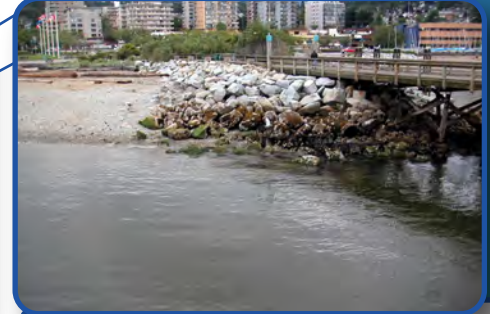


West Vancouver would like to thank the following organizations for their support:

Opportunities

- Create a stable 'toe' to hold fine sediments on the beach to the west.
- Guide and trap sediments on the upper and mid-shore for on-going beach nourishment.

2006

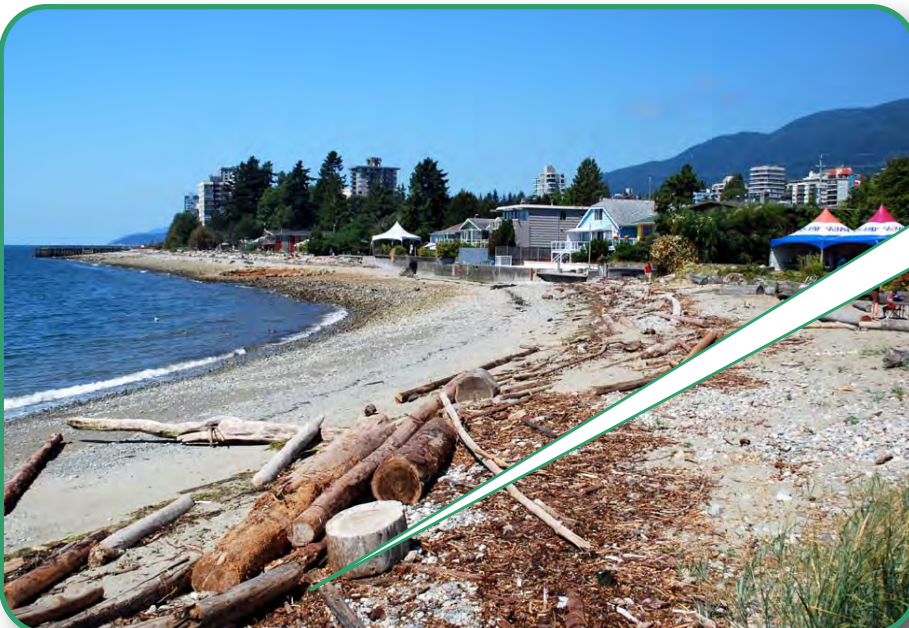


Ambleside has a wide, sloping stretch of sandy beach which is popular with visitors to the Seawalk. Without protection this stretch of beach is vulnerable to erosion by waves and longshore drift (the process by which waves and currents move sediments laterally along a beach), resulting in a heavily eroded beach to the west and infilling of the embayment to the east.

Achievements

- Tuning the existing riprap slope to build more effective drift sills along the lower shore.
- Creating a stable 'toe' at Ambleside Pier interrupts longshore drift and prevents erosion.

2010



Rocks from the top of the riprap slope were reclaimed to create drift sills running along the the lower shore. Drift sills create a stable 'toe' at Ambleside Pier; interrupting longshore drift, disrupting wave energy and stabilizing the sandy beach at Ambleside along the beach stretching westerly to Lawson Pier. By working with natural coastal processes they provide a long term, sustainable solution to erosion.

Opportunities

- Create more intertidal habitat, encouraging existing populations to expand and grow.
- Improve biodiversity by creating new habitats and colonisation opportunities.

2006



The waters along the West Vancouver

shoreline are full of life. Wherever there is suitable habitat and conditions large communities of marine plants and animals, including kelp, algae, invertebrates and fishes thrive. The existing riprap slope stopped above the low water mark where only a few species such as sea lettuce, mussels and barnacles are able to take advantage.

Achievements

- Large boulders from the top of the existing riprap slope were repositioned along the lower shore, creating valuable habitat and attachment sites for a range of species.

2010



The riprap used to create drift sills below the low water mark also doubled as habitat boulders, providing attachment opportunities in deeper water for a wider range of species. The habitat boulders provide space for nearby kelp beds to expand, creating important nursery, breeding and feeding grounds for many species of fish.

Opportunities

- Improvement of the ecological and aesthetic value of Ambleside Pier and Seawalk.
- Re-connection of the Seawalk and developed upper shore with the shoreline.

2006



The riparian zone is an important natural habitat. It is a protective buffer between the shoreline and the land, and as a productive habitat it increases biodiversity at the site and provides nutrients to the foreshore. The existing riparian vegetation was restricted to the west side of the pier (above), to the east the shore was bordered with bare riprap.

Achievements

- Removal of some of the existing riprap east of the pier to create a riparian habitat bench.
- Colonisation of the area by plants and animals will enhance biodiversity and aesthetic value.

2010



The top layer of the easterly riprap slope was removed to create a riparian habitat 'bench' suitable for colonisation by plants such as dune grass, beach pea and Pacific silverweed (pictured above). The riparian zone provides a salt and pollution buffer between the land and the sea, creates habitat for insects and birds, and provides valuable biological material and nutrients to coastal waters.

Opportunities

- Re-connect the Seawalk and foreshore developments with the shoreline
- Recognise and utilize all opportunities to connect the public with the local environment.

2008



Ambleside beach, pier and boat ramp create opportunities for the public to physically engage with the shoreline and natural environment, however this stretch of the Seawalk is developed and has little physical connection to the waterfront.



Achievements

- Creation of a riparian habitat bench between the shoreline and the Seawalk.
- Future plans to improve beach access by creating a trail connecting to the Seawalk.

2010

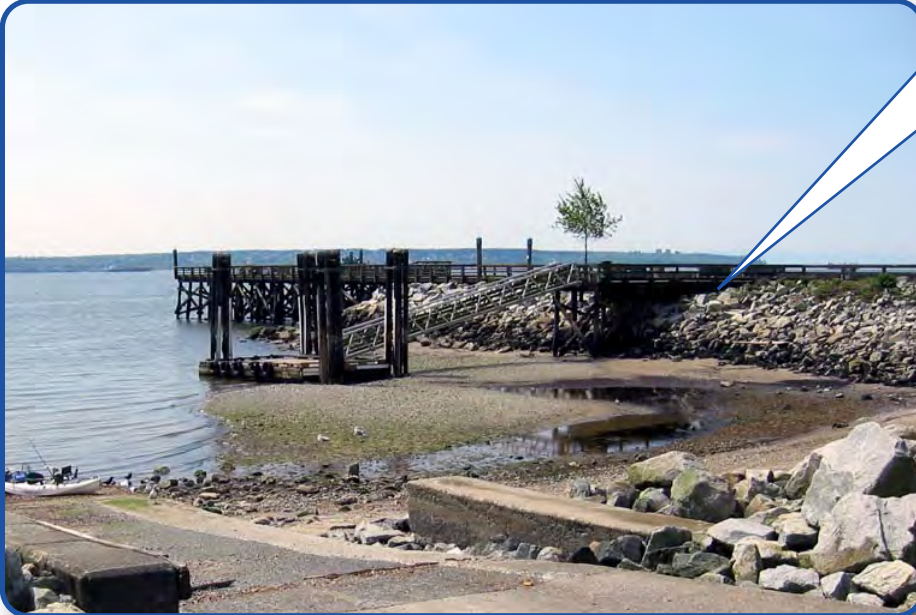


The creation of a riparian habitat bench located by the pier and the water feature provides a visual and physical connection between the Seawalk and the shoreline. Future plans for the site include the construction of a public foot path connecting the pier to Millennium Park, with improved riparian habitat alongside the path and better access to the shoreline.

Opportunities

- Improve public recreation facilities at the site by restoring the float and boat ramp access.
- Create a safe and accessible environment for water users.

2008

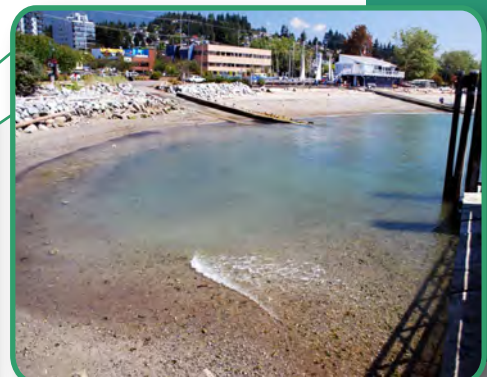


Ambleside Pier is a popular recreation site with public floats and boat launch facilities. Much of the fine sediment that was eroded from the beaches to the west of the pier was deposited in this sheltered cove. As the sediment infill accumulated it reduced the depth of the cove; during low water the boat launch was unusable and the public float was almost entirely stranded.

Achievements

- Sediment infill was excavated to open the area surrounding the public float and boat launch.
- Drift sills located west of the pier will reduce the rate of infill, protecting public leisure facilities.

2010



The area between the boat launch and public float was dredged to remove the sediment infill, allowing boats to be launched and safe water access to the public float at all times. The drift sills created to the west of the pier will reduce the rate of sediment infill in the future, providing ongoing protection for the boat ramp and float.

Opportunities

- Reduce beach erosion and the associated costs of ongoing infrastructure and habitat repair.
- Prevent the need for continuous artificial beach nourishment over an extensive area.

2006



The stretch of shoreline between Lawson Creek and Ambleside has been vulnerable to erosion by storm waves and longshore drift. Fine sediments are swept easterly along the beach by currents and waves, and are deposited in the cove to the east of Ambleside Pier and into deeper waters off-shore.

Achievements

- Reclaimed boulders from the existing riprap slope were re-positioned to create a drift sill to prevent beach erosion along the shoreline.

2010



Boulders taken from the existing riprap slope were repositioned along the lower shore to make drift sills, creating a stable 'toe'. As longshore drift is interrupted, fine sediments are held in place on the shoreline and erosion is reduced. By working with natural processes, drift sills can provide long-term prevention of erosion and are environmentally sound.

Summary

The projects carried out at the 15th Street foreshore area focussed on public access, shoreline protection and habitat development. Tombolas and boulders were positioned east of Lawson pier to trap fine sediments and increase the beach profile. The Seawalk trail was extended to connect Millenium Park and Lawson pier, and riparian fringe habitat was created alongside the trail. The broken concrete culverts at 15th Street were replaced with boulders to create a more natural fresh water 'spring', encouraging the growth of mussel beds along the lower shore and improving aesthetics.

Status

Conceived 2006. Major works 2007-2010. There is ongoing habitat monitoring.

Public Amenities

- Public Access
- Environmental Engagement



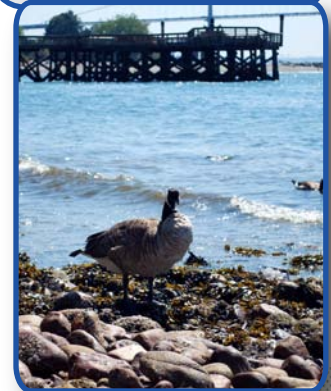
Economic Benefits

- Beach Stabilization



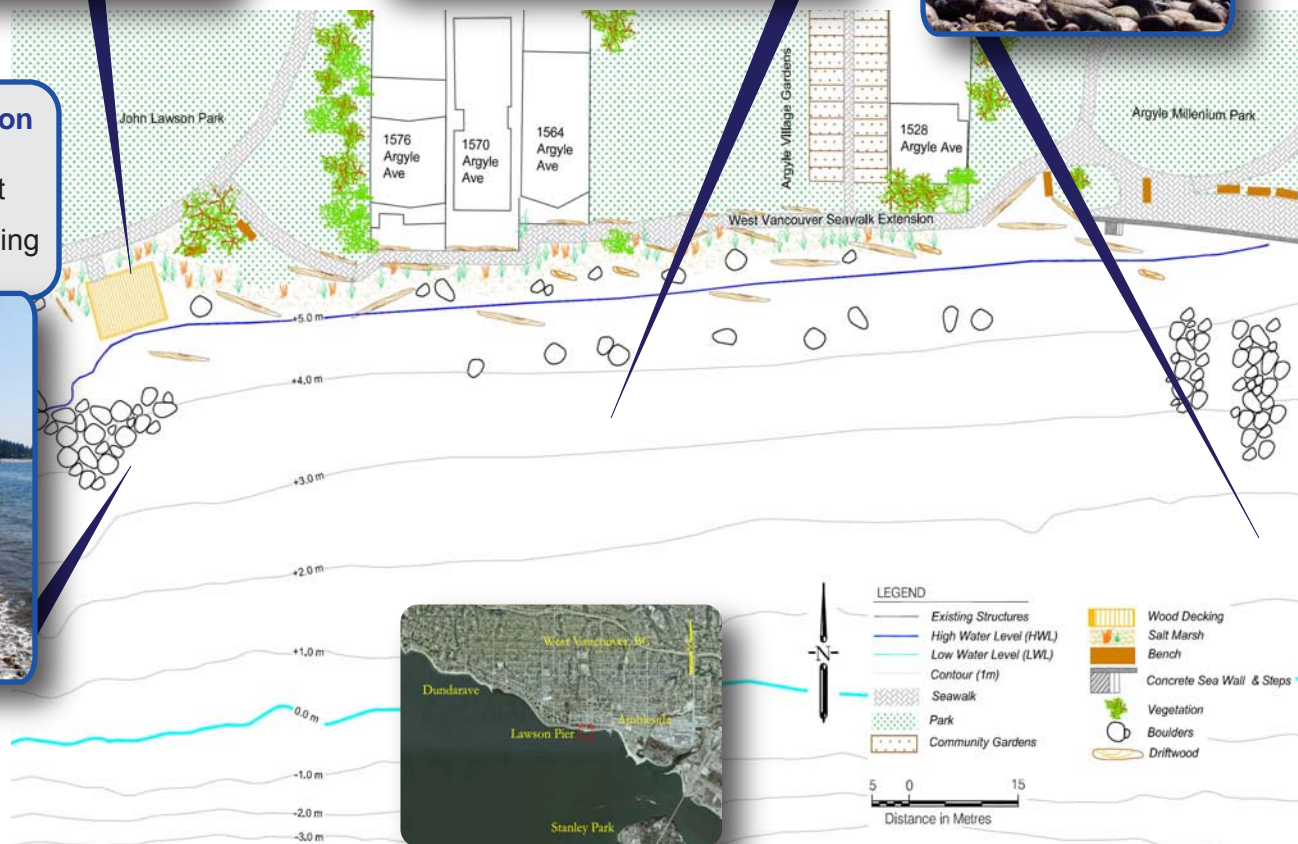
Habitat Development

- Freshwater Culvert
- Riparian Fringe



Shoreline Protection

- Sediment Transport
- Shoreline Roughening



West Vancouver would like to thank the following organizations for their support:



Opportunities

- Prevent unstable substrate from being swept out to sea by waves and currents.
- Guide and trap sediments on the upper shore for continuous beach nourishment.

2008

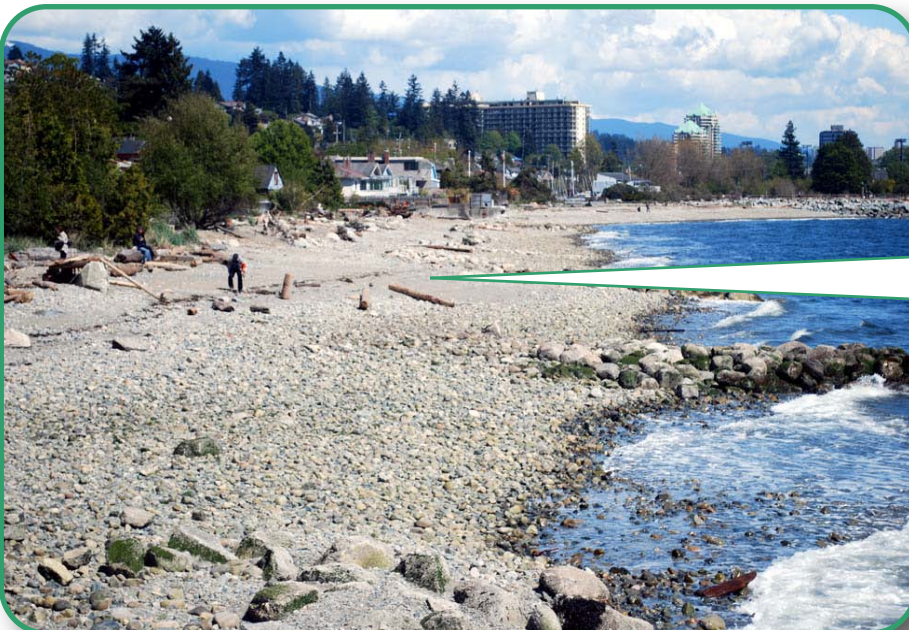


'Longshore drift' is the movement of fine sediments along a shoreline, caused by lateral currents. The beach between Ambleside Pier and Lawson Pier had historically experienced a very high level of erosion caused by waves and longshore drift. Fine sediments were swept easterly and eventually into deeper water, leaving behind cobble and pebbles.

Achievements

- Patches of boulders create tombolas which guide and trap sediments on the beach.
- By trapping sediments tombolas increase the beach profile and provide long term benefits.

2010



Tombolas mimic islands, they interrupt longshore drift and wave movements and trap sand and fine sediments on the shore. Strategically placed, tombolas can be used to target areas most vulnerable to erosion



By trapping sediments in this way, tombolas provide long term wave protection and natural, continuous beach nourishment.

Opportunities

- Reduce coastal erosion and storm damage by returning the shoreline to a natural state.
- Implement a long term solution to the problems of erosion and wave damage.

2008



The stretch of shoreline between Lawson Pier and Ambleside had historically experienced a high level of erosion, as fine sediments were carried off by waves and currents



leaving a low-profile, pebble and cobble beach with no natural protection from waves.

By returning the shoreline to a natural state, coastal developments are protected and beach erosion is reduced, with little ecological impact.

Achievements

- Boulders create wave trips and sediment traps to protect the shoreline and prevent erosion.
- Recreation of a more natural and defensive shoreline, with long term protective benefits.

2010



Boulders were strategically positioned to create tombolas and wave trips. Working like a natural rocky shore they 'trip' waves lower down the shore, and trap sediments along the upper shore, preventing erosion and encouraging natural beach replenishment. By working with natural coastal processes, wave trips and tombolas have long term benefits.



Opportunities

- Replace broken concrete culverts and return the beach to a more natural state.
- Guide the flow of fresh water from the culvert, encouraging the growth of mussel beds.

2009



The two reinforced cement culverts exposed on the foreshore at 15th Street were badly damaged and eroded. Culverts and creeks are an important source of fine sediments for the upper shore and freshwater for many intertidal species. By removing the culvert pipes the fresh water and sediments could be retained on the upper- and mid-shore.

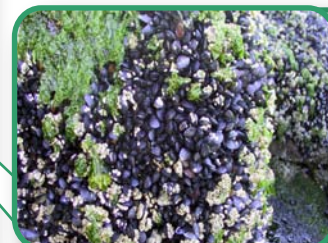
Achievements

- The ends of the culverts were removed to encourage fresh water flow onto mussel beds.
- Boulders positioned around the culvert regulate and direct water flow.

2010



The damaged ends of the culvert pipes were removed and remaining sections were covered with boulders to return the shoreline to a more natural state.



By removing the damaged sections the culverts were 'opened' mid-shore, creating a steady flow of nutrient-rich freshwater to the lower shore allowing mussel beds and algae to flourish.

Opportunities

- Replace broken concrete culverts and return the beach to a more natural state.
- Guide the flow of fresh water from the culvert, encouraging the growth of mussel beds.

2009



The two reinforced cement culverts exposed on the foreshore at 15th Street were badly damaged and eroded. Culverts and creeks are an important source of fine sediments for the upper shore and freshwater for many intertidal species. By removing the culvert pipes the fresh water and sediments could be retained on the upper- and mid-shore.

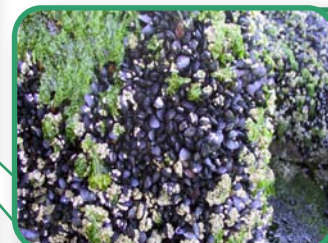
Achievements

- The ends of the culverts were removed to encourage fresh water flow onto mussel beds.
- Boulders positioned around the culvert regulate and direct water flow.

2010



The damaged ends of the culvert pipes were removed and remaining sections were covered with boulders to return the shoreline to a more natural state.



By removing the damaged sections the culverts were 'opened' mid-shore, creating a steady flow of nutrient-rich freshwater to the lower shore allowing mussel beds and algae to flourish.

Opportunities

- Replace broken concrete culverts and return the beach to a more natural state.
- Guide the flow of fresh water from the culvert, encouraging the growth of mussel beds.

2009



The two reinforced cement culverts exposed on the foreshore at 15th Street were badly damaged and eroded. Culverts and creeks are an important source of fine sediments for the upper shore and freshwater for many intertidal species. By removing the culvert pipes the fresh water and sediments could be retained on the upper- and mid-shore.

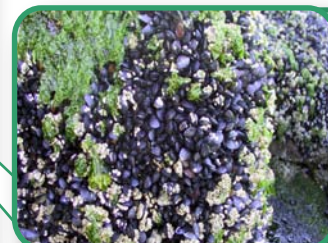
Achievements

- The ends of the culverts were removed to encourage fresh water flow onto mussel beds.
- Boulders positioned around the culvert regulate and direct water flow.

2010



The damaged ends of the culvert pipes were removed and remaining sections were covered with boulders to return the shoreline to a more natural state.



By removing the damaged sections the culverts were 'opened' mid-shore, creating a steady flow of nutrient-rich freshwater to the lower shore allowing mussel beds and algae to flourish.

Opportunities

- Improvement of the ecological and aesthetic value of the Seawalk by recreating natural habitat.
- Connect the newly constructed trail and nearshore developed areas with the shoreline.

2009



The riparian fringe is an important natural habitat, it acts as a protective buffer between the sea and the land, provides important habitat for many animals, traps terrestrial pollutants, stabilises sediments, and helps cycle nutrients into the intertidal zone. Riparian habitats are a key feature of a self-sustaining shoreline.

Achievements

- Creation and expansion of riparian habitat along the upper shore to improve ecological value.
- Physical connection of the trail to the shoreline and improved aesthetic value.

2010



As the new shoreline path was built an intertidal bench was created, expanding the area available for the existing patchy riparian vegetation. Suitable habitat was increased by the addition of fine sediments and soils in which the dune grass and other riparian species already present, could grow. The riparian habitat attracts insects and birds and provides biological material to the shoreline.

Opportunities

- Encourage public interest in the local natural environment, especially the shoreline.
- Foster public stewardship of the coastline through engagement with their surroundings.

2009



Public access to the shoreline was restricted by various physical and visual barriers throughout the site that disconnected both the Seawalk and the public from the shoreline. By removing these barriers and restoring the connection between the Seawalk and the foreshore it is hoped that the public will have more opportunity to engage with the local environment.



Achievements

- Improvement and creation of physical and visual access to the local environment.
- Development of space and opportunities for public engagement with the habitat.

2010



Physical and visual access to the shoreline was restored by the creation of the trail and riparian habitat between 16th and 15th, the provision of facilities such as the viewing deck at John Lawson park, and the creation of additional beach access points. Further enhancement works are planned for the future. It is hoped that these features will help foster an increased sense of public stewardship over the site and the shoreline.

Opportunities

- Reconnect the public with the shoreline by providing improved public access to the beach.
- Improve the continuity of the Seawalk, and public amenities, between 15th and 16th St.

2008



The Seawalk was cut off at Ambleside Millennium Park with a street detour through a busy parking lot, connecting to John Lawson Park. Properties backed directly onto the shoreline restricting access to the beach to entry points from the sea wall at the Millennium Park and the path at Lawson Pier.

Achievements

- Creation of a trail along the upper shore, connected to the beach by riparian habitat.
- Improvement of public access to the beach, shoreline, piers and parks across the site.

2010



Construction of a new trail stretching from Millennium Park to John Lawson Park provides safer pedestrian access along the upper shore. The trail is bordered by a natural riparian habitat and sloping shoreline. The development of the trail allowed for the expansion of public spaces and amenities across the site.

Opportunities

- Reduce beach erosion and the associated costs of ongoing infrastructure and habitat repair.
- Prevent the need for continuous, artificial beach nourishment while softening the shoreline.

2008



Certain areas of the beach between 15th Street and Ambleside have experienced heavy erosion of fine sediments leaving a pebble and cobble beach. Hard-faced concrete seawalls protecting shoreline developments are themselves compromised and damaged by wave action and erosion.

Achievements

- Use of boulders to protect the shore and guide and trap sediments on the beach.
- Restoration of a self-sustaining and naturally protective shoreline.

2010



Boulders, tombolas and wave trips roughen the shoreline, providing protection from waves and trapping fine sediments on the upper shore.



By recreating a natural rocky shoreline these enhancement features provide long-term prevention of erosion and protection of the upper shore, with additional environmental benefits such as creation of valuable intertidal habitat and fish habitat.

Summary

There has been a high degree of erosion at Lawson Pier, as with Lawson Creek. The purpose of this project was to provide shoreline protection, enhance the biodiversity of the intertidal zone and stabilize the existing sediments for riparian habitat, algae and invertebrates.

Status

Conceived 2006. Major works 2006-2010. There is ongoing habitat monitoring.

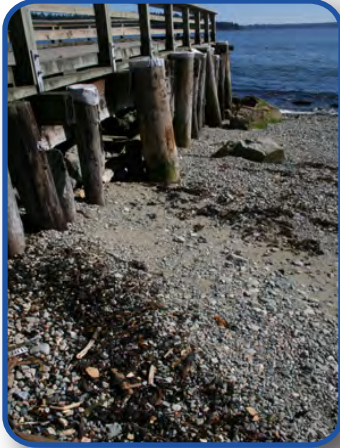
Public Amenities

- Public Access



Economic Benefits

- Beach Stabilization



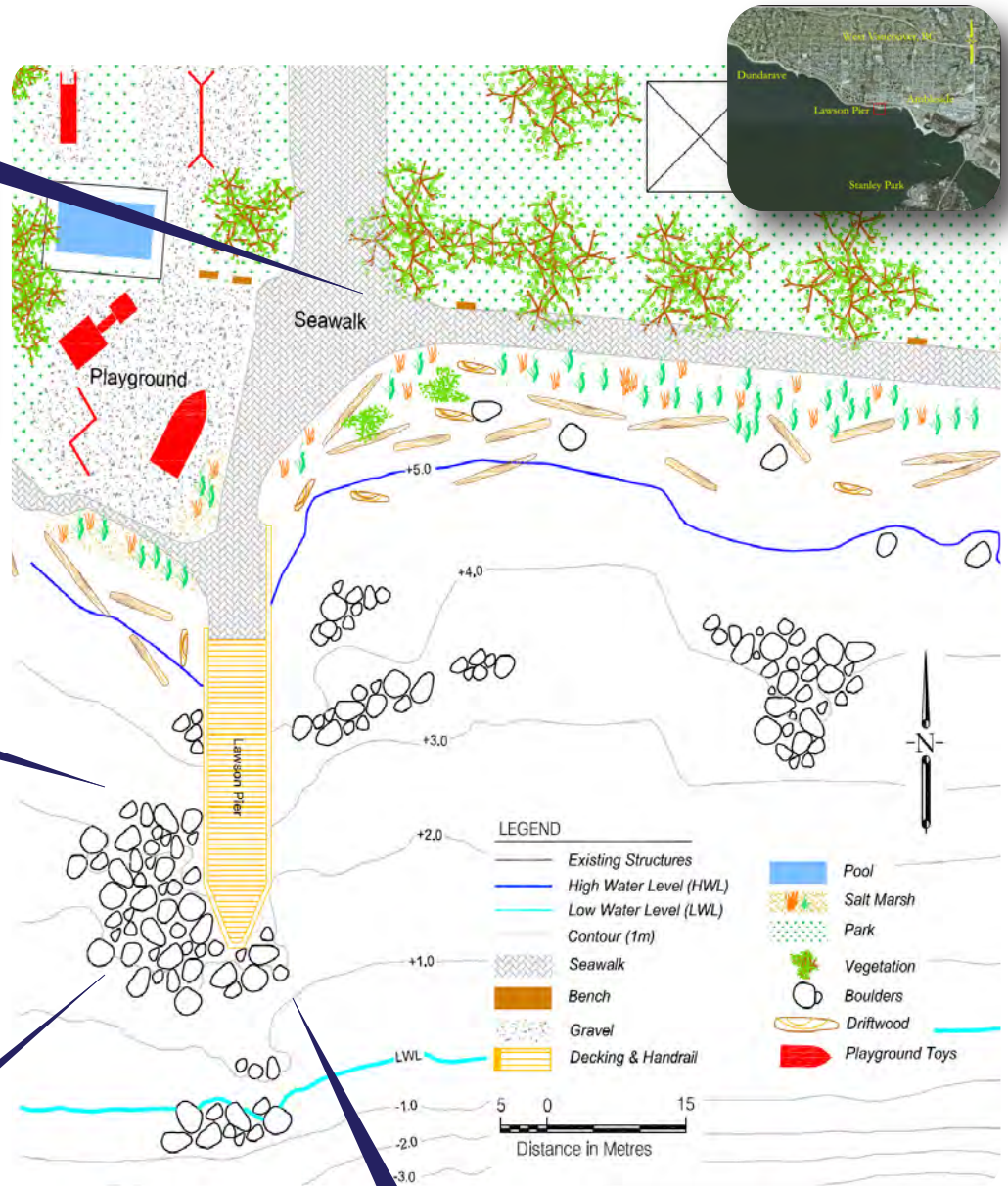
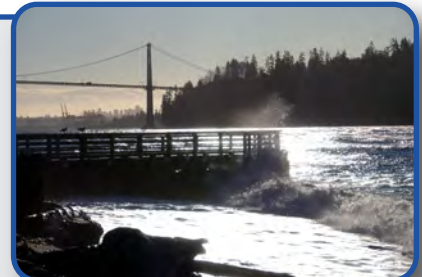
Habitat Development

- Habitat Boulders



Shoreline Protection

- Wave Trips
- Sediment Transport



West Vancouver would like to thank the following organizations for their support:

Opportunities

- Prevent small, unstable substrate from being swept out to sea by waves and currents.
- Encourage natural deposition of sediments, replenishing and building the beach profile.

2006

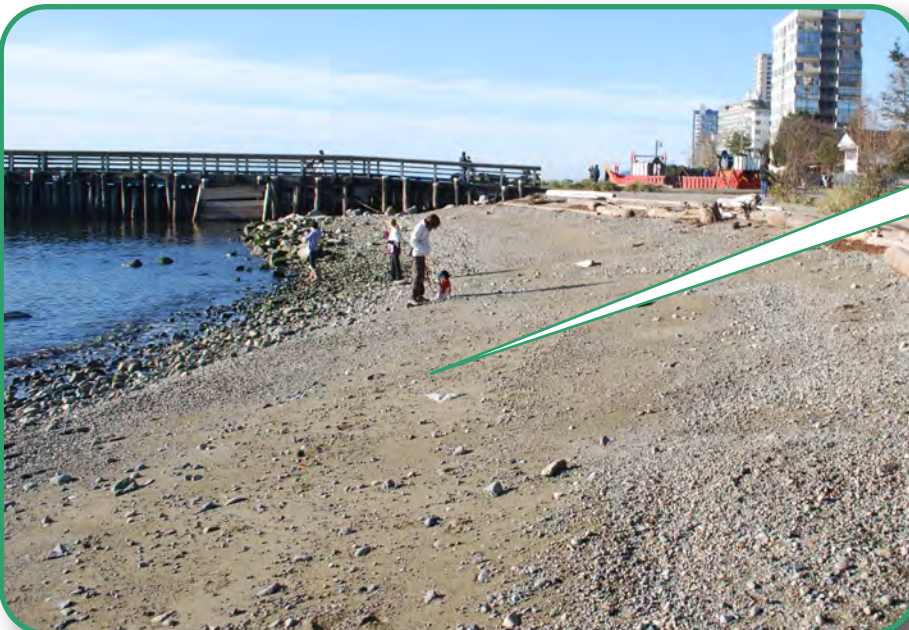


As waves hit the beach at an angle sediments are not just moved back and forth, instead they are gradually swept laterally, to the end of the beach and out to sea. Preventing this erosion from occurring safeguards shoreline structures and developments, as well as the beach. Boulders can be used to control the flow of water and sediments along the shore.

Achievements

- Patches of boulders create tombolas, which guide and trap sediments on the beach.
- By trapping sediments, tombolas increase the beach profile and provide long term benefits.

2010



Tombolas are patches of boulders which guide and trap fine sediments carried by waves and currents. By retaining and stabilizing sediments in this way, we are able to use tombolas to increase the beach profile using natural coastal processes and provide long term prevention of beach erosion. Tombolas also act as wave trips and create intertidal habitat for rockweed, barnacles and mussels.

Opportunities

- Prevent erosion by reducing the power and suction load of waves reaching the beach.
- Implement natural sea defences that will have long term benefit.

2006



A low-profile, cobble beach offers little resistance to waves. Travelling up the beach, only gravity reduces the force of the wave until it breaks on an object or loses momentum. Waves that meet with a hard-faced object are reflected back down the beach at full-force, gravity increases their momentum as they retreat, amplifying beach erosion.

Achievements

- Boulders positioned along the lower shore trigger waves and diffuse their energy.
- These 'wave trips' act like a natural rocky shore and provide long-term protection.

2010



Boulders partially buried along the lower shore 'trip' waves, triggering them to break and their energy to dissipate before they reach the upper shore. Wave trips act like a natural rocky shore line, reducing the power of waves at the lower shore and protecting the sediments on the beach. They provide a long term, natural solution to erosion.